

Third Evaluation of VINN Excellence Centres

*AFC, BiMaC Innovation, BIOMATCELL, CESC,
CHASE, ECO₂, Faste, FUNMAT, GHz, HELIX,
Hero-m, iPack, Mobile Life, ProNova, SAMOT,
SuMo & WINGQUIST*

MARY O'KANE ET AL

Title: Third Evaluation of VINN Excellence Centres - *AFC, BiMaC Innovation, BIOMATCELL, CESC, CHASE, ECO2, Faste, FUNMAT, GHz, HELIX, Hero-m, iPack, Mobile Life, ProNova, SAMOT, SuMo & WINGQUIST*

Author: Mary O'Kane et al

Series: Vinnova Report VR 2016:01

ISBN: 978-91-87537-40-4

ISSN: 1650-3104

Published: January 2016

Publisher: Vinnova - Swedish Governmental Agency for Innovation Systems / Verket för Innovationssystem

Registration no: 2009-02164

Vinnova - develops Sweden's innovation capacity for sustainable growth

Vinnova is Sweden's innovation agency. Our mission is to promote sustainable growth by improving the conditions for innovation, as well as funding needs-driven research.

Vinnova's vision is for Sweden to be a world-leading country in research and innovation, an attractive place in which to invest and conduct business. We promote collaborations between companies, universities, research institutes and the public sector. We do this by stimulating a greater use of research, by making long-term investment in strong research and innovation milieus and by developing catalytic meeting places. Vinnova's activities also focus on strengthening international cooperation. In order to increase our impact, we are also dedicated to interacting with other research financiers and innovation-promoting organisations. Every year Vinnova invests about SEK 2.7 billion in various initiatives.

Vinnova is a Swedish government agency working under the Ministry of Enterprise and Innovation and acts as the national contact agency for the EU Framework Programme for R&D. We are also the Swedish government's expert agency within the field of innovation policy. Vinnova was founded in January 2001. About 200 people work here and we have offices in Stockholm and Brussels. Our Director General is Charlotte Brogren.

The **Vinnova Report** series includes publications and reports, often by external authors, from programmes and projects that have received funding from Vinnova. Includes also editorials related to Vinnova's mission, by independent authors.

Third Evaluation of VINN Excellence Centres

*AFC, BiMaC Innovation, BIOMATCELL,
CESC, CHASE, ECO2, Faste, FUNMAT,
GHz, HELIX, Hero-m, iPack,
Mobile Life, ProNova, SAMOT,
SuMo & WINGQUIST*

GENERALIST EVALUATORS: MARY O'KANE, ALISON MCKAY, ANJA SKRIVERVIK,
RUSSEL MORRIS & SYBRAND VAN DER ZWAAG

EXPERT EVALUATORS: THILO BEIN, PAUL SAS, HELINÄ MELKAS,
PETER TOTTERDILL, GLENN LYONS, JON SUNDBO, JILT SIETSMA, ROGER REED,
KRISTIINA TAKKINEN, SABETH VERPOORTE, MARTIN STUTZMAN,
MARIE-PAULE DELPLANCKE, LUCIENNE BLESSING, DAVID BARTON,
JACKIE KLOPP, CHRIS PREIST, SUSANNE BÖDKER, PETER WRIGHT, SERENA BEST,
JANNE ELIN RESELAND, ANJA SKRIVERVIK, GERARD VAN RHOON,
DOMENIQUE LANGEVIN, MIKA LINDÉN, KRISTIAN MARTINSEN,
CLAUDIA ECKERT, ERNESTO LIMITI & HERMANN SCHUMACHER

Title: Third Evaluation of VINN Excellence Centres - *AFC, BiMaC Innovation, BIOMATCELL, CESC, CHASE, ECO2, Faste, FUNMAT, GHZ, HELIX, Hero-m, iPack, Mobile Life, ProNova, SAMOT, SuMo & WINGQUIST*

Author: Mary O'Kane et al

Series: Vinnova Report VR 2016:01

ISSN: 1650-3104

ISBN: 978-91-87537-40-0

Published: January 2016

Publisher: Vinnova - Verket för Innovationssystem/Swedish Governmental Agency for Innovation Systems

Registration no: 2009-02164

Production: Vinnova's Communication Division

Contents

Preface	5
1 Introduction	7
2 Overarching report from the generalist evaluators on Berzelii and VINNEx Stage 3 Centre evaluations, 2013-2015	9
3 Evaluation of AFC - Antidiabetic Food Centre	14
4 Evaluation of BiMaC Innovation	20
5 Evaluation of BIOMATCELL	24
6 Evaluation of CESC	31
7 Evaluation of CHASE	37
8 Evaluation of ECO2	41
9 Evaluation of the Faste Laboratory	48
10 Evaluation of FUNMAT	53
11 Evaluation of GHz	57
12 Evaluation of HELIX	64
13 Evaluation of Hero-m	70
14 Evaluation of iPack	77
15 Evaluation of Mobile Life	82
16 Evaluation of ProNova	87
17 Evaluation of SAMOT	93
18 Evaluation of SuMo Biomaterials	101
19 Evaluation of WINGQUIST	107
Appendix A. Guidelines – Group 1	112
Appendix B. Guidelines – Group 2 – 3	131
Appendix C. Guidelines – Group 4	154

Preface

Vinnova and its predecessors have since 1995 funded competence research centres with an effort to build bridges between science and industry in Sweden by creating excellent academic research environments in which industrial companies participate actively and persistently in order to deliver long-term benefits. The mission is to strengthen the very crucial links in the Swedish national innovation system between academic research groups, industrial R&D and public sector actors. The competence research centres have shown to generate very good long term results for participating companies in forms of e.g. new products, new processes and financial results and increased competitiveness.¹

Based on previous experience, Vinnova started a new programme VINN Excellence Centre programme in 2005 funding 4 centres and in 2007 funding 15 centers and opened up a new, third generation competence centre programme year 2015. The existing centres from the VINN Excellence programme have been evaluated twice during the years and as consequence of that, two of them did not receive continued funding. The remaining 17 centres have now been operating for eight years and this report presents the results of the third evaluation of these centres.

The evaluation of stage three, year 5-8, of VINN Excellence Centres was focused on the long-term output, outcome and impact on the partners; industrial-, public- and academic partners and also on the future, the plans beyond stage 4. The evaluation is an opportunity to give advice and recommendations on how each centre can become even more efficient and effective. Based on the evaluation results, Vinnova has decided that 16 out of 17 centres will be approved for a fourth period.

On behalf of Vinnova I want to express our great appreciation to all the international evaluators. I especially want to give our gratitude for the generalist evaluators, Mary O’Kane (Chair), Alison McKay, Russell Morris, Anja Skrivervik and Sybrand van der Zwaag that has met 17 centres in the Swedish system. All evaluators accomplished their extremely hard work with great enthusiasm and professionalism. Their reports will be of great value, not only for the further development of each individual centre, but also for the VINN Excellence Centre programme and Vinnova as such.

Vinnova in January 2016

Charlotte Brogren
Director General

¹ Arnold, Erik. Et.al. Long term Industrial Impact of the Swedish Competence Centres. Vinnova Analysis VA 2013:11. 2013

1 Introduction

The third and last evaluation has been realized. 17 VINN Excellence Centres were evaluated during the time period October 2013 until October 2015 by two to three generalists and two experts per centre. The chief evaluator was Professor Mary O’Kane, a former university vice-chancellor, a member or chair of many Government and private sector boards and committees, and as current part-time Chief Scientist and Engineer for the State of New South Wales, Australia. The other generalists were Alison McKay, Professor of Design Systems at University of Leeds, UK, Anja. Skrivervik, Professor in ElectroMagnetics and Antennas at the Swiss Federal Institute of Technology Lausanne (EPFL), Switzerland, Russell Morris, Professor at School of Chemistry at University of St Andrews, Scotland and Zybrand van der Zwaag, Professor at the Faculty of Aerospace Engineering at Delft University of Technology, Netherlands. The experts were chosen from a list of recommended people, one list for each Centre. The recommendations were done by the Centres themselves.

The evaluations were divided into four groups and they were evaluated at different occasions. Group 1 in October 2013, group 2 in September 2014, group 3 November 2014 and group 4 October 2015.

Group 1: HELIX, ECO2, SAMOT

Group 2: BIOMATCELL, SuMo, CHASE, GHz, WINGQUIST

Group 3: CESC, Hero-m, ProNova, FUNMAT, Faste, Mobile Life

Group 4: AFC, BiMaC Innovation, iPack

The prerequisites for this evaluation were somewhat changed compared to the process during the second evaluation. The actual interview time was shortened, the number of evaluators present on the interview day was decreased and new steps were introduced. The time for the actual interview was shortened and lasted for 3-4 hours compared to one and a half day previous time. This was possible because a pre-interview process was introduced and many questions could be answered in the comments to the pre-evaluation report and this lead to the fact that the range of discussion points were not as wide as before. The pre-interview process contained these new steps:

- Pre-interview report sent to evaluators six weeks before interview day
- Pre-evaluation report sent out to centres three weeks before interview day
- Comments from Centres on pre-evaluation report to evaluators two weeks before interview day

The pre-interview report documentation consisted of the latest version of the operational plan, an evaluation report and the latest scientific advisory board report. More detailed description on the evaluation process and the content in the evaluation report etc. can be found in the appendices A-C, the guidelines for the evaluations.

Another change was that none or only one of the experts were present during the interview. The experts not attending the interview were contacted by phone before and after the interviews.

The following chapters are written by the evaluators with unchanged wordings. The summary, the overarching report includes also the centres belonging to the Berzelii Centra Programme since they were evaluated in connection to the VINN Excellence Centres and the general statements are valid for this programme also. Almost the same criteria were used in both programmes.

2 Overarching report from the generalist evaluators on Berzelii and VINNEx Stage 3 Centre evaluations, 2013-2015

Evaluation outcomes

Three Berzelii Centres and 17 VINN Excellence Centres were evaluated over the period 2013-2015. All Centres but one are performing to a standard that merits continued funding in Stage 4, in some cases with conditions contained in recommendations.

There is considerable variation in Centre performance and in the prospects for continuation beyond Stage 4 as illustrated by the following table:

CENTRE	PERFORMANCE
UPSC [BERZELII]	Exceptional; partners want to continue beyond Stage 4
GHZ [VINNEX]	Excellent; partners want to continue beyond Stage 4
CHASE [VINNEX]	Excellent; partners want to continue beyond Stage 4
FUNMAT [VINNEX]	Excellent; beyond Stage 4 unclear
BIMAC INNOVATION [VINNEX]	Very good; partners want to continue beyond Stage 4
HELIX [VINNEX]	Very good; partners want to continue beyond Stage 4
HERO-M [VINNEX]	Excellent research with good industry impact; beyond Stage 4 unclear
PRONOVA [VINNEX]	Unusual VINNEx Centre structure; research very good and has industry impact; probably bilateral collaboration at best post Stage 4
EXSELENT [BERZELII]	Research very good; industry impact moderate; beyond Stage 4 unclear
MOBILELIFE [VINNEX]	Very good; partners discussing beyond Stage 4 scenarios
FASTE [VINNEX]	Very good; partners want to continue beyond Stage 4
ECO 2 [VINNEX]	Good; beyond Stage 4 not finalised
WINGQUIST [VINNEX]	Good; partners want to continue beyond Stage 4
AFC [VINNEX]	Good; plans for beyond Stage 4 not advanced
CESC [VINNEX]	Good; partners discussing beyond Stage 4 scenarios
UPPSALA BERZELII	Reasonable; partners want to continue beyond Stage 4
SUMO [VINNEX]	Reasonable; partners are not sure yet if they wish to continue beyond Stage 4 but discussions are ongoing among the industrial partners
SAMOT [VINNEX]	Reasonable; beyond Stage 4 not clear at evaluation
BIOMATCELL [VINNEX]	Has produced research results at an appropriate level for a VINN Excellence Centre but has more to do to increase the commercial impact of its work. No clear idea yet about beyond Stage 4.
IPACK [VINNEX]	Unsatisfactory

Observations on the programmes and the centres

International perspective

Over the years of Vinnova/VR Centre evaluations we are happy to note that the Centres are generally performing at a 'good to very good' level when benchmarked against Centres outside Sweden – with a small number at world-leading standard.

10-year funding

The 10-year funding of Centres has proved to be important. It has been interesting to note how even the very best Centres took some time to settle down and build high-impact cooperation with their industry partners. For weaker Centres this settling down period has taken much longer and, as can be seen from the table above, some are yet to realise their industry impact fully. Tough reviews at each of the Centre stages have proved beneficial in providing feedback, as have the International Scientific Advisory Boards (ISABs). It is a pity some of the Centres have been reluctant to have their ISABs meet regularly. It is notable that the leading Centres make heavy use of their ISABs.

The importance of Vision, Mission and Strategy

The best performing Centres each have a well-articulated vision, a challenging mission and a strategy that provides a detailed roadmap for achieving the mission. This strategy is renewed and refreshed as the Centre prepares an Operational Plan for each Stage of the Centre. The weaker Centres did not have such well-linked visions, missions and strategies.

The importance of an effective Board and a strong Director

The crucial role of the Centre Board, and especially the Board Chair, is possibly somewhat overlooked by Vinnova and VR in establishing Centre success criteria, but it is clear that a strong, active and visionary Board working with and supporting a strong Director is crucial to bring a Centre to a high standard.

The importance of 'added value' in the Centres

A well-founded and well-run Centre is more than the sum of its parts. The Centre should act as a focus for all the research, training, and translation/commercialisation activity. In the Centres with the best leadership from the Board and Management this happens naturally, but in the poorer performing Centres this aspect is almost completely missing. We suggest that that the 'added value' provided by being a Centre (as opposed to simply a set of bilateral collaborations) is specifically requested as part of the evaluation paperwork so that it can be more formally assessed. At the very least this will flag the issue to the Centres that have not realised the importance of it themselves.

Partner motivations and contributions

In the best performing Centres, the Centre and all the partners have a good understanding of the motivations, contributions (cash, in-kind & intangible) and expectations of each of the Centre partners with regard to the Centre. This clarity is important so that the Centre can target satisfying its partners' needs and keeping them involved in the Centre while maximising the Centre's overall impact and thereby delivering on the funding bodies' expectations.

International experience for PhD students

We are happy to note that the Centres increasingly expose their PhD students to work experience outside Sweden. However in this respect the Centres do not yet perform at the level of mainland European universities

Two centres merging – a good outcome

One particularly good result (at the time of Stage 3 evaluation, in this case late 2014) is that two of the most outstanding Centres in the evaluation, GHZ & CHASE, are considering a merger

after Stage 4. This would create a high impact centre both in terms of industry impact and research impact. This should be encouraged.

GHZ and CHASE intend to have a joint project in Stage 4. The evaluation team believes this is a vital step on the path to a merger and, accordingly, the Centre Agreement should be drafted in a way that would make this easy to implement.

Making sure high-impact centres maximise their international visibility

GHZ and CHASE combined would be a very good candidate for any future Centre programme introduced by Vinnova (as would UPSC). We suggest any such programme ought to encourage these new Centres to use Vinnova (or Vinnova/VR) funding as the core funding which helps such centres attract funding from other prestigious sources. At the moment there is an artificial divide – the UPSC and GHZ teams in particular have a lot of funding which is separate from the Berzelii (UPSC) and VINN Ex (GHZ) funding and the artificial separation means that the international impact and strength of the Centres are less visible than they could be, especially internationally.

More generally there is a need for the Centres to aim for higher international visibility, giving conscious attention to developing their brands.

Gender balance – more could be done

Despite Vinnova and VR's emphasis on gender balance, we were disappointed to note that no significant efforts were observed actively to steer the gender balance in several of the Centres evaluated. This applies both to Centres with a male dominance and to Centres with a female dominance. In this respect the Centres seem to be lagging behind industry.

Supporting new and unusual fields

One encouraging outcome of the VINNEx programme is its effective support in growing fields that do not traditionally have a presence in academic research. There are two notable examples in this crop of Centres – Faste working the field of functional products and CESC working to minimise the environmental impact of the ICT industry. The fact that these Centres are finally performing at a satisfactory level is testament to the effectiveness of the VINNEx programme in nurturing and building up critical mass in new disciplines for Sweden.

The importance of conscious endorsement of Centre Operational Plans

Over several evaluations one VINN Excellence Centre, ProNova, has proved challenging for evaluators. While it is clear it has world-leading researchers, the industry-engagement arrangements of the Centre seemed to be structured in a way that provided little support for translating results for industry partners' uptake. This issue was repeatedly criticised in evaluations with those evaluations being regarded as unfair by the Centre. This mystery was finally cleared up in the Stage 3 evaluation when it became clear that the Centre had received approval for an initial Operational Plan that set out an industry engagement mode of operating which differs subtly but significantly from that used in the other VINNEx centres. Subsequent Operational Plans for the Centre reflected the initial one in this respect and were approved by Vinnova but the difference was not brought to evaluators' (or indeed senior Vinnova programme managers') attention. The complexity of what is required in the Centre Operational Plans probably contributed to this. Simplifying these requirements and sending all extraneous

material to appendices would help with this issue. We suggest the core of the Operational Plan focus on KPIs and timing for the Centre, its projects, and processes of partner impact.

More funding flexibility needed between stages

In the interests of smooth transition between Centre stages, we recommend that Vinnova/VR allow more flexible funding arrangements between stages so money can be carried forward if there are good reasons to do so.

Provision of commercialisation/technology transfer expertise

Impact is an important component of all the Centres funded by Vinnova and VR. It is notable that different Centres start from different points in their previous experience with industry collaboration and that many of the weaker Centres would benefit from some help from experienced commercialisation or technology transfer professionals. The exact nature of the contribution is likely to depend on the skills already present in the Centres.

Two examples illustrate where provision of expertise could have been very valuable. Firstly, the AFC VINN Excellence Centre at Lund is in a field where much of the innovation needs to be developed through spin out companies (a total of nine for AFC). The Centre would have benefitted from more specialist expertise in spinning out companies from an academic environment. The second example is the EXSELENT Berzelii Centre at Stockholm, where there seemed little previous experience in working with industry. This Centre would have benefitted very early on from some more structured technology transfer expertise working quite closely with the management team. Different Centres would benefit in different ways but Vinnova/VR should act as facilitators in order that suitably qualified people could join the board, management or research team in order to improve the pull through of research into impact. Finding the right people (e.g. those who been CEOs of spin out companies or successful technology transfer experts) is key here, and Vinnova/VR are likely to be best placed to help with this process.

Comments on process

Two process innovations were introduced by Vinnova for the 2014-15 evaluations:

- 1 Remote evaluator – two experts in the field of the Centre were engaged for each evaluation, one present at interview and one (the ‘remote specialist evaluator’) participating by phone in pre- and post-interview discussions and contributing to the pre- and post-interview reports. For the 2014 Gothenburg Centres, this process seemed to work reasonably well in three cases and less well in the other two, despite good intentions all round. For the later evaluations, the teams took the approach of having the remote evaluator contribute fully to the pre-interview report and night-before-interview discussion, but did not require the remote evaluator generally to contribute to the writing of the final report; rather asking them to be the first editor of this report. The revised process was much more successful. Nevertheless we suggest sending the remote evaluators a simple questionnaire asking them what did and did not work well and seeking their suggestions for improvement. While the lowering of the quality and depth of the Vinnova evaluation process as a result of having only one expert evaluator present during interview might be tolerable at Stage 3 evaluations, the physical presence of two generalist evaluators at interview remains a key requirement for a professional evaluation of a centre.

For one Centre, Faste, the specialist evaluator who was to attend the interview fell ill and could not be replaced at short notice. In this case, what worked well was that both specialist evaluators ‘coached’ the generalist evaluators on the (for this case quite significant) specialist issues in the pre-interview discussion and the interview and subsequent final report processes went remarkably smoothly.

Pre-report – for 2014-15 evaluation rounds, a pre-report covering all the matters of the evaluation (and not just scientific matters as in the previous round) was sent to each Centre before interview, with each Centre having the chance to respond either before or at the interview. We were concerned initially that this might make the interview stilted but in practice the process seemed to work quite well. The only concern we have is that one Centre, BIOMATCELL, received a neutral-to-positive report before interview (and made no pre-interview comments on the report) but the final report was much more negative.

Use of specialist evaluators in common

It would have been helpful for the Centres and their evaluators if there were at least one common specialist evaluator for Centres operating in the same or close fields. This would allow more precise evaluation of the Centres and pave the way for closer collaborations between them. Groups which would have benefitted from a specialist evaluator in common are:

- GHZ + CHASE
- WINGQUIST + Faste
- Hero-m + FUNMAT
- CESC + Mobile Life
- BIOMATCELL + SuMo + BiMaC Innovation

25 October 2015

Mary O’Kane (Chair)

Alison McKay

Russell Morris

Anja Skrivervik

Sybrand van der Zwaag

3 Evaluation of AFC - Antidiabetic Food Centre

A VINN Excellence Centre at Lund University

Introduction

On 13 October 2015, the Chair of the Centre Board, Hannie Lundgren, board members, the Centre Director, Inger Björck, colleagues of the AFC VINN Excellence Centre, PhD students, external partners, and university representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Russell Morris as generalists and Marjukka Kolehmainen as specialist). The evaluation team also included Laura Bravo, as the remote specialist evaluator. At interview Mats Jarekrans and Lena Eckerdal Rimsten were present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing information for the evaluation via the report to the evaluation team, feedback on the pre-interview report, and the clarifying meeting with the evaluation team.

This evaluation is particularly focused on the output from the Centre in the form of scientific, societal, industrial, and education results and the impact of this output. The Centre has a strong, multidisciplinary research core which produces very good scientific output and has industrial impact through a set of spinout companies and through involvement of a range of small, medium and large food companies and a public sector partner.

Long-term Vision, Mission and Strategy

The vision and the mission are appropriate and address a major world problem. The strategy pursued by the Centre in recent years has led to important achievements but arguably needs some modification for Stage 4 and beyond to increase the resilience and impact of the Centre’s spinouts through which much of the Centre’s intellectual property is being commercialised.

How the Centre addressed the recommendations of the previous Review

The Centre reports that it addressed all 20 recommendations from the previous evaluation (seven of which were repeated/reworded from the review before that) at least in part.

Centre Partners

The Centre has one academic partner, Lund University, one public sector partner, Region Skåne, and eight company partners. Some of the partners are new at Stage 3. This set of partners worked well for this stage but could profitably be expanded in Stage 4 to provide a wider range of possible outlets for AFC intellectual property both directly and through its spinouts.

Scientific Quality and Productivity

Research area, competence profile, people, facilities, critical size, and processes for ideas generation

AFC is performing multidisciplinary research activity aimed at the design of innovative food concepts with scientifically proven potential against insulin resistance syndrome (IRS) and the prevention of related disorders (obesity, type 2 diabetes, cardiometabolic diseases). This is a research area of the utmost importance and extensive efforts to advance the field are being undertaken by the international scientific community. The distinguishing feature of AFC, compared to other centres internationally, is that research groups from various disciplines come together to work towards gathering scientific evidence for the use of foods, food components and mixed diets in the prevention of diabetes and obesity. The scientific targets of the research also include related comorbidities such as inflammation, cardiovascular disease and cognitive decline. In addition, special foods for the Nordic diet, such as berries and whole grain cereal foods and their components, are examined for their potential in preventing diabetes and obesity, which makes the Centre unique.

The competence profile is comprehensive and complementary, with excellent researchers and an adequate critical size.

AFC has excellent facilities, both in-house and available at specialised centres of LU, Region Skåne and the industrial partners. The new facilities and qualified personnel incorporated in previous stages (Food for Health, Gut Microbiome and Memory Laboratories and the analytical/metabolomic platforms) have proved essential and contributed to improved AFC competencies and increased productivity. Other new methodologies, such as epigenetics, genomics, transcriptomics and food metabolomics are in the pipeline. New international partnerships are currently being discussed, with the goal of winning European Union funding, through mechanisms such as Horizon 2020 and Marie Curie programmes.

International comparators with other Centres and Collaborations

AFC has identified several potential collaborators around the world. These include the research cluster at the Canadian Centre for Agri-Food Research in Health and Medicine (CCARM), the Japanese Association for Dietary Fibre, and the China-Europe Productivity Centre. In addition, a new collaboration has started with European Centre for Nutrition and Health (France, Lyon).

Recommendation 1: That the Centre identify more world-leading competitor institutions and perform comprehensive SWOT analyses to turn potential threats into opportunities for enhanced collaboration.

Scientific output and impact of scientific results

The comprehensive research strategy of AFC has produced good scientific results, with innovative findings that open new research lines. The scientific output, i.e. number of publications, thesis, ongoing PhD projects, and invited speeches, is broadly good and outstanding in parts. It seems that the industrial partners are involved with the discussion and progress. In addition, the industrial partners say that they are able and eager to use the results in their own concept and product development. The creation of multiple new spinouts around the scientific results and innovations underlines the AFC commitment to its mission.

Of particular potential importance is the work on the diet-gut microbiota-host metabolism-brain axis, which uses food and diet to regulate postprandial metabolism, with the goal of positive effects on cognitive function. The findings of the Centre on the potential of antidiabetic concepts in cognitive decline associated with IRS and the planned future research on tailoring foods to prevent cognitive decline and dementia are very innovative and of great interest.

AFC is also contributing significant results in other traditional research fields (e.g. pre/probiotics, polyphenol-rich foods), with the production of new prebiotic oligosaccharides, discovering antidiabetic/antiobesogenic gut microbiome signatures, potential new antidiabetic probiotics/symbiotics, and new food concepts for the control of postprandial metabolism and appetite regulation, etc. Contributions in fields like the gut microbiota, the biochemical and physiological effects of gut-derived components and metabolites, the potential of spices and berries, and new uses of cereals/cereal fractions are of notable scientific impact. Advances in food technology (Pickering emulsions) and biotechnology (tailor-made enzymes) are also to be commended.

Critiques of research programmes, projects and outputs - science, methodology and technological outcomes

Interventions with obese, prediabetic individuals or individuals otherwise at risk should be promoted in the near future. This focus is needed to get evidence-based information on the real antidiabetic, antiobesogenic and preventative function of the products developed.

Foodomics should be applied to gather more information about the components of the foods and how they add benefits to products. This would also create new ideas for active compounds for future translation activities.

In the interview, AFC underlined that they would not like to choose between dietary patterns and food components in the future. This is probably a good decision, but care has to be taken that the resources are not spread too thinly, which may hinder scientific productivity of the AFC.

Overall conclusion - scientific quality and productivity

Scientifically, this is a good centre that is focused on a complex pathology and associated disorders. The multidisciplinary research strategy is successfully contributing to the creation of innovative food concepts that are being transferred to industry. The research is promoting advances in the scientific knowledge of the mechanisms of action of diets/foods/food ingredients, and opening new fields of research. However, more effort should be made to translate the preventative food concepts (multi-functional dietary portfolio) to consumers, medical practitioners, educators, and to the regulatory authorities.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

The Centre has produced some excellent outputs that look to have potential for significant societal impact. Overall, nine new industrial entities have been formed, and the case studies presented in the interview gave a good overview of the potential for commercialisation that the research has afforded. However, it is clear that all the spinout companies are still at an early stage, and are necessarily very risky – it could be that by the end of the project none of these

small spinouts will still be viable. Therefore a major recommendation is that the Centre build on its successes and approach more companies for involvement in Stage 4. This will ‘de-risk’ the commercialisation and translation strategy and lead to a more balanced portfolio of options.

The Centre should be building on its brand and approaching larger companies such as Unilever, Danone and others that are members of the Food KIC to attract new partnerships. Even those companies that are not food producers themselves should be targeted. A good example of success here is the InnovaFood link with IKEA.

There was some verbal evidence that know-how from the Centre has been successfully transferred to the larger company partners. This type of impact is important, but one has to remember that is very difficult to measure, and the Centre needs to ensure that it communicates these successes effectively.

Overall we think the outputs and impacts are good. There is a real sense from the report and the interview of a team that is committed to not only being high-class academics but also to making an impact through innovation.

Recommendation 2: That the Centre strive to ensure the involvement of more partner companies in Stage 4. This is really important to make a success of Stage 4 and build a base for any future Centre beyond the current funding.

Recommendation 3: That the Centre strengthen its capacity for identifying/defining the core questions that are important to its partners and build greater flexibility into the science programme to address these needs effectively.

Organisation and Management of the Centre

The leadership provided in the Centre was specifically praised during the interview and presentations, and the Board and management should take great credit. There don’t seem to be any major issues with the way the Centre is governed and managed, save for perhaps a lack of branding.

The Centre as a whole has a presence on the web, but there doesn’t seem much further evidence of a ‘brand’ out there. Only seven papers in WOK have the Centre listed in their address. Large funding such as that given by Vinnova should be used by the management team to build a ‘brand’ that will hopefully be recognised as a leader at the interface between academia and industry. At the very least, the AFC public webpage could be used more effectively to showcase the Centre’s activities.

Recommendation 4: That the Centre capitalise on its considerable achievements to build a stronger brand.

The International Scientific Advisory Board (ISAB) report was fairly light touch and not really of much use to the Centre. One omission from the advice seems to be in the area of translation or commercialisation, as it does seem that the Centre has learned almost everything by itself, and this has taken time.

Recommendation 5: That the Centre seek advice on commercialisation/translation, either by appointing someone to the ISAB with suitable experience or by constituting a new advisory group specifically to deal with commercialisation strategy. This will be particularly important for beyond Stage 4.

At the interview the Centre raised its perceived restrictions on funding to aid commercialisation. The evaluation team later raised these matters with Vinnova. We understand there is more flexibility in how the funding is used than the Centre currently understands and accordingly suggest the Centre and Vinnova discuss this in planning for Stage 4.

Training Personnel of High Competence

There is a good recruitment of international talent at both staff and student level and there are no serious issues with gender equality, although we recognise the Centre's wish to balance employment in the Centre by attracting more male students.

The PhD students we met during the interview were impressive and were unanimously appreciative of the training provided by the Centre (e.g. innovation/entrepreneurship training). An addition that would be beneficial for the students would be more focus on potential industrial involvement – they are all excited by the fact that their research could be used by someone for the good of society.

Recommendation 6: That the Centre encourage the mobility of students to industry for short research visits during their PhDs.

Long term development during Stage 4 and beyond

In its evaluation report the Centre indicated that during Stage 4 it intends to translate unique results from work to date into proof of concept systems while searching for yet more antidiabetic food concepts. In this stage it also intends to prepare for beyond Stage 4 by applying in the forthcoming Vinnova competence centre call and, if this is not successful, it still intends to focus particularly on the gut/brain axis research and apply for a range of grant funding to support this.

This is appropriate but the evaluation team suggests that the Centre could make much more of the good scientific concepts and the promising spinout companies it has produced to date by building its brand and by seeking to expand its partner base for Stage 4 especially with major global food players. Hence the recommendations given above.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That the Centre identify more world-leading competitor institutions and perform comprehensive SWOT analyses to turn potential threats into opportunities for enhanced collaboration.
- **Recommendation 2:** That the Centre strive to ensure the involvement of more partner companies in Stage 4. This is really important to make a success of Stage 4 and build a base for any future Centre beyond the current funding.

- **Recommendation 3:** That the Centre strengthen its capacity for identifying/defining the core questions that are important to its partners and build greater flexibility into the science programme to address these needs effectively.
- **Recommendation 4:** That the Centre capitalise on its considerable achievements to build a stronger brand.
- **Recommendation 5:** That the Centre seek advice on commercialisation/translation, either by appointing someone to the ISAB with suitable experience or by constituting a new advisory group specifically to deal with commercialisation strategy. This will be particularly important for beyond Stage 4.
- **Recommendation 6:** That the Centre encourage the mobility of students to industry for short research visits during their PhDs.

Conclusion

AFC is a good example of a VINN Excellence Centre performing at an appropriate level at the end of Stage 3.

Assuming the recommendations are addressed, the evaluation team recommends continued funding.

Mary O’Kane (Chair)

Laura Bravo

Marjukka Kolehmainen

Russell Morris

4 Evaluation of BiMaC Innovation

A VINN Excellence Centre at Royal Institute of Technology, KTH

Introduction

On 15 October 2015, the Chair of the Centre Board, Anders Brodin, board members, the Centre Director, Daniel Söderberg, colleagues of the BiMaC Innovation VINN Excellence Centre, PhD students, external partners, and university representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Russell Morris as generalists and Carmen Freire as specialist). The evaluation team also included Youssef Habibi as the remote specialist evaluator. At interview Mats Jarekrans and Peter Åslund were present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing information for the evaluation via the self-evaluation report, comments on the pre-interview report and the clarifying meeting with the evaluation team.

The Centre was created in 2007 by bringing together one university (KTH) and several industrial partners with a vision to contribute to paradigm-shifting advances within the forest-based industry sector. The vision and mission of this Centre is perfectly in line with the global awareness and demand for innovative bio-based (forest) materials and products, as well as with the relevant role of the forest sector in Sweden.

This evaluation is particularly focussed on the output from the Centre in the form of scientific, societal and industrial results and the impact of this output.

Long-term Vision, Mission and Strategy

The Centre has a clear and appropriate long-term vision, mission and strategy. The Centre’s activities are coherent with these.

How the Centre addressed the recommendations of the previous Review

The Centre has addressed the recommendations of the previous review very well and used these actions to improve the Centre’s performance in Stage 3.

Centre Partners

The Centre has one academic partner, KTH, and eight company partners (including the KTH commercialisation company, KTH Holding) all of which have been in the Centre since at least Stage 2.

The Centre maintains strong links with its partners especially through excellent communication processes overseen by the Board and through projects that involve several partners. A key mechanism for determining and articulating partner needs is the Industrial Advisory Committees, which all partners participate in.

From the interview it would seem that the partners (industrial and academic) are very satisfied with the Centre.

For Stage 4 the Centre is considering involving ‘sponsor’ partners – partners from industries other than the traditional pulp and paper industries that might be potential users/developers of innovative products built on inventions, processes or prototypes coming from the Centre.

Scientific Quality and Productivity

The Centre comprises leading expertise from the main research areas, namely biofibre packaging materials, functional wood and fibre surfaces and biocomposite materials. The shared facilities between the University and industrial partners in addition to the unique research environment of the KTH Campus have contributed to the success of the Centre.

The scientific merit of the Centre is very good resulting in part from the synergic integration of the skills and core competencies of the researchers from different areas.

In Stage 3 the Centre has published 35 scientific papers in international journals (in generally appropriate for the research fields of the Centre) with medium to high impact factors (ranging from 1 to 11.5). Two scientific papers were published in very high impact factor journals, Nature Communications and Angewandte Chemie-International Edition (from DLP 6). A progressive increase in scientific production was observed when compared to the previous stages. However, there is still a need for enhancement both in terms of quantity and quality to achieve high scientific impact to fulfil the vision of the Centre in *paradigm-shifting advances*. Indeed, it is important to mention that the Centre research plans for the next stage comprise a large number of innovative projects that should contribute to enhancing the quality of the scientific output, and improve the recognition and brand of the Centre.

National and international collaborations from both the academic and industrial sectors are important to achieving worldwide impact and reach. Within the Centre only a few (inter)national collaborations were established during Stage 3. European and international collaborations seem to be very few. The international networking and collaboration (including the industrial involvement) could be further stimulated for example through joint research and development projects including bilateral or EU-H2020 projects and the establishment of exchange/mobility programmes for Masters and PhD students.

Recommendation 1: That the Centre improve the quality and number of the scientific publications, and that these be clearly identifiable as coming from research undertaken within BiMaC innovation. The number of international collaborations with other centres active in this field should be expanded.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

There is no doubt that the actual numbers of outputs compares relatively poorly with other VINN Excellence Centres at the same stage, and the recommendation regarding focusing a little more on high quality academic output that is recognisable as coming from BiMaC Innovation should be acted upon.

Having said that however, the interview was very good in clarifying the strategy of the Centre for intellectual property protection, and the input from KTH Holdings was very important here. We are now much happier with the general level and quality of output from Stage 3.

A major goal for evaluation of VINN Excellence Centre is ‘concrete evidence of impact’. The AMOR process is an exciting example of such impact, demonstrating how the academics have worked in collaboration with the different types of companies to form a robust implementation plan that seems to be working to the benefit of all partners.

From reading the written report it was a little unclear whether the ‘tools’ (e.g. the testing experiments and modeling systems) developed by the Centre were having impact and how important these innovations were for the partners. The interview clarified the issue greatly, and it is now obvious that there is significant impact from these aspects. It is important that the Centre finds a way to communicate early stage and less tangible impacts and their importance effectively as this adds significantly to our view that the funding provided to the Centre is adding appropriate value. This is an important method of ensuring that the ‘brand’ of the Centre is enhanced.

Recommendation 2: That the Centre develop a method by which early stage and less tangible impacts are highlighted and communicated more effectively.

Organisation and Management of the Centre

The interview proved categorically that the Centre is well managed and that the leadership provided by the Chair of the Board and his team is very evident.

It is particularly good to see a centre that has all the processes in place for deciding on the future direction of the research and, in particular, the strategy for patenting and industry collaboration. The systems the Board has put in place are robust and appropriately matched to the needs of all partners in the Centre.

Training Personnel of High Competence

The meeting with the PhD students was very successful. They are very enthusiastic about the Centre and particularly appreciative of the opportunities for interaction with industry that the Centre affords. BiMaC Innovation is clearly attracting suitably qualified people.

Mobility of personnel between university and industry is very satisfactory. Clearly several of the Centre partners (as well as other companies) are taking on the qualified PhD students for industrial positions at the end of their studies. This says a lot about the quality of the training given by the Centre.

Gender issues were not discussed specifically, but the gender balance of the Board, management team and PhD cohort suggests that there is no real problem over and above that which is common in many technological fields.

Long term development during stage 4 and beyond

The Centre has quite a detailed a plan for Stage 4 aimed at achieving greater industrial focus and good output in human terms through PhD graduations and targeted postdoctoral projects. In this stage the Centre indicates that it intends to look for a wider range of ways (including the sponsor partner concept and various new funding sources) to deliver technology and specific Centre results for industry.

The Centre partners have identified a clear continuing need for a centre such as BiMaC Innovation and are united in intending to develop a successor organisation to the Centre beyond Stage 4 (and to the Wallenberg Centre which finishes about the same time as BiMaC Innovation). This successor organisation is likely to be a structure that retains the top scientific capability of the current centre but with a wider remit in terms of topics and partners. They are already quite advanced in planning funding applications (to be submitted by KTH) to assist with funding this successor centre. They will submit an application in the upcoming competence centre call and they are proposing to apply for major National Platform funding.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That the Centre improve the quality and number of the scientific publications, and that these be clearly identifiable as coming from research undertaken within BiMaC innovation. The number of international collaborations with other centres active in this field should be expanded.
- **Recommendation 2:** That the Centre develop a method by which early stage and less tangible impacts are highlighted and communicated more effectively.

Conclusion

BiMaC Innovation is a very good example of a VINN Excellence Centre (with the potential to be excellent if the recommendations are followed) producing good output with high impact.

The evaluation team recommends continued funding.

Mary O’Kane (Chair)

Carmen Freire

Youssef Habibi

Russell Morris

5 Evaluation of BIOMATCELL

A VINN Excellence Centre at Gothenburg University

Introduction

On 10 September 2014, the Chair of the Centre Board, Peter Bramberg, board members, the Centre Director, Jukka Lausmaa, Scientific Director, Peter Thomsen, colleagues of the BIOMATCELL VINN Excellence Centre, PhD students, external partners, and university representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Sybrand van der Zwaag as generalists and Serena Best as specialist). The evaluation team also included Janne Reseland as the remote specialist evaluator. At interview Mats Jarekrans, Pontus von Bahr and Thomas Eriksson were also present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing information for the evaluation.

This evaluation is particularly focussed on the output from the Centre in the form of scientific, societal and industrial results and the impact of this output. The Centre delivers high quality scientific results and interesting outputs for its current industry SME partners, but has failed to strengthen its industrial impact through major health care companies. The Centre is still in the early Stages of preparation for Stage 4.

Long-term Vision, Mission and Strategy

BIOMATCELL has a clear vision and scientific mission but its strategy on how to connect the Centre to the industrial world, beyond the current industrial SME partners, is insufficiently developed. While the Centre had been notified of the need to look for new partners in the evaluation report for Stage 2, very little progress has been made in the formulation of a strategy or taking concrete steps. However during interview the evaluation committee was informed about recent ongoing negotiations with new partners.

How the Centre addressed the recommendations of the previous Review

The Centre’s response to the recommendations of the previous evaluation was reasonable, but their actions taken did not always lead to tangible results. In particular the absence of results on Recommendation 4 (a strategy to build strong networks with large industrial partners) is regretful. The Centre failed to take real action on Recommendation 10 (international internships for its young researchers) and 11 (a trainee programme for senior research roles). The Centre easily could have taken a pioneering role for the university as a whole. While the Board seems to monitor the evolution of the Centre in more detail than in the past, it still did not set quantitative targets (Recommendation 5).

Centre Partners

The BIOMATCELL industrial partners include SMEs, a university IP holding company, university spin outs, a national research institute, and the region. Partners are engaged in BIOMATCELL activities at many levels and the Centre is highly conscious of the requirement

to understand the needs of the partners. Due to company takeovers and policy changes of some of the industrial partners, the number of companies involved in the Centre has decreased by one during Stage 3. Oss-Q (now Oss-Design) joined the Centre in Stage 3. During the period under review, the Centre appointed four tenured young staff which is important in securing and strengthening the (long-term) position of the university. At interview, the representatives of the industrial and regional partners in the Centre expressed a high degree of satisfaction with the functioning of the Centre and the added value it brought to them.

Scientific Quality and Productivity

Research area, competence profile etc

There is plenty of novel materials research being performed within the BIOMATCELL Centre and the quality of the biological work in particular is high. The team leaders are major players in the field of Biomaterials and are known and respected worldwide. The Vinnova funding appears to have brought together a very strong team of researchers who offer good “international reach”. There are excellent research facilities available within BIOMATCELL, and this seems to offer a good platform of high-level training for PhD students and young researchers. The gender balance of junior staff and students is also to be commended, however the evaluation team notes that at senior levels of the Centre the gender balance is not so good.

Scientific output and impact of scientific results

The list of available state-of-the-art processing, microscopy and molecular biology facilities is very good. Personnel involved in BIOMATCELL comprise 90 researchers and the number of peer-reviewed outputs over the last two years is 137. This figure is good and the work has been published in a number of leading (high-impact-factor) journals in the field. Citations appear to be good although the team are encouraged to consider broadening their publication profile to clinical journals and those that are likely to attract the attention of relevant industries. Links have been established with China, Japan and the USA. Overall, there appears to be a good level of international collaboration, leading to publications co-authored with international colleagues. There appears to have been increasing levels of “internationalisation” during Stage 3 including with the New York Stem Cell Foundation. We would encourage the senior members of the team to extend their international links to the PhD students and postdocs in BIOMATCELL.

There has been reasonable level of success with external grant applications (particularly through Swedish funding routes) and EU grants, however, as the research programme enters Stage 4, it would seem essential to increase activity in this area and to ensure additional linkages with major international companies.

International comparators with other Centres and Collaborations

The BIOMATCELL Centre has established international links with the USA, China and Japan, and formalized agreements for research collaboration and exchange of students have been made with institutions in the USA, Poland, and Finland. The list of international visits and visitors reflects, with a few exceptions, relatively short-term visits and does not demonstrate real mobility of students and staff.

Critiques of research programmes, projects and outputs - science, methodology and technological outcomes

The BIOMATCELL Centre seeks to address key clinical needs and challenges through a combination of materials synthesis and characterisation, biological evaluation and the creation of clinically relevant biological models. Research has been divided into five different project areas each with cross-linkages. There appears to be a good level of engagement with clinicians, but this could be enhanced further during Stage 4.

OSTEOCHONDRAL is a mature project area with clear evidence of scientific development and represents a significant addition to the international field in terms of the novelty and rigour of the work. Several PhDs have been completed successfully over the past year in both hard and soft tissue applications. Highlights include understanding the cellular mechanisms and processes underlying bone growth and repair, a strong stem cell research activity, interesting new results in the area of cell-cell signalling and their unique exosomes and micro-vesicles work. Some ideas from the project area have been patented, but the route to market needs to be through established industrial partners present in the field. The new relationship established with the New York Stem Cell Foundation appears to be promising, but the Centre is encouraged to continue to seek the partnership of industrial companies in this area. While the cross-linkages between this project and the NANO project are explained clearly, it would be good to see a clear plan of the specific PhD projects and trajectory for the ongoing postdoctoral research.

The BIOACTIVE project area reported in Stage 2 has been discontinued and the individual project areas have been amalgamated and subsumed into the FREEFORM (ADDITIVE MANUFACTURING) area. The work encompasses bone healing in porous materials and the production of novel metal alloy-based porous implants using innovative processing techniques. The team have researched a number of different avenues, including hollow, ion substituted calcium phosphate spheres for hard tissue reconstruction. This work was patent protected by BIOMATCELL AB and then a new spin out was established (Psilox AB). The developments seem promising and offer potential for proof of concept during Stage 4, but further development will be required to reach the market. Despite Arcam's strategic alliance agreement with DiSanto Technology Inc, US, they may need to be more proactive in forming partnerships with equipment manufacturers and companies with metallurgical interests. The team members estimate that this will require 3 years or more (including pre-clinical and clinical testing, preparation of documentation for regulatory approval) and this seems to be an accurate reflection of the project status.

The NANO project aims to investigate the effects of nanoscale topographies and chemical patterning on biological response at the molecular, cellular and tissue levels. Cross linkages have been made with the INFECTION CONTROL and OSTEOCHONDRAL project areas. The research area is highly topical, but for this reason the nano-bio area is also highly competitive. The BIOMATCELL Centre has the advantage of a good range of materials production and processing techniques and characterisation tools. There have also been some good research publications, including the effect of protrusions on cell response at the molecular level. While the outputs from this project are research-oriented, there is scope for commercialisation. Prior to Stage 4, this individual project will be terminated and the activity merged with existing projects providing routes for translation of their work.

The INFECTION CONTROL project aims to provide a better understanding of the role of implant surface composition and properties on infection and inflammatory response. This is an extremely important area of research which has strong potential for translation. There is good evidence of cross-linkage with the NANO project and the researchers recognise the balance that needs to be achieved surface properties that encourage osseointegration but suppress bacterial activity. The scope of the work in this project ranges from materials production through to *in-vitro* and *in-vivo* studies, including human trials. The research has a strong clinical focus (e.g. dental and bone-anchored prostheses) and excellent potential for translation, due to the combination of the quality microbiology research and two industrial partners, Integrum and Bactiguard.

The BIOMEMBRANE (GUIDED BONE REGENERATION) seeks to seal wounds via a physical barrier. Initial focus has been in the area of malleable ion substituted calcium phosphate formulations. The work is based on sound scientific principles and it is clear that there is still much to learn about cell behaviour, but the team needs to ensure that there is sufficient novelty and scope in their work for translation and commercialisation. The field is highly competitive and there should perhaps be further involvement of polymer chemists to assist in the formulation of patentable new materials.

Processes for Idea Generation

There seems to be a good level of cross-linkage between the various research streams in the Centre, although some projects appear to be more highly integrated than others. A strong point of BIOMATCELL is that it brings together high-level scientists and clinicians with a range of different backgrounds and disciplines. The training environment provided for young researchers is adequate. Although 35% of the PhD students have an undergraduate degree from universities outside Sweden, an international recruitment of key competence, e.g. postdocs, is important to ensure new input and maintenance of the high productivity.

It is essential to identify the real and pressing clinical problems that need to be addressed in order to maximise the opportunities for research translation. Dual competence programmes with the opportunity to take clinical specialist training and PhD training simultaneously might be one option to increase the collaboration with clinics. The management should consider how best to continue and increase the level of interaction between the five research programmes to ensure enhanced communication and therefore “added value”.

Overall conclusion - scientific quality and productivity

BIOMATCELL is undertaking some good research. The academic publication output is strong and a number of papers have been published in top journals in the field. There are some examples where the research has led to IP generation and potential for commercialisation. However, the level of engagement with industry needs to be strengthened during Stage 4. The Centre as a whole will need to consider a strategy to continue beyond the current funding round and this may require both a critical evaluation of the ideas that are being developed and a more focused and concerted effort in securing grant funding over the next two years. The expenditure associated with *in-vivo* testing and clinical trials is likely to increase dramatically during Stage 4, and these costs need to be budgeted carefully. It is recommended that the management team

put together a GANTT chart for the whole programme to plan decision points and milestones and identify the timing of the key tasks in this final Stage of funding.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

BIOMATCELL has had good output in terms of the important research results on well-defined difficult problems, scientific platforms, and well-trained early career researchers including PhD graduates. Its current industrial partners, primarily local SMEs, rate the Centre highly for new scientific results which they can build on. The OSTEOCHONDRAL and BIOACTIVE projects have both led directly to product commercialisation through licensing and spin out companies respectively. It was unfortunate that the link with Cellartis ended during the last Stage of the programme. This situation is a reflection of the cell and tissue engineering field at present. It is also unfortunate that the link with Sandvik has also ceased. This contraction in the industrial linkages is worrying and the Centre needs to ensure that this interaction is expanded and increased over the remaining Vinnova funding period, to maximise the opportunities for translation of the excellent research work.

Probably the most distinguishing feature of BIOMATCELL is its achievements in the area of osseointegration and associated infection control. This is an area of enormous health need globally and the fact that BIOMATCELL does not have direct relationships with major relevant health care companies in this field needs to be addressed urgently if the VINN Excellence Centre programme objectives are to be achieved for this Centre. Pick up and promulgation of the Centre's scientific achievements by the global health care industry is *the* major challenge for the Centre in Stage 4 and beyond.

At interview this issue was discussed productively but the evaluation panel was concerned by the lack of concrete strategies to address this matter.

Recommendation 1: That the Centre develop and implement a strategy to raise its profile nationally and internationally and use this to target potential major national and global industrial partners not only for Stage 4 but for the long-term future. This process needs to be resourced well and needs to be the top priority for the Centre in Stage 4.

Recommendation 2: That, as well, the Centre explore, as a matter of urgency, other practical impact mechanisms especially those aimed at commercial take up of the Centre's expertise, platforms and discoveries particularly by global health care companies. The Centre needs to settle reasonably quickly on which mechanisms to use and then determinedly execute them, measuring and assessing progress rigorously with the help of quantitative performance indicators. In this matter possible mechanisms to be explored could include:

- a think-tank of leading clinicians who identify major clinical needs
- contract research as a way to experiment with working with potential industrial partners
- companies that are paying industrial affiliates
- model contracts that provide operational options for engagement to potential new partners
- appointment of a knowledge transfer fellow whose role is to market BIOMATCELL expertise.

Organisation and Management of the Centre

The Board and management do a good job of ensuring high scientific productivity in the Centre and they together provide an environment for successful development of junior researchers. But both Board and management do not demonstrate significant enthusiasm or determination for dealing with the challenge of engaging the global health care industry with the Centre although there is a good intellectual understanding of the matter. The evaluation team suggests the Centre, with the support of its partners, re-think the composition of the Board and management to ensure appropriate expertise is co-opted to meet this challenge successfully.

Recommendation 3: That the Centre, in consultation with its partners, critically re-examine the composition of its Board and management team to ensure it can meet the challenge of engaging successfully with global health care companies.

The evaluation team notes that the International Scientific Advisory Board (ISAB) is working particularly well and its advice is very much valued by the Centre. The ISAB could be another valuable source advice on meeting the Centre's major future challenge.

Training Personnel of High Competence

The students and postdocs are key to the success of the BIOMATCELL Centre and some good personnel initiatives are noted. The research facilities available are world-class. However, it was noted that the discontinuation of the Biosum graduate school has led to a reduction in the number graduate courses available. While experimental research is a key component of PhD training, so too is the provision of relevant courses, suitable for higher-level students. It is important that a mechanism is identified to ensure that graduate students have access to scientific courses, but also more general research management and business-related courses in preparation for a career outside academia. It is also recommended that students be made aware of the possibilities available to them for exchanges and collaborative visits overseas.

Recommendation 4: That the Centre re-invigorate the graduate school and see its course offerings as opportunities to build long-term practical engagement with current and potential future partners. Graduate training could involve entrepreneurship and global industry engagement strategies.

Long term development during Stage 4 and beyond

The Centre is yet at a relatively early Stage of formulating its plan for Stage 4 and beyond. In formulating its plan it will have to pay special attention to formulating the steps to be taken to bridge the gap between fundamental academic research and the application of their findings in real patients on the one hand and the need to attract new large industrial partners on the other hand, while not losing the commitment of the current partners.

While the evaluation team is of the opinion that the BIOMATCELL core expertise field of osseointegration and infection control is well very well chosen and deeply rooted in the research groups at the University of Gothenburg and the current (and potential future) industrial partners in the Gothenburg region and therefore is likely to survive in years to come, major strategic decisions still have to be taken to secure a successful operation of the Centre during Stage 4 and beyond.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That the Centre develop and implement a strategy to raise its profile nationally and internationally and use this to target potential major national and global industrial partners not only for Stage 4 but for the long-term future. This process needs to be resourced well and needs to be the top priority for the Centre in Stage 4.
- **Recommendation 2:** That, as well, the Centre explore, as a matter of urgency, other practical impact mechanisms especially those aimed at commercial take up of the Centre's expertise, platforms and discoveries particularly by global health care companies. The Centre needs to settle reasonably quickly on which mechanisms to use and then determinedly execute them, measuring and assessing progress rigorously with the help of quantitative performance indicators. In this matter possible mechanisms to be explored could include:
 - a think-tank of leading clinicians who identify major clinical needs
 - contract research as a way to experiment with working with potential industrial partners
 - companies that are paying industrial affiliates
 - model contracts that provide operational options for engagement to potential new partners
 - appointment of a knowledge transfer fellow whose role is to market BIOMATCELL expertise.
- **Recommendation 3:** That the Centre, in consultation with its partners, critically re-examine the composition of its Board and management team to ensure it can meet the challenge of engaging successfully with global health care companies.
- **Recommendation 4:** That the Centre re-invigorate the graduate school and see its course offerings as opportunities to build long-term practical engagement with current and potential future partners. Graduate training could involve entrepreneurship and global industry engagement strategies.

Conclusion

The Centre has produced research results at an appropriate level for a VINN Excellence Centre but has more to do to increase the commercial impact of its work.

Assuming that the recommendations in this report are addressed, the evaluation team recommends continued funding.

Mary O'Kane (Chair)

Serena Best

Janne Reseland

Sybrand van der Zwaag

6 Evaluation of CESC

A VINN Excellence Centre at Royal Institute of Technology, KTH

Introduction

On 12 November 2014, the Chair of the Centre Board, Christer Törnevik, board members, the Centre Director, Mattias Höjer, colleagues of the CESC VINN Excellence Centre, PhD students, external partners, and University representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Anja Skrivervik as generalists and Chris Preist as specialist). The evaluation team also included Jackie Klopp as the remote specialist evaluator. At interview Jenni Nordborg, Mats Jarekrans, Alexander Alvsilver and Thomas Eriksson were also present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing information for the evaluation via the self-evaluation report and during the clarifying meeting with the evaluation team.

This evaluation is particularly focused on the output from the Centre in the form of scientific, societal and industrial results and the impact of this output as well as the long-term sustainability of the Centre.

How the Centre addressed the recommendations of the previous Review

The Centre received 11 recommendations at the end of Stage 2. Three of these recommendations addressed the lack of definition in the vision and thus of the research programme, four the international visibility and status of the Centre, three the articulation between partners and projects and one the involvement of KTH in the management of the Centre.

The Centre has carefully considered these recommendations, which has resulted in a new vision and mission declaration leading to a smaller number of better-focused projects. The new Vision is "a sustainable society supported by ICT". The Centre has also, through the means of a Vinnova-funded internationalisation programme, made considerable and successful efforts to appear more visibly as an internationally leading institution in the field of ICT4S. The Centre has a strong link to KTH management through the Vice-President of Sustainable Development who is a member of the Centre’s Management Group and through the Vice-Dean of the ICT School, who represents KTH at the Centre’s Board. The actions taken on recommendations concerning partner articulation and projects were clarified at interview and the steps taken to identify the partners’ needs through project identification and generation mechanisms and balance these with areas for important cutting-edge research are quite appropriate.

Long-term Vision, Mission and Strategy

The Centre has adopted a new Vision and Mission, which clarify its purpose. The Strategy of the Centre to achieve its Mission is appropriate.

Centre Partners

The Centre involves seven partners, from academia (1), public authority (2), industry (3) and one research institute. All have an interest in using ICT for sustainability. Four partners (linked to Media) terminated their partnership at the end of Stage 2 following completion of successful projects. This allowed the Centre to focus more on work associated with its newly-formulated Mission.

The complement of partners of the Centre seems well balanced and all partners have a strong commitment to the Centre. The role of the partners is well defined at the Board and management levels of the decision-taking processes. The partners have different interests in the Centre, ranging from increased knowledge and competence to behavioural change for sustainability, brand differentiation and new products. The Centre is to be commended for its effort in discerning and articulating the outputs and impacts expected by its partners and also getting some of these partners to think in new ways in regard to the broader mission of the Centre.

The Centre is considering adding new partners for Stage 4 in order to gain access to new areas of competence (e.g. social networks). The Centre should also consider adding new partners which might help it develop its international collaborations to strengthen its position to continue activities after Stage 4.

Scientific Quality and Productivity

The Centre demonstrates a good solid basis of strong expertise in FMS/Industrial Ecology to build on and branch out from to other disciplines. The action research approach that involves real world problems that do not easily disaggregate along disciplinary lines is a solid strategy for fostering interdisciplinary research. The organization and processes around project development also appear to be a good setup to encourage interdisciplinary thinking – mixing of researchers in projects, events (internally and externally) bringing them together to share results and generate new ideas; and having offices used by both diverse KTH staff, Centre partners outside KTH, and visitors from abroad. Hosting and organising ICT4S 2014 so successfully has also significantly raised the international profile of CESC. Strategic follow up activities and engagements will be needed to maintain this momentum. Especially given a focus of the Centre on communication, more explicit attention might be given to the data sciences and creative data visualizations as a way to stimulate thinking and communications about sustainability. This is an opportunity for other academics in the school of Computer Science and Communication to contribute to CESC. Methodologically, there is great opportunity to combine quantitative and qualitative approaches to yield more general insights in the area of Sustainable HCI, particularly through the D2S project and the strong participation and commitment of Coop as a partner.

Scientific output and impact of scientific results

CESC is now aiming to increase its scientific output targeting high impact journals – always a good aspiration keeping in mind that quality and audience are more critical than quantity. CESC might also think about disciplinary spread of the journals – already quite far ranging but could still touch more on urban planning, business and social sciences. The Environmental Strategies Research (FMS) team is making strong Q1 journal contributions, in the area of understanding direct impacts of ICT, and the substitution effects of ICT in print and travel. Research

contributions from MID are not yet as internationally strong as the FMS/Industrial Ecology work. We would like to see them publish more work in higher impact venues (either conferences such as CHI, DIS, CSCW or journals such as TOCHI). It may be worth the MID team focusing on publishing less but ensuring it is of high enough quality to enter a high impact venue. More creative overlap between the FMS and MID should also be explored. The work on digital versus print media is winding down, as media partners are no longer partners of CESC, but this work can be considered a significant success in terms of research outputs and the resulting understanding of digital product impact. The work on social LCA also demonstrates international leadership.

Overall, the research focus is highly relevant and significant in terms of the struggle to better understand sustainability and strategies to implement more sustainable practices. Combined with the action research approach, we are confident that this research, especially if intensified, will be impactful not only in a scientific sense but also for policy and practice.

International comparisons with other Centres and Collaborations

With its overall focus on ICT for sustainability, strong industrial ecology approach linked to ICT technology, and inclusion of a wide array of disciplines, CESC is a rather unique Centre. In particular, the FMS work is making contributions at an internationally leading standard. MID is not yet doing so but has the potential to both enrich the current work at the Centre in a cross-cutting way and make internationally significant contributes within its own arena. The appointment of Daniel Pargman to form the new MID4S group is a valuable step in increasing both engagement and quality within MID.

To gain even more stature and have more impact, the Centre might increase its presence in EU projects, and work strategically to foster broader project collaborations including in Africa, Asia and Latin America to become truly more global in reach, which is the practice, for example, in leading US centres. These are also areas where a great deal of leapfrogging can occur with high local and global impacts.

Recommendation 1: That the Centre further strengthen its international presence through building new relationships while continuing to invest in existing relationships and increase its level of participation in EU projects which will be strategic in terms of building relationships to secure EU funding to help support the Centre in the long term.

Critiques of research programmes, projects and outputs - science, methodology and technological outcomes

Overall, we found the newly refocussed research programmes, projects and outputs as well as the combination of approaches very sound and promising with more significant impacts possible in the future. More focus on the possibilities of new data and data visualization and the combination of qualitative and quantitative methodologies would be of value. Improving the quality and disciplinary spread of publishing as well as the geographical spread of collaborations should also be a goal. More might also be published where possible on the process and findings coming out of the local projects such as the work with the City of Stockholm – such case studies are invaluable and can advance the theory of methods for this kind of engaged research.

Overall conclusion - scientific quality and productivity

CESC appears to be the largest interdisciplinary Centre for ICT4S globally, with a clear and growing presence on the world map but with potential for more intense and broader reach. This Centre and its diverse outputs and impacts are no mean achievement since interdisciplinary research is necessary to address sustainability concerns and is often aspired to but is hard to achieve in practice including in the realm of publishing scientific results. The thought that CESC has put into process, projects and outcomes in this regard is an achievement and, with effort, it should be able to improve the quantity, quality and breadth of its publishing in the next phase. The portfolio of projects appears appropriate, spanning study of specific substitution effects; how IT can be used to influence customer behaviour; advancing the state-of-the-art of social LCA by applying it to ICT; and more broad challenges such as sustainable and “smart” cities and long-term scenarios.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

CESC has demonstrated and benefitted from considerable and enthusiastic engagement from the Centre partners. It is to be commended that many of the partners see CESC as providing longer-term strategic thinking and insight, as opposed to expecting an instant financial return.

The Centre has made a significant contribution to the understanding of the direct and indirect impacts of ICT, and is making contributions to associated standards such as those of the ITU. It was apparent at interview that the project partners – particularly TeliaSonera and Ericsson – value this work and make strong and active contributions to it. The work on social LCA provides an example where expertise developed within CESC is likely to be embedded in the long-term practices of the partner companies.

The Centre supports partners in thinking more strategically and accessing broad and diverse expertise they do not otherwise have. This was particularly notable in the work on ICT’s role in sustainable cities, where CESC has been able to support Stockholm in understanding how best to incorporate such considerations in its planning and governance practices.

The creation and spreading of the Green Hackathons has raised the visibility of ICT4S internationally among the development community, and generated many ‘seed’ ideas as prototypes. One strong commendation of this approach comes from the fact that it was a Green Hackathon that drew the attention of Coop, resulting in it becoming a partner.

It is to be commended that the Centre thinks reflectively about the process of having impact, and disseminates their experiences through publication. We encourage continuing this approach.

Organisation and Management of the Centre

The Board is well constituted and works effectively in providing strategic guidance for the Centre and support for the Director and his team. Centre management is inclusive and working well.

The Centre is well served by its International Scientific Advisory Board which meets frequently and provides helpful, critical advice to the Centre in its reports.

The report to the evaluation team was generally thoughtful and well written.

Financial management is adequate. It would have been helpful to have more details of individual partner contributions in the budget but this matter was dealt with satisfactorily at interview.

Training Personnel of High Competence

The Centre has been able to recruit PhD students very dedicated to the field of the Centre and with a wide variety of backgrounds relevant to Centre. This leads to a vivid and connected research community. The junior researchers have excellent opportunities to attend and present their work at international conferences, but also to visit other labs abroad for short or medium time stays. The Centre has been active in promoting ICT for sustainability in the KTH curriculum and is developing three PhD courses on the topic. Academic Centre members are working on developing a Masters track on Sustainable Information Society and in developing education activities focusing the social dimension of sustainable development, based on CESC pioneering research results.

Long term development during stage 4 and beyond

In its current plans for Stage 4, the Centre is focusing on implementation and integration of results. This will be done in the framework of the existing projects, but the final decision on which projects will be funded will be determined as part of the planning process for Stage 4. The Centre has a clear process planned for how to prioritize projects for this Stage.

In its thinking to date for beyond Stage 4, the Centre envisages four scenarios, depending on the funding that will be available and the preferences of the partners. The evaluation team suggests this thinking should be sharpened as part of the process of planning for Stage 4 as the Centre has an opportunity to make strategic choices at this time (e.g. by targeting new partners which might be willing to support CESC after VINN Excellence Centre funding finishes) which set it up to be successful beyond Stage 4 and to retain the excellent features that have been developed through the life of CESC so far.

Recommendation 2: That in planning for Stage 4, the Centre make conscious strategic choices that maximise its opportunities for beyond Stage 4 and involve partners and potential future partners in the planning process.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That the Centre further strengthen its international presence through building new relationships while continuing to invest in existing relationships and increase its level of participation in EU projects which will be strategic in terms of building relationships to secure EU funding to help support the Centre in the long term.
- **Recommendation 2:** That in planning for Stage 4, the Centre make conscious strategic choices that maximise its opportunities for beyond Stage 4 and involve partners and potential future partners in the planning process.

Conclusion

CESC is a good example of a VINN Excellence Centre performing at an appropriate level as it reaches the end of Stage 3. It is clear that the Centre partners including its host institution KTH value it highly. The evaluation team recommends continued funding.

Mary O’Kane (Chair

Jackie Klopp

Chris Preist

7 Evaluation of CHASE

A VINN Excellence Centre at Chalmers University

Introduction

On 11 September 2014, the Chair of the Centre Board, Paul Häyhänen, board members, the Centre Manager, Staffan Sjödin, colleagues of the CHASE VINN Excellence Centre, PhD students, external partners, and university representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Sybrand van der Zwaag as generalists and Anja Skrivervik as specialist). The evaluation team also included Gerard van Rhoon as the remote specialist evaluator. At interview Mats Jarekrans, Tommy Schönberg and Thomas Eriksson were also present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing very clear and structured information for the evaluation.

This evaluation is particularly focused on the output from the Centre in the form of scientific, societal, industrial, and education results and the impact of this output. The Centre delivers real value in all output categories with exceptionally good industrial transfer impact. The Centre is be complimented for its preparation of its post-Stage 4 structure.

Long-term Vision, Mission and Strategy

The formulated vision and mission statements are clear and remained unchanged with respect to those of Stage 2.

With regard to strategy, the activities of CHASE are concentrated on continuously identifying long-term needs of the partners including initiating pre-studies as well as new projects. The Centre aims to perform at an internationally recognised top-level. Given the available resources and the core expertise of the partners, CHASE has selected a number of topics in which it can excel. The value of its approach is reflected in the (above average) level of engagement by the industrial partners and the number of start-ups that have been initiated by the partners within the context of the CHASE programme.

The projects of CHASE address different aspects of societal needs and therefore will have differing potential industrial and economic impacts. Wireless Communication is of interest for mass public use, whereas the Remote Sensing and Medical Application are activities addressing dedicated applications with relevance to society. All projects offer good prospects to promote sustainable growth of Sweden as they all focus on new knowledge and new technological developments. Eventually, the results of the projects may lead to new products and services.

The Centre already has an active policy of bringing its findings to the attention of relevant regional and Swedish communities and is aware that it should increase the impact of its communication to the outside (European and international) world.

The Centre has a very clear strategy to prepare for Stage 4, focussing on the successful topics of Stage 3, and has made impressive steps towards to formulation of a plan for the Centre structure beyond Stage 4. While the report of CHASE-GHz strategic committee is not out yet, the evaluation team expects this to be an excellent starting point for the further discussions with current academic and industrial partners, with new partners, as well as with Vinnova and other funding agencies for long-term pre-competitive research.

How the Centre addressed the recommendations of the previous Review

The Centre received 11 recommendations in the evaluation in Stage 2. The Centre has paid real attention to these recommendations and has acted adequately upon all of them. The Centre also seems to have responded very well to the suggestions of the international scientific advisory board and even involves the ISAB in the project selection process for Stage 4. The Centre convincingly answered the questions raised by the evaluation team on the basis of their desk-research during interview.

Centre Partners

The Centre has two university partners, one research institute and 14 industrial partners. No less than 5 companies joined the Centre during Stage 3, which may be interpreted as a good sign of the industrial relevance of the work of the Centre. The industrial partners are of different size and technical maturity. At interview the industrial partners expressed great satisfaction with the relevance of the contributions made by the Centre. While the Centre has a very strong Chalmers focus, the representative of KTH and SP were similarly satisfied with the way their contributions were being valued and embedded in CHASE.

Scientific Quality and Productivity

The scientific quality of the Centre is of very high standard. The project leaders are recognised in their respective research areas, and the housing of the Centre in one department of Chalmers creates an excellent research environment for the consortium. It promotes sharing of facilities and the generation of new ideas. This is enhanced by the good integration between university- and industry-based researchers, which fosters the mobility of ideas and generates innovation.

Centre researchers have received prestigious awards for some the achievements achieved in the Centre.

The projects pursued by the Centre are all timely in addressing points critical not only for the industrial partners but for society at large. This timeliness leads to a very dynamic and responsive research environment due to the relevance of the results to the partners, and is a key to the brilliant success of the Centre. All projects pursued are internationally seen of very high standard, while two of them are at the world leading level in their field.

The productivity is very good in terms of number of publications of journal papers and contributions to international peer reviewed conferences. In addition, eight PhD theses, eight licentiate theses and 29 Masters theses have been defended. It is also noted that Professor Kildal organised the large international conference on antennas and propagation, EuCAP, in 2013. The attribution of this event to Göteborg is most certainly linked to the growing visibility of the Centre.

The quality of the achieved results is demonstrated by the international response: one advanced ERC grant, several keynote presentations at conferences, promotion in committee work. This general recognition also illustrates the timeliness and relevance of the elected projects.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

The Centre is commended for the high impact of its results, both on the industrial partners and on societal aspects in general, impact evident in every project. As an example, the Centre's ongoing work on projects related to MIMO systems and OTA systems has fostered a disruptive approach to the OTA characterization of wireless systems. This has been enabled by an excellent initial idea, followed by a close collaboration between the university and industrial partners to develop both the theory and the measurement tools enabling OTA characterization using reverberating chambers. The involved partners have at the time an important edge over the international competition thanks to their participation on the Centre.

Examples of impact on society are given by the Microwave Hyperthermia and Sensor system projects. New approaches to make cancer treatments more efficient without increasing toxicity are highly appreciated by medical staff and patients. Similarly, the sensors enabling early characterisation of stroke has the potential to save a great number of lives in the future.

The Centre has also a great impact on the education of highly qualified personnel, as its PhD students all get access to industrial projects, facilities, and ways of managing projects. This, along with the excellent academic education dispensed by the university partners, renders the students highly qualified for both academic and industrial careers.

Organisation and Management of the Centre

The Centre has appropriate governance and management including a very effective Centre Manager.

The information on the financial situation is clear and supported by good explanatory notes.

The International Scientific Advisory Board (ISAB) comprises acknowledged leaders in the field. The ISAB has provided a helpful and detailed guidance that is clearly appreciated by the Centre.

Training Personnel of High Competence

CHASE provides its PhD students with good training in industrially-linked research.

More generally, the CHASE working environment is stimulating with a good influx of external experts. There is good interaction with universities as well as with the industrial partners.

The evaluation team noted that while a good percentage of CHASE postgraduates is female, gender balance in other aspects of the Centre (Board, management team, ISAB, etc.) is poor. The Centre is encouraged to strive for gender balance in its structures as it moves to Stage 4.

Long term development during stage 4 and beyond

As noted above, the Centre is well advanced in its preparations for Stage 4 and beyond.

One of the most exciting aspects of the Centre's future planning is its discussions with GHZ about closer integration and possibly merger.

Recommendation 1: That the Centre continues its far-sighted planning for Stage 4 and beyond and continues the discussions with GHZ about possible integration.

The Centre was clear about the added value of being a long-term centre. It expressed its hope that Vinnova announce its plans about a possible new centre programme as soon as possible in order to give VINN Excellence centres such as CHASE a chance to include application to such a programme in their forward planning. However the evaluation team notes that there are already various Vinnova programmes that might provide good support for a beyond-Stage 4 CHASE and recommends that CHASE commence discussions with Vinnova on this.

Recommendation 2: That the Centre initiates in-depth conversations with Vinnova about which Vinnova funding options might be suitable for beyond-Stage 4.

At interview the Centre acknowledged that being better known internationally especially in Asia could be beneficial especially beyond Stage 4.

Recommendation 3: That the Centre increase its international presence/branding.

At interview the Centre made a strong case for moving to a new style of Centre Agreement that would help it begin its transition to the time when VINN Excellence Centre funding ceases.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That the Centre, supported the University, continues its far-sighted planning for Stage 4 and beyond and continues the discussions with GHZ about possible integration.
- **Recommendation 2:** That the Centre initiates in-depth conversations with Vinnova about which Vinnova funding options might be suitable for beyond-Stage 4.
- **Recommendation 3:** That the Centre increases its international presence/branding.

Recommendations to Vinnova

- That Vinnova considers allowing CHASE to have a more flexible Centre Agreement for Stage 4 which allows for a joint project with GHZ.
- That Vinnova considers continued funding of the integrated GHZ and CHASE Centres post-Stage 4.

Conclusion

CHASE is an excellent example of a VINN Excellence Centre producing good output with high impact.

The evaluation team recommends continued funding and encourages Vinnova to consider funding the Centre beyond Stage 4.

Mary O'Kane (Chair) Anja Skrivervik Gerard van Rhoon Sybrand van der Zwaag

8 Evaluation of ECO2

A VINN Excellence Centre at Royal Institute of Technology, KTH

Introduction

On 9 October 2013, the Chair of the Centre Board, Staffan Berglund, the Centre Director, Peter Göransson, colleagues of the ECO2 VINN Excellence Centre, PhD students, external partners, and university representatives, had a formal interview with the generalists of the international evaluation team at Vinnova to evaluate the Centre's performance in Stage 3. The scientific experts of the evaluation team, Paul Sas and Thilo Bein, had already provided a report to the Centre on the scientific aspects of the Centre's operations and the Centre had provided a written response to this. At the formal interview the generalist evaluators, Mary O'Kane (Chair), Anja Skrivervik, and Sybrand van der Zwaag, addressed matters such as results and impacts, organisation and management, finance, interaction between industry partners and the university, and educational activities. We thank all members of the Centre and the Vinnova/VR team for their efforts in providing information for the evaluation.

Long-term Vision, Mission and Strategy

During the first 7 years of existence the Centre has gone through a very interesting stage of sharpening the definition of its core contribution to the field of vehicle design leading to the theme provisionally formulated as "*vehicle design starting from cross-functional conflicts*".

Despite this interesting intellectual positioning, ECO2's communication to the outside world has been modest and it has not had the strong impact on the wider academic literature and wider media which is to be expected from a VINN Centre of Excellence. While the number of scientific publications produced is good, many of the publications seem to be of a purely technical scientific nature, not bringing to the front the combined ecological and technological approach for which this Centre wants to be known.

At interview the ECO2 team articulated an impressive historical sweep through their evolving and increasingly sophisticated schema for the Centre's operating approach. This presentation clarified the role and approach of the Centre in a manner that was not captured nearly as well in earlier documentation. This needs to be articulated in all their major statements for Stage 4 as it is what makes this Centre both distinct and effective as illustrated by the examples given by industrial partners (large and SME) of how this way of approaching system design has driven new insights and commercial returns.

Recommendation 1: That the Centre articulates in its main strategic statements its new operating insight ("*vehicle design starting from cross-functional conflicts*") as explained eloquently at interview. In particular this needs to be captured in the Mission/Vision/Strategy in a way that is specific to this Centre and clearly differentiates this Centre from other groups around the world working in related fields.

Recommendation 2: That the Centre develops a strong focus on improving its international visibility and engagement through more researcher exchanges and visits with the aim of high impact joint publications with the external parties; through special-purpose meetings and conferences reflecting the unique proposition of the Centre; and through the development and implementation of a comprehensive Brand ECO2 strategy.

Scientific Quality and Productivity

Research Area, Competence Profile, People, Facilities, Critical Size

As noted above the ECO2 Centre focuses on research in vehicle design to achieve more sustainable and economically competitive vehicles. This includes vehicle research in the areas of lightweight structures and materials, noise and vibration, vehicle dynamics, aerodynamics and environmental strategies. A multi-disciplinary and multi-vehicle approach is the core of the Centre's research strategy. Multi-disciplinarity in the ECO2 philosophy implies multi-functionality and therefore the restructuring of the research activities at the start of Stage 3 around five clusters, and the introduction of the concept of conflicting functions in those clusters, was a good decision and facilitates the start of new research lines and strengthens the ECO² multi-disciplinary focus.

The ECO2 Centre is a strong and competent partnership between university and industry researchers, with well-recognised expertise in vehicle engineering design. The industrial partners include major Swedish rail and road vehicle manufacturers as well as specialized SMEs. The research topics are in line with the competence of the Centre partners. By combining the expertise and resources of the partners, a unique consortium has been formed that has the necessary critical size to achieve relevant outputs in a multi-vehicle context. The competence in vehicle engineering design is well-recognised, but the competence in ecology related engineering aspects is yet to be demonstrated.

The capabilities of the Centre in terms of size and facilities are considerably strengthened by additional funding supporting the host environment of the Centre (CEEM, TRENOP, SeRC, Xpres, EU- projects, and others). This illustrates that through ECO2 the position of KTH as a vehicle innovation center in Sweden has been strengthened. In terms of capacity the number of professors and participating industrial partners in the ECO2 Centre is relatively large. On the contrary, the number of PhD students directly involved is relatively small. Involving more PhD students would further increase the research capacity at a relatively low cost.

International Comparators with other Centres and Collaborations

As already indicated in the previous evaluation reports, the ECO2 Centre aims to address vehicle design in a holistic way including ecological issues as well as in addressing the various transport modes. The high involvement of industrial stakeholders is commended. There are a few centres world-wide such as the US transport research centres or the Austrian Virtual Vehicle Institutes following a similar approach but which are not addressing the full value chain in vehicle design.

In Stage 3 the ECO2 Centre increased its international cooperation significantly having more exchange with other highly recognised research groups world-wide. However the international

collaborations should still be further strengthened. In this regard, the following suggestions are given:

- Additional cooperation in fields such as LCA, tyre modeling, adaptive structures where highly recognized research groups exist in Europe (also within Sweden)
- Extending the international collaboration also towards international SMEs
- Most of the visits from and to other research groups were short-term visits. The collaboration should be strengthened by more long-term visits e.g. offering secondments of at least 3 months for PhD-students (incoming and out-going). Also see Recommendation 4 below.
- It has been noticed that most of Centre's international collaboration has been in aeronautics and rail. The Centre has also considerable expertise in road transport modes. The Centre could become more involved internationally in addressing these modes.

Critiques of Research Programmes and Projects - Science, Methodology and Technological Outcomes

The research, which is mainly conducted by PhD students, uses appropriate methodologies and overall is of high quality. In general the research output in terms of publications is good, but the multidisciplinary ecological aspect should be stressed more in future publications. Most of the research projects are conducted in close collaboration with industry and the technological outcomes are highly valued by the industrial partners.

Some specific remarks:

- The research lines in cluster A to C are relevant and of a high scientific level. The majority of those research lines have a clear eco-impact and multiple-vehicle aspect and a high potential for technological output.
- The technological output and the impact of the Centre is convincingly illustrated by the two reported cases (Transient Crosswind Stability and Multi Functional - Multi Disciplinary Design) where basic research activities of cluster B and C resulted in practical applications implemented by the industrial partners.
- Cluster D (Coupling materials-environmental analysis) has been launched more recently (at the start of Stage 3) and has substantial application potential.
- Research lines in cluster E are not well described in the Report to the Evaluation; details on the tools and models used (the former Virtual Vehicles) are still missing; the publication record is below average. At interview it became clear that the Centre has decided to put ecological modelling activities in Cluster E although these activities could be argued to cut across all the other clusters.
- The interaction between the five clusters is not clear. In view of demonstrating the multi-disciplinary research results, a common platform where results from all cluster projects are implemented should be beneficial for the centre.

Processes for Idea Generation

The ECO2 Centre established a clear procedure to identify and implement needs driven research involving all partners of the Centre. This process is appropriate for the objectives of the centre. However, the process relies strongly on close communication among the partners. Thus the understanding of the centre as a forum of discussion and emphasising personal contacts is vital for the efficient idea and innovation generation. The success of this approach is proven by

identifying research projects and needs fitting the common interest of the partners as well as getting some SMEs involved as partners.

Overall Conclusion - Scientific Quality and Productivity

The changes introduced at the beginning of the Stage 3 clearly improved the performance of the Centre. Overall, the scientific quality is very good by which the Centre is becoming one of the leading research center in their field. The productivity in terms of publications is good but the Centre's ecological emphasis is underdone in its publications. This is a pity as this is one of the things that makes this Centre unique. The technological outcome regarding demonstrators and products is good however leaving room for improvement.

Recommendation 3: That Cluster E activities be treated and carefully described as a cross-cutting platform.

Recommendation 4: That the Centre's ecological aspect is reflected better in the Centre publications in order that the Centre gets credit for one of its most interesting and distinguishing features.

Centre Partners

The Centre has a nice set of industrial partners covering 3 major Sweden-based companies active in the production of cars, trucks and trains, 3 smaller SME companies supplying materials and material solutions and the Trafikverket. The Centre has handled the collapse of Saab well. The current set of partners will be fully adequate for the next round, yet having Volvo Cars on board as well would be bonus.

The Centre has set up a well-functioning procedure for Needs Identification and Articulation and the industrial partners expressed great satisfaction in the way their needs and visions were heard and incorporated in the programme. On the other hand the academic partner seemed to have enough freedom to conduct their research in a academically satisfying manner.

In the report and during the discussion several examples were given of successful transfer of Centre developed competences and ideas to the industrial partners. Some of the data transfer actually resulted in new business or new potential business. The transfer of knowledge and expertise seemed to be nicely distributed over all industrial partners.

So far the research in the Centre has only led to two patents. This policy of minimal focus on patents was fully endorsed by the industrial partners in the Centre.

Organisation and Management of the Centre

The Board's Role

The Board of the Centre is now well composed and the commitment of the industrial and academic Board members as perceived from the report and the discussion is excellent.

Management Team (MT) Structure, Processes and Performance

The Centre has a well-functioning management structure with well-distributed tasks and good internal communication. The various roles in the organization team are well covered and there

is a proper rotation scheme making sure the commitment to the Centre is not restricted to a limited number of individuals.

The evaluation team notes the clever use by the Centre of its Centre Coordination Group (CCG) incorporating the particular focus on environmental aspects through the Environmental Management Group (EMG).

The downside of this management structure and intensive manner of working is that a relatively large percentage (about 25%) of the budget of the Centre is spent on overhead. During discussion it became clear that also the costs related to learning and preparation for teaching the Centre scientific concepts and methods were included in the overhead costs.

While the fraction of overhead costs in the total budget is high and could possibly be reduced in a next stage, the success of the Centre justifies the costs.

The International Scientific Advisory Board (ISAB)

The International Scientific Advisory Board (now consisting of 3 senior academics from Germany, Korea and Sweden) has not been very active during the period under review. However, they seemed to follow the activities of the Centre in an adequate manner as their report on the performance of the Centre was insightful and valuable.

The Report to the Evaluation Team

The report to the evaluation team was carefully constructed and provided a sound and comprehensive basis for the discussion at interview. However the back-and-forth between scientific experts and the Centre and the lively discussions at the formal interview were particularly important for the Review Team to get a full grasp of the major achievements of the Centre in Stage 3 and the long-term evolution of the Centre across the 7 years it has existed so far.

Communication and Promotion

The Centre has given attention to communication matters through Stage 3 but not in a way which fully highlights the special and unique features of the Centre which are so valued by its end-user partners. This is an area that needs careful and creative attention going forward as noted in Recommendation 2 above.

Financial Management

The financial statement as produced by the Centre were sufficiently clear and showed the Centre to be financially sound. The direct cash commitment from the industry still is limited, yet the in-kind contributions are at an acceptable level. The delay in the financial contribution of one of its industrial partners was explained during the meeting and it was indicated that the commitment in the next period would be increased to make up for it.

The Centre management commented that the Vinnova format for presenting the financial results of the Centre deviates significantly from the University financial reporting scheme, causing an inappropriate amount of time and effort to be spend on the compilation of the financial tables.

During the meeting several industrial partners indicated their intention to keep supporting the Centre even after the end of the Vinnova funding period.

Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The Centre has attracted high quality PhD students, from which about a half come from outside Sweden. Moreover, the Centre has during Stage 3 been able to recruit Ciaran O'Reilly and Sara Tyskeng as assistant professors, while four of the Centre's assistant professors were promoted to associate professors.

Mobility of Personnel between University and Industry

Clearly, the ties between university and industry are very strong, as could be seen by all the partners' commitment and enthusiasm at the interview. All PhD students have strong ties in both worlds, some of the academic students sitting part time in the industry and the industrial students having strong ties to the university. Mobility exists also at the level of Faculty, as two adjunct professors from industry are now based part-time at KTH. Mobility between university and societal partners does not appear to be as strong, but this is linked to the different role of these partners.

Gender Perspectives

The Centre has an excellent gender balance in the academic staff, both at senior and PhD student levels, as the Centre has been able to raise the number of female students over the past years. There is still only one woman in the Board, but the gender balance is excellent at AMG, EMG and CCG levels.

Training for Senior Roles in Research

The Centre is doing an outstanding job exposing young researcher the needs of both academic and industrial research, leading them to achieve high-qualified profiles very appealing for the industry. However, the students would benefit from a higher international exposure by doing 3-month internships abroad.

Long term development during Stage 4 and beyond

The evaluation team acknowledges that the Centre has given attention to Stage 4 but it was agreed at interview that this could be sharpened considerably.

Recommendation 5: That the Centre sharpens its programme for Stage 4 with particular attention given to both qualitative and quantitative performance indicators. These performance indicators should address both industrial and academic targets.

How the Centre addressed the recommendations of the previous Review

The Centre has given a lot of thought to the recommendations of the previous review and has addressed most of them in a satisfactory way.

The first recommendation about clarifying the mission lead to a complete new way of thinking putting “*vehicle design starting from cross-functional conflicts*” at the core of the scientific approach. While this change of paradigm appeared clearly during the discussions, it does not yet appear explicitly in the mission/vision/strategy stated in the report.

The Centre has undertaken steps to increase its competence in “ecological aspects” by recruiting faculty and senior researcher, and by re-defining the aim of Cluster E. These steps are starting to

lead to new results for different clusters, but are not yet well exploited in the publications of the Centre.

The Centre has not increased its participation in EU research projects, but we agree that such programmes are not aimed to Centres but more at individual participants from KTH. We do however encourage the Centre to strengthen its networking activities.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That the Centre articulates in its main strategic statements its new operating insight (“*vehicle design starting from cross-functional conflicts*”) as explained eloquently at interview. In particular this needs to be captured in the Mission/Vision/Strategy in a way that is specific to this Centre and clearly differentiates this Centre from other groups around the world working in related fields.
- **Recommendation 2:** That the Centre develops a strong focus on improving its international visibility and engagement through more researcher exchanges and visits with the aim of high impact joint publications with the external parties; through special-purpose meetings and conferences reflecting the unique proposition of the Centre; and through the development and implementation of a comprehensive Brand ECO2 strategy.
- **Recommendation 3:** That Cluster E activities be treated and carefully described as a cross-cutting platform.
- **Recommendation 4:** That the Centre’s ecological aspect is reflected better in the Centre publications in order that the Centre is gets credit for one of its most interesting and distinguishing features.
- **Recommendation 5:** That the Centre sharpens its programme for Stage 4 with particular attention given to both qualitative and quantitative performance indicators. These performance indicators should address both industrial and academic targets.

Recommendations to Vinnova

- That the financial reporting should be aligned with University practice
- That the evaluation criteria for Stage 4 are specified at the start of Stage 4
- That the final review (and possibly future Stage 3 and final reviews of other Centres) includes the physical presence of the specialists
- That the evaluation interviews be held on site.

Conclusion

The evaluation team is of the opinion that the Centre has produced good scientific and particularly good industrially-relevant results during Stage 3. It presented satisfactory concrete evidence of these results in the various documents and written and oral exchanges that were part of the process of the evaluation. The newly-defined Centre Mission “*vehicle design starting from cross-functional conflicts*” offers the Centre excellent opportunities to reach its full potential but needs more precise formulation.

Assuming that the above recommendations are addressed, the evaluation team recommends continued funding.

Mary O’Kane (Chair) Thilo Bein Paul Sas Anja Skrivervik Sybrand van der Zwaag

9 Evaluation of the Faste Laboratory

A VINN Excellence Centre at Luleå University of Technology

Introduction

On 11 November 2014, the Chair of the Centre Board, Vahid Kalhori, board members, the Centre Director, Magnus Karlberg, colleagues of VINN Excellence Centre the Faste Laboratory, PhD students, external partners, and University representatives led by the Vice-Chancellor had a formal interview with the two generalist members of the evaluation team (Mary O’Kane (Chair) and Anja Skrivervik). The evaluation team also included David Barton and Lucienne Blessing as the remote specialist evaluators. At interview Mats Jarekrans, Daniel Olausson, Lena Rimsten, and Thomas Eriksson were also present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing information for the evaluation via the self-evaluation report and during the clarifying meeting with the evaluation team.

This evaluation is particularly focused on the output from the Centre in the form of scientific, societal and industrial results and the impact of this output.

Long-term Vision, Mission and Strategy

The Vision, Mission and Strategy of the Strategy are well defined, coherent and appropriate to the general aim of the Centre.

How the Centre addressed the recommendations of the previous Review

The Centre received 18 recommendations at the end of Stage 2 and has acted on all of them. The actions undertaken have shown results or partial results in most cases. Some actions have been particularly successful and original, e.g. the way the gender equality issue has been tackled. Other recommendations, e.g. recruiting more senior level researchers of high international status are more difficult to achieve over a short time period, but the Centre has striven to be more international in its recruitment of junior researchers. The Centre could improve its international visibility by making better use of its International Scientific Advisory Board (ISAB).

Centre Partners

The Centre is formed by one university partner (LTU) and 7 industrial partners, of which 5 have been active from the beginning of the Centre, one joined in Stage 2, and one at the beginning of Stage 3. The partner spectrum ranges from SMEs to very large global companies and interaction between all partners is open and vivid. The Centre is very open to accommodating new partners, even in Stage 4, which is dedicated to utilization.

Scientific Quality and Productivity

Research Area, Competence Profile, People, Facilities, Critical Size, and processes for ideas generation

The research area is very important from both a scientific and a practical point of view, and will become increasingly so for the foreseeable future. The practical importance has been consistently emphasized by the company representatives and it is pleasing to see that an additional two companies have joined the consortium in Stage 3. The team has overall strengthened its competence, in particular on the engineering analysis side. It has also made significant advances in theoretical constructs and implemented some of these theoretical insights in some highly practical software tools.

Good progress has also been made in meeting recommendation 3 of the Stage 2 evaluation report that the Centre improves the visibility and effectiveness of its interdisciplinary approach. There have been more than 420 knowledge-sharing events which is highly commendable. The number, titles and list of authors of the journal publications also indicate that the interdisciplinary approach is well featured in the output from the Centre.

With the additional project funding that has been attracted, the total activity directed to the Centre's field of research has increased since the Stage 2 evaluation and the total resources taken together have been well utilized for making a substantive contribution to the field, especially given the considerable involvement of the companies.

Scientific output and impact of results

The scientific output in terms of journal papers published and conference presentations given has grown since 2011 to the current rate of publication. A comparison with the KPI results of Stages 1 and 2 shows that the Centre has increased its publications in Stage 3 and is on track to meet or exceed all its publication targets for this Stage. It is particularly impressive that the Centre has significantly increased its publications with international co-authors and its industry-academic joint publications. The large number of knowledge-transfer events organised reflect that there has been good transfer of the results into the industrial and scientific communities.

That said, the Faste Laboratory is one of the few university-industry centres globally working in the field of functional products. In many aspects, its work and that of its industry partners is defining core aspects of this new field. To protect and leverage its leading-edge, pioneer status in this area, it is important for the Centre to be very strategic about its communications strategy, targeting very top academic journals, professional publications (e.g. *Professional Engineer* in the UK or its Swedish equivalent) and high-end popular press (*The Economist*, *The Financial Times*, etc.) as well as the big industry conferences in which they already participate to good effect. The Centre has attracted at least one major international conference (for 2019) and a good range of international visitors but it could do more in this regard.

Recommendation 1: That the Centre strengthen its communications strategy still further to build on and leverage its pioneer status in this important emerging field.

International Comparators with other Centres and Collaborations

It was difficult to assess the collaborations with and benchmarks against other international centres from the Centre report but discussion at interview clarified the usefulness of the good

links that have been established with the groups at Nottingham and Cranfield that work in closely related domains.

Critiques of Research Programmes and Projects - Science, Methodology and Technological Outcomes

The Centre has taken on board recommendation 7 from the Stage 2 evaluation by managing and structuring WP1 in a similar manner to the other working packages.

All the individual research projects have been well managed and have produced useful results for industry partners. Particularly noteworthy are the Design for Mode Application project, the results of which has been implemented at the Climate Group at VCC, and the DataMap tool that has helped GHT expand their technical offering to customers.

Overall Conclusion - Scientific Quality and Productivity

Concrete results have been achieved in many of the individual research projects in close collaboration with the partner companies. There is clear evidence that companies are taking up the concept of functional products and the methods and tools developed by the Centre, and that they realize that “looking at service life agreements” is important for them in order to remain competitive in the long term. Scientific quality and productivity have significantly improved since the Stage 2 evaluation judging by the number of journal and conference papers, especially those featuring international and industrial co-authors.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

This Centre shines in terms of its innovative, industry-focused outputs. At interview the industry partners provided a diverse set of examples of the impact of the Centre’s operations on their companies which ranged from an innovative SME through to some of Sweden’s best-known firms.

As well as impacts in the form of modifications to industry partners’ internal operations, the Centre is justly proud of its impacts through:

- providing projects and platforms for colleagues from companies from an array of industries to meet to share and test concepts and experience with functional products
- publications, meetings, conferences, etc.
- industry partners employing Centre graduates
- industry partners being able to send staff to specialised courses in the Centre.

The Centre has also undoubtedly had an impact through its imaginative education processes at undergraduate and postgraduate coursework levels. These initiatives are to be commended.

Organisation and Management of the Centre

The General Assembly, where all participating partners are represented is the highest authority of the Centre. The role of the Board is "the strategic direction of the Centre and the monitoring and coordination of activities". It comprises one representative of each industrial partner and the Dean of the engineering faculty of LTU. The Centre Director is the scientific and operational

leader of the Centre and works in close cooperation with the Board and the Executive Committee, the operational management group of the Centre.

The Centre has a dedicated and enthusiastic Board with a very involved and effective Chair. The Director, who was appointed at the start of Stage 3, has proved to be an able leader who has coordinated the Centre's activities very well including its interactions with partners and wider stakeholders.

The project generation process was clarified at interview and is well adapted to the specific needs of the Centre. Before the beginning of a new stage, the Executive Committee clarifies the partners' needs, which are formalized in projects for the Stage. After approval by the Board, these projects form the core of the research during the Stage. Strategic projects can be proposed and approved at any time during a Stage. The evaluation team particularly commends the gender strategic project which has produced lessons which could be profitably disseminated to other VINN Excellence centres.

The members of the ISAB who have provided written commentary are generally complimentary about the Centre and make good suggestions for improvement. However since 2011, only one physical meeting of the ISAB has been arranged (in 2012) with two other videoconference meetings this year (to be fair it was one of our recommendations to use virtual meetings – but that was to encourage the Centre to hold more meetings with the ISAB). This matter was discussed at interview. The Centre agrees it could make better use of its ISAB. Its members are of high level, but the ISAB should meet at least once a year. The Centre is already considering extending the membership (both for the purposes of advice and international visibility). In doing this it could consider adding an industrial executive of high calibre to the ISAB to add to the Centre's visibility.

Recommendation 2: That the International Advisory Board meet at least once a year, and contribute to the international visibility of the Centre.

The written report to the evaluation team is well written but does not do justice to the Centre's outputs and their impact on the industrial partners that were revealed at interview. The financial report is acceptable, but the Centre needs to clarify the matter of the cash contribution to be provided by the University, which is not up to standard at this point.

Training Personnel of High Competence

Internal mobility from University to industry and vice versa is fostered by encouraging industrial PhD to join the Centre and by Centre graduates joining industry. The PhD students (and indeed all researchers of the Centre) have excellent access to industry information and data, giving them a valuable and quite unique edge in the type of research they are doing. Junior researchers are encouraged to be internationally mobile and take advantage of the possibility of visiting labs abroad for short- or medium-length stays. PhD students are also encouraged to participate in and present at international conferences, and the Centre is commended for the students' sophisticated understanding of the importance of international communication.

The Centre has initiated several courses to train both undergraduate and graduate students in its core domains.

The Centre has an excellent awareness of gender and equality issues, and strives to address these issues both in abstract and practical ways. It has been very successful in recruiting female PhD students in a male-dominated topic.

Long term development during Stage 4 and beyond

The Centre has a well-defined, long-term development plan spanning all four Stages, in which it is foreseen that the Centre partners will devote Stage 4 to the utilization of results. This fits very well with the overall vision of the Centre.

The Centre plans to continue its existence beyond Stage 4, but is still at the discussion phase on the practical model it wants to follow.

All Centre partners (the University and the industry partners) expressed their satisfaction with and commitment to the Centre. They believe they have something special in the Faste Laboratory brand and described a range of options that are under active consideration at the Board for promoting the Faste Laboratory beyond Stage 4.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That the Centre strengthen its communications strategy still further to build on and leverage its pioneer status in this important emerging field.
- **Recommendation 2:** That the International Advisory Board meet at least once a year, and contribute to the international visibility of the Centre.

Conclusion

The Centre is an excellent example of a VINN Excellence Centre performing at a highly satisfactory level at the end of Stage 3. It is clear that outputs from the Centre have had a real impact on industry partners. The evaluation team recommends continued funding.

Mary O’Kane (Chair)

David Barton

Lucienne Blessing

Anja Skrivervik

10 Evaluation of FUNMAT

A VINN Excellence Centre at Linköping University

Introduction

On 10 November 2014, the Chair of the Centre Board, Lennart Karlsson, board members, the Centre Director, Anita Lloyd Spetz, colleagues of the FUNMAT VINN Excellence Centre, PhD students, external partners, and University representatives led by the Vice-Chancellor had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Anja Skrivervik as generalists and Marie-Paule Delplancke as specialist). The evaluation team also included Martin Stutzman as the remote specialist evaluator. At interview Mats Jarekrans, Anders Marén and Thomas Eriksson were also present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing information for the evaluation via the self-evaluation report and during the interview with the evaluation team.

Before the interview the evaluation team provided a pre-interview draft report that raised a number of questions and issues, all of which were satisfactorily addressed at interview.

This evaluation is particularly focused on the output from the Centre in the form of scientific, societal and industrial results and the impact of this output.

Long-term Vision, Mission and Strategy

The long-term vision, mission and strategy of the Centre are all appropriate.

How the Centre addressed the recommendations of the previous Review

The Centre received four recommendations in the Stage 2 evaluation. The Centre has paid real attention to these recommendations and has acted adequately upon all of them.

Centre Partners

The Centre has one university partner (LiU) and 11 industrial partners, one joining during Stage 3. The industrial partners are of different size and technical maturity. The relations between all partners in the Centre are based on trust and mutual respect for the respective priorities of each partner, leading to excellent and fruitful interactions.

Scientific Quality and Productivity

Research area, competence profile, people, facilities, critical size, and processes for ideas generation

FUNMAT has cleverly defined its niche “market” based on the fundamental competences it developed prior to the formation of the Centre. It has managed over the last 8 years to build on this fundamental knowledge but also to renew and develop it by applying to other agencies for funding for the more atomic-level aspects of their research. They have renewed and expanded their synthesis and characterization equipment pool partly through the “in-kind” contribution of the industrial partners and partly through other funding.

The pool of competences has increased and the collaboration with other groups in fields where the LiU groups were less knowledgeable (i.e. the modelling part) has allowed further developments. The contribution of internationally renowned visiting scientists is also helping in the development of the Centre.

FUNMAT has certainly reached a critical mass with specialists in all necessary fields (fundamental and applied). The involvement of the industrial partners is considerable and the transfer of competencies is insured by the transfer of persons formed in the Centre to the industries but also by the involvement of industrial actors in the education system and the research centre.

The structure of the Centre is flexible enough to allow permanent scientists who have too many responsibilities for new activities to shift in and out of the Centre to the benefit of the projects. The Centre is clearly integrated in a larger structure dealing with material science (40 full-time professors) and benefits from it. In addition to providing competent PhD students, it also allows for the renewal and purchase of an impressive pool of high-end instruments. Material science is a priority of LiU.

The Centre is attractive for young scientists, providing considerable opportunities for PhD candidates and typically keeping them as post-docs. As it is clear this last point is beneficial for the development of the Centre, it would be nice to offer to the post-docs more international exposure maybe in the form of periods working in labs in other countries.

The process for idea generation is based on the collection of ideas at all levels of operation and on a discussion of these ideas on a regular basis. The process takes place first at the level of the individual themes and continues by an evaluation at the management and board level.

Scientific output and impact of scientific results

The number of publications in peer-reviewed journals, of invited talks and of participation to major conferences in the concerned fields is very high. They have managed to publish regularly while patenting many of their innovations. The results are original and at the forefront of the field. They have managed to contribute to the development of analytical tools and thus have very high-end equipment and they are very often among the first to be able to carry out certain experiments. The H-index of the senior scientists of FUNMAT is very high for the field.

The contribution of FUNMAT projects to publications and to distinctions received by members of FUNMAT is not easy to identify as the promoted label is LiU but this it is a clear policy (and achievement) of the group to produce excellent publications.

International comparators with other Centres and Collaborations

The Linköping thin film group is internationally recognized as one of the top five groups working in the field. They have links with many top-ranked research institutions and they collaborate with them as can be seen by the number of common publications.

Critiques of research programmes, projects and outputs - science, methodology and technological outcomes

In general, FUNMAT is balancing very well its activities between the fundamental developments and the industrial applications and implementations. The methodology to go from

nano-scale understanding of the phenomena to the large-scale applications seems to be well established and effective. The strong involvement of the industrial partners at all Stages of development is a key to this success.

During the interview, the correspondence between the operational plan and the results was presented in a very clear way. Most of the objectives were reached or are on the point of being reached. When this is not the case, a clear explanation was given.

The strategy to be developed to insure the transfer of the know-how at the end of Stage 4 should be discussed and detailed as a matter of priority as there is a danger this valuable asset will be lost when the VINN Excellence Centre funding ceases.

Overall conclusion - scientific quality and productivity

The quality and quantity of the scientific and industrial results that have been achieved is impressive. FUNMAT has managed to build a very high-end technological platform with qualified persons and top-of-the-line equipment. The relationships with the industrial partners seem to be excellent, dynamic and constructive. FUNMAT is certainly an excellent asset for the Swedish industries.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

The Centre uses the approach of carrying out application-inspired basic research – thus impact needs to be considered in terms both of developments in the fundamental side of material science and in novel applications that address the industry partners' needs. As noted in Section 5 above, the Centre has had an impact in terms of discoveries in basic research that have led to highly-cited publications, successful PhD graduations, awards, and invitations to give keynote addresses. On the matter of impact on partners in meeting their needs, the Centre gives an impressive set of success stories in its report. These case histories were expanded on at interview particularly by industry partners who are clearly very satisfied with the return on their investment in the Centre.

Organisation and Management of the Centre

The Centre has excellent governance and management with clear roles for the board, management team and project leaders. The coherence between the management and the projects is excellent. The Board has successfully handled the change of directors and has implemented a clear plan for succession planning at all management levels. This process provides an opportunity for the senior researchers to be involved in projects other than their own, which is good for cross-fertilization.

The International Scientific Advisory Board (ISAB) meets regularly with the Centre and these meetings lead to fruitful discussions and suggestions. However, these inputs are not always recorded in a written report. The Centre Director and the Board are aware that this might lead to the loss of valuable input, and will ask for written reports of their next meetings with the ISAB.

The written reporting to the evaluation team was informative and clear, and the Centre responded satisfactorily to the evaluators' questions on the financial reporting, which arose mostly from minor mistakes.

Training Personnel of High Competence

The Centre has managed to recruit high-level personnel both at senior and junior levels. This seems to be due both to the excellent working atmosphere and facilities provided by the Centre and to the overall policy settings of LiU. The mobility between industry and the University seems easy within the Centre both for junior and senior researchers. However, the junior researchers do not appear motivated to gain the international experience which would be very important for their careers, so the Centre should try to provide them with incentives and opportunities to visit labs abroad. The early career researcher planning meetings are commended, as is the initiative of the Board of organizing informal meetings between the junior researchers on a regular basis.

The Centre has an excellent gender balance.

Long term development during Stage 4 and beyond

The Centre is clear about how it intends to operate in Stage 4, which is primarily a continuation of the activities and *modus operandi* of Stage 3. At interview, ideas for post-Stage 4 were discussed but the Centre has yet to give this matter detailed consideration. It is important that the Centre clarifies its views on development after Stage 4 so that there is an orderly transition out of FUNMAT to whatever follows and so know-how is not lost and the other benefits associated with the excellent industry-university collaboration built up in FUNMAT are retained as much as possible.

Recommendation to Strengthen the Centre

In summary, our recommendation is:

- **Recommendation:** That in planning for Stage 4, the Centre develop a clear view on how to wind up FUNMAT and transition to appropriate arrangements that preserve know-how and maintain the key benefits associated with industry-university connections built up through the Centre.

Conclusion

FUNMAT is an excellent example of a VINN Excellence Centre producing very good output with high impact both scientifically and for its industry partners.

The evaluation team recommends continued funding.

Mary O’Kane (Chair)

Marie-Paule Delplancke

Anja Skrivervik

Martin Stutzmann

11 Evaluation of GHz

A VINN Excellence Centre at Chalmers University

Introduction

On 16 September 2014, the Chair of the Centre Board, Peter Olanders, board members, the Centre Director, Jan Grahn, colleagues of the GHz VINN Excellence Centre, PhD students, external partners, and university representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Sybrand van der Zwaag as generalists and Ernesto Limiti as specialist). The evaluation team also included Hermann Schumacher as the remote specialist evaluator. At interview Mats Jarekrans, Tommy Schoenberg and Thomas Eriksson were also present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing information for the evaluation via the self-evaluation report and the clarifying meeting with the evaluation team.

This evaluation is particularly focused on the output from the Centre in the form of scientific, societal, industrial, and education results and the impact of this output. The Centre fully meets the needs expressed by the industrial partners and conducts scientific research at a very high level.

Long-term Vision, Mission and Strategy

The Centre focuses on several leading microwave research topics which are relevant to its industrial partners. The current mission statement of the Centre is compact yet clear and fully in line with the targets set by Vinnova for VINN Excellence Centres, as it addresses the generation and transfer of new knowledge from the academic partners to the industry. The number of industrial partners has doubled with respect to the start of the Centre and some of the new partners are from outside Sweden.

How the Centre addressed the recommendations of the previous Review

The Centre received 17 recommendations in the evaluation of stage 2. The Centre has addressed all recommendations made at the end of Stage 2 and the reported issues have been resolved. The way the Centre has benchmarked its performance against that of older VINN Excellence Centres is excellent and the results clearly indicate that the Centre performs well.

Centre Partners

The Centre comprises a single academic institution, one research institute and 13 industrial partners of widely different size. Most interestingly some of the newer partners are large international companies from outside Sweden. Although the research in GHz is grouped in a relatively small number of themes, the themes selected cover the needs of both large and small industrial partners. The overall level of industrial participation in the Centre is high, resulting in no less than 50% of the journal publications co-authored by industrial researchers.

The Centre rightfully advertises the global structure of its industrial partners, and the wide range of company size and structures, from publicly traded global leaders to small start-up companies. This heterogeneity is, naturally, also reflected in the varied intensity of research interactions.

The small industrial partners, located in or in the vicinity of Gothenburg, appear to participate very actively in the research itself and directly benefit from techniques developed and the available infrastructure. During interview it was reported that some of the larger partners in the Centre had updated their technology roadmaps due to being close to the new science developed in the Centre.

It was stated that during the Stages 1-3 about 30 companies had enquired about the opportunity to join the Centre, but their requests to join had been rejected for various reasons. The Centre indicated it may accept a further 2-3 companies when entering stage 4.

At interview the industrial members expressed great satisfaction with the Centre even to the extent that the Chair of the Board stated that the Centre would continue with industry funding even if the Vinnova funding came to an end.

Scientific Quality and Productivity

Research area, competence profile etc

The Centre's activities cover two somewhat diverging areas of research (both within the general realm of wireless communications and sensing).

The first, in terms of projects and larger allocated resources deals with problems encountered in current and future **mobile communications networks**. Specifically, aspects of energy efficient microwave power amplifiers are addressed, both from microwave engineering (PA design proper) and communications engineering (signal design) perspectives. The title of this research project, "Energy Efficient MIMO Transmitters", is slightly misleading since MIMO is not the focus, but it sets boundary conditions for the design of the power amplifiers (and transmitters go beyond power amplifiers, of course). This project has, in its power amplification emphasis, a strong correlation with a second project, named "Advanced characterization and modelling for technology optimization of multifunctional circuits". Under this rather generic header, the goal is to investigate fundamental issues of GaN based field effect transistors, where frequency dispersive (or in the time domain, memory) effects make the realization of power amplifiers for complex signals and also the combination of several functions on one chip challenging, compared to other technologies. These memory effects can be related to electro-thermal interactions, but in this material system more importantly trapping and de-trapping of charge carriers with sometimes very long time constants. The topic of GaN electronics is again picked up in the project on "Gallium Nitride Oscillators". Both high performance radar sensors and communication systems with increasingly complex signal constellations require the generation of signals with high spectral purity. Since the relative phase noise of oscillators decreases when the signal amplitude is increased, the use of a large breakdown voltage technology such as AlGaIn/GaN is an interesting idea. On the down side, the aforementioned trapping and de-trapping effects generate low frequency noise components which are up-converted and increase the phase noise of the oscillator. The usability of GaN FETs for low phase noise oscillator is thus not trivial and warrants a significant amount of research.

The second research area covered by the Centre is **Terahertz Electronics**. Chalmers has a longstanding track record of excellence in this area. The Centre project, “THz Space Components”, emphasizes the use of this frequency range in radio astronomy and space-borne earth exploration, but THz electronics sees increasing use also on earth-based systems for security application and spectroscopy, for example in life sciences. The project, which is also instrumental for the continued growth of start-up companies, exploits the excellent status of Chalmers InP HEMT and GaAs Schottky technologies. In this area, the activities heavily rely upon the 100 nm Chalmers InP HEMT technology, together with the more traditional GaAs for Schottky junctions. The former is indeed a key enabling technology to enter the true THz range with active circuits.

Both areas of research remain scientifically highly relevant. The divergence of the two research areas is not critical, it reflects the interests of the industrial partners involved. Different markets are addressed by industrial partners with very different structures. The mobile communications market is driven by large companies; this is also true for the defence market, which here benefits from the efforts targeting the mobile communications market – requirements for high performance, high efficiency power amplification are equally important for both base stations and radar systems, and advanced concepts like actively electronically steered antenna arrays (AESA) and multiple input/multiple output (MIMO) concepts are being increasingly exploited in both sectors as well.

A specific comment applies in this case regarding the increased focus that should be placed on research topics differing from power generation, such as robust low noise amplification and signal conditioning through T/R switching. In fact, even if not in the present needs of the communication area, the defence and security realm is strongly involved in applying GaN technology to integrated front-end solutions.

A brief comment on the suggestions in the report of the International Scientific Advisory Board (ISAB): the ISAB emphasized the need for a focus on packaging, and suggested an increased attention to SiGe and RFCMOS technologies. Packaging is clearly an important area that needs to be addressed concurrently with IC design, especially for millimeter-wave/THz applications. SiGe and RFCMOS are hot fields of research and development, but it is doubtful whether it would be in the best interest of the Centre to enter an already well-advanced field such as Si-based millimeter-wave electronics at the expense of the current focus on GaN and InP technologies.

GHZ is able to exploit a rather broad competence profile including Communications Engineering, Microwave Engineering, Circuit Design, and Semiconductor Technology in its portfolio. This mixture is deemed to be instrumental for solving the challenges which the Centre addresses. It is not only manifest in the background of the scientists involved, but also in the companies actively engaged in the Centre. Such further focus may be targeted making use of the potential synergies with the CHASE Centre.

The external visibility of the Centre is continuously growing and the branding efforts is successful: the invited participation of the Centre representatives in major academic and scientific events, as well as the demonstrated scientific production rate are remarkable.

A critical size for research has been achieved in all areas of research addressed. Long-term sustainability may be a concern for research areas where the economic support is led by SMEs or spin-off companies, as in the case of the THz line.

Research programme and results

The four different research projects have already been described above; this section will concentrate on the results achieved.

Energy efficient MIMO transmitters

The Centre reports state of the art results for power amplifiers in the mobile communications frequency range (1-3 GHz). The group uses a large tool set of approaches, including specifically designed input signals and pre-distortion. The research on the effect of large antenna configuration (via antenna load impedance and antenna mutual coupling) on the linearity of power amplifiers is very relevant given the increasing importance of large arrays in both communication and radar scenarios.

Techniques for efficiency-enhancement are adopted (e.g. Doherty), as well as harmonic tuning in different strategies. Switching-mode PA architectures are addressed and led to interesting results. In general, the scientific achievements in the field of PA design are remarkable. A possible direction towards higher output power levels and operating frequencies may be envisaged, that will pose new challenges to the research line. Interactions with the CHASE centre will be highly beneficial in this area.

Gallium Nitride Oscillators

As expected, the large voltage swing allowed by a high breakdown voltage technology such as GaN enables excellent low phase noise far away from the carrier, but close to the carrier the phase noise suffers from the strong low-frequency noise components generated in the active devices themselves. Using an external resonator with a high quality factor, the group was able to demonstrate close-in phase noise at par with the state of the art in other technologies – but not better. The modelling effort, with accurate prediction of phase noise in the close-in (“30 dB roll-off”) regime, is also an important contribution.

The results achieved are very good, not establishing however a high enough advantage over existing solutions in terms of phase noise to motivate system designers to switch from well-established solutions to the still risky GaN technology. GaN oscillators (and GaN multifunctional circuits per se) may have more advantages when used in harsh environments, such as high temperatures, where the larger bandgap has added benefit. At the present state of the art, more traditional solutions (e.g. not GaN-based) exhibit better performance both for phase noise close to the carrier and integration level, not necessitating the use of external resonators.

A possible research direction may consist in implementing high-efficiency techniques to the design of GaN oscillators, thus providing energy-efficient DC-RF conversion.

Advanced characterization and modelling for technology optimization of multi-functional circuits

For this project, the report is confusing. On the one hand, the motivation clearly states the importance of memory effects/frequency dispersion in GaN electronics. On the other hand, the key results reported concentrate on the development of a HEMTS switch model and another model which seems to concentrate on charge carrier transport in the presence of very high electric fields. No further mention is made in the research abstract of the originally targeted GaN specific impairments. The characterization of long-term memory effects is then mentioned again on page 19 of the report, and declared of great value for partners Infineon and NXP.

Regarding the characterisation activities, they appear to focus solely on the large-signal side, while not stressing low-noise modelling oriented towards device robust operation. In fact, a key property of GaN-based LNA consists in exhibiting a high robustness to high level impinging signals, thus allowing the elimination, in robust receivers, of limiting stages. No contributions appear to be reported for this goal, however important for the application of GaN-based electronics to T/R modules in defence applications.

THz Space Components

This project is driven by a closely-knit research community of SMEs and recent start-ups, strongly connected to Chalmers. The LNA results are truly impressive.

Some “true” THz results were also reported, albeit very briefly. The research direction towards the extension of the InP HEMT technology towards the true THz frequency range should be emphasised more.

As previously noted, the instrumentation and consumables needed in this line to extend further the Centre’s research capabilities have to be addressed and critically evaluated, eventually leading to strategies to attract support (e.g. security and defence markets).

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

The Centre has a high level of industry participation both in terms of financial contribution and participation in research. Outputs to the industry partners include licences, patents, a high number of early disclosures of scientific results and inventions, and, competence transfer which takes many forms but is most directly seen in the industrial PhD students, in the companies employing graduates, and in the Centre appointing adjunct professors from, but paid by, the industrial partners.

GHz is undoubtedly a high-impact centre especially in terms of industry impact. At interview industry partners from large and small companies enthusiastically provided detailed examples of direct and indirect benefits they derived from their participation in the Centre. More examples were given in the report to the evaluation and on the GHz website.

Organisation and Management of the Centre

The Centre is well run with an engaged and active Board and an outstanding Director supported by a highly competent management team.

The Centre makes good use of its International Scientific Advisory Board.

The report to the evaluation team was very clear and informative. Great care was taken to document the Centre's performance using various metrics. The industrial interaction was also well documented.

The Centre has established its brand name in a very competitive and international field.

The financial management is in order. The industrial in-kind contribution is increasing which reflects industry satisfaction with the Centre.

Training Personnel of High Competence

The Centre produces well-trained PhD students who are valued by industry.

Students are recruited from universities around the world. They are given excellent opportunities to work closely with industry but are also encouraged to publish and to work with related laboratories in other countries.

Long term development during stage 4 and beyond

The Centre is well advanced in its preparations for Stage 4 and beyond.

One of the most exciting aspects of the Centre's future planning is its discussions with CHASE about closer integration and possibly merger.

Recommendation 1: That the Centre continues its far-sighted planning for Stage 4 and beyond and continues the discussions with CHASE about possible integration.

The Centre was clear about the added value of being a long-term centre. It would be helpful for the Centre if Vinnova were to announce its plans about a possible new centre programme as soon as possible in order to give VINN Excellence centres such as GHZ a chance to include application to such a programme in their forward planning. However the evaluation team notes that there are already various Vinnova programmes that might provide good support for a beyond-Stage 4 GHZ and recommends that GHZ commence discussions with Vinnova on this.

Recommendation 2: That the Centre initiates in-depth conversations with Vinnova about which Vinnova funding options might be suitable for beyond-Stage 4.

At interview the Centre made a strong case for moving to a new style of Centre Agreement that would help it realise the proposed joint project with CHASE for Stage 4.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That the Centre, supported the University, continues its far-sighted planning for Stage 4 and beyond and continues the discussions with CHASE about possible integration.
- **Recommendation 2:** That the Centre initiates in-depth conversations with Vinnova about which Vinnova funding options might be suitable for beyond-Stage 4.

Recommendations to Vinnova

- That Vinnova considers allowing GHZ to have a more flexible Centre Agreement for Stage 4 which allows for a joint project with CHASE.
- That Vinnova considers continued funding of the integrated GHZ and CHASE Centres post-Stage 4.

Conclusion

GHZ is an excellent example of a VINN Excellence Centre producing good output with high impact.

The evaluation team recommends continued funding and encourages Vinnova to consider funding the Centre beyond Stage 4.

Mary O’Kane (Chair)

Ernesto Limiti

Hermann Schumacher

Sybrand van der Zwaag

12 Evaluation of HELIX

A VINN Excellence Centre at Linköping University, LiU

Introduction

On 11 October 2013, members of the Centre Board, the Centre Director, Mattias Elg, and his management team, colleagues from the HELIX VINN Excellence Centre, PhD students, external partners, and the university representative, had a formal interview with the generalists of the international evaluation team at Vinnova to evaluate the Centre's performance in Stage 3. The scientific experts of the evaluation team, Helinä Melkas and Peter Totterdill, had already provided a report to the Centre on the research aspects of the Centre's operations and the Centre had provided a written response to this. At the formal interview the generalist evaluators, Mary O'Kane (Chair), Anja Skrivervik, and Sybrand van der Zwaag, addressed matters such as results and impact, organisation and management, finance, interaction between industry partners and the university, and educational activities. We thank all members of the Centre and the Vinnova/VR team for their efforts in providing information for the evaluation.

Long-term Vision, Mission and Strategy

HELIX has a well-thought-out and appropriate vision and mission. It also has a good strategy but one which could be profitably extended to ensure a long-term future for HELIX when VINN Excellence Centre funding finishes.

Scientific Quality and Productivity

Research Area, Competence Profile, People, Facilities, Critical Size

The long-term funding commitment together with the physical facilities create high expectations of HELIX's scientific quality, output and impact. HELIX has achieved a great deal. New steps need to be taken to achieve a sustainable future and greater impact.

The previous evaluation report recognised that research talent and experience in HELIX were impressive; competence building has continued during Stage 3. The number of disciplines represented by HELIX researchers has grown, giving a good basis for investigating sustainable organisational development. The relatively low proportion of researchers with an international background is partly explained by the need to communicate in Swedish with partner organisations.

Interactive research based on collaboration between researchers and practitioners lies at the heart of the HELIX approach. This can increase the impact of research in partner organisations and is motivating for researchers. It also provides a further challenge as researchers need to balance academic and practical pressures. On the basis of the report and response to interview questions, HELIX has succeeded in managing this demanding task.

HELIX focuses on "everyday mobility" between the Centre and its partners at local, regional and national levels, proclaimed as a "new model for university-industry collaboration". From the wider European perspective HELIX is a potential role model for other universities where

interactive research is a rarity. However HELIX is not unique in focusing on university-industry collaboration; it would be helpful to elaborate the distinctiveness of its model more clearly. The potential importance of the approach is high both nationally and internationally, emphasising the need for clearer articulation of the model and its impact. Nonetheless the model of collaboration appears fruitful from the perspective of researchers and doctoral students; we endorse the positive comments of the IAB on the “rich and challenging” level of support provided for the development of doctoral students.

There is little in the HELIX Centre Report concerning innovation in research methodology and there may be potential to widen the sphere of methods. Many identified topics might benefit from even more interactive methods, facilitating longer and deeper collaboration between the case organisation, its personnel and researchers. Participatory activities with customers/users often require novel methods. Competence in such methods would strengthen the Centre’s claims to achieve impact on partners, complementing more traditional methods. Such collaboration might strengthen the Academy’s ability to attract industry sponsorship required for future financial stability.

The report acknowledges the challenge of integrating different research perspectives. In part this reflects the previous evaluation’s call for the greater integration of knowledge across clusters, which remain very diverse in scope. Measures have been undertaken to respond to this demanding challenge recognising that researchers need to keep a balance between HELIX, the faculties and the departments. This requires further development.

The HELIX Academy is a welcome innovation. It promotes dissemination and use of research-based knowledge among partner organisations, and can bring researchers together in ways that increase integration of research perspectives and knowledge. HELIX has appointed a group of researchers to deal specifically with knowledge transfer and use, and to plan the activities of the Academy. International partners could play an important role in the future development of the Academy and would add a wider appreciation of the different workplace contexts which exist outside Sweden.

The size of the Centre is appropriate for its research areas and projects. Long-term funding gives a strong basis for competence-building in the future, maintaining coherence in the work programme, stability within the research team, and a sound basis to support the development of PhD students and their research.

International Comparators with other Centres and Collaborations

HELIX has strived to achieve more visible international engagement. The International Scientific Advisory Board (ISAB) enables PhD students to present and discuss their research with Board members. This is promising as a way of broadening the base of international collaboration. HELIX researchers are involved in diverse academic networks, collaborating with European and non-European universities. The international conference in June 2013, which required considerable effort, resulted in new collaborative relations that may result in joint projects if appropriate steps are taken. The attempt to secure international collaboration has come relatively late in HELIX’s funding cycle but is now a matter of focus.

Strategic engagement with EU and other international bodies should be enhanced. Building an international “brand” takes time and requires an action plan as well as additional staff resources (cf. the note on the HELIX Academy above). Horizon 2020 provides important opportunities for income generation and for profile raising. Achieving this requires a much more concerted approach to European collaboration than in the past, despite the recommendations of previous evaluations.

Critiques of Research Programmes and Projects - Science, Methodology and Technological Outcomes

HELIX’s impact is considerable and the report to the evaluation team includes good examples of this. In addition to the survey, qualitative methods have been deployed though there is scope for further development. The overview of the survey is interesting but it is not apparent, for example, how the results were obtained. The cases show a rich picture. East Sweden Regional Council illustrates the way in which development work has been embedded. Notable results have clearly been reached in the case of the European Structural Funds in Sweden. Some reflections concerning the impact on citizens/users/customers should have been included too. It is claimed that HELIX has been able to create opportunities for individual and collective learning; this is crucial and should be emphasised in the future.

Processes for Idea Generation

There is a high degree of participation and engagement by partner organisations, and the vision and research strategy have been developed in a dialogue with them. Such dialogue is challenging but provides unique opportunities. This, combined with long-term funding and the other assets, results in excellent opportunities for groundbreaking research.

Overall Conclusion - Scientific Quality and Productivity

HELIX has made significant progress during Stage 3. Networking has increased; the Centre has qualified staff, an interesting project portfolio and good plans for developing the research programme and internationalisation. Productivity in terms of publications appears good. However we identified several areas which require further development or articulation in order to ensure the impact that HELIX deserves and its longer-term future.

Recommendation 1: That HELIX uses Stage 4 to capitalise on its excellent achievements to date and also uses Stage 4 to construct an internationally visible, high-impact institute that will flourish after the VINN Excellence Centre funding finishes.

Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

The Centre has a stable partnership and all original partners still participate actively.

Processes for Needs Identification and Articulation

The Centre has a fitting process for needs identifications and articulation. The projects are properly discussed internally prior to being sent to the Board for final discussion and formal approval. The evaluation panel was happy to learn that the Board takes its role seriously and has reportedly turned down potentially interesting proposals not meeting the strategic plan of the Centre.

Partner Participation in Innovation and Technology Translation

The Centre has been very successful in getting its innovative ideas accepted and used by the partners. The Centre is to be commended for conducting a customer satisfaction poll amongst its partners. The poll showed a good level of satisfaction. The evaluation panel was happy to learn that there will be a second customer satisfaction poll next year and that more attention will be given to stakeholders not indicating high levels of satisfaction. The poll will complement further qualitative evaluation by the Centre of its activities and impact.

Commercialisation Successes and Benefits to Society

Various concepts developed at the Centre have been implemented by the industrial partners, the partners from public sector organisations and the partners from labour market organisations. In this manner, the Centre certainly did contribute to society. It should be mentioned that the concepts initially developed for the local Swedish society increasingly are now being applied to solve similar issues elsewhere in Europe and even in Africa. Another notable example is the adoption by the EU of HELIX-inspired project evaluation in certain fields.

Organisation and Management of the Centre

The Board's Role

The Board is functioning well and is willing to take a shaping role and a devil's advocate role when needed.

Management Team (MT) Structure, Processes and Performance

The management team is clearly cohesive. The Centre transitioned between directors very well during Stage 3.

The International Scientific Advisory Board (ISAB)

The Centre has made good use of its excellent ISAB. A striking and useful innovation from the Centre is its National Scientific Advisory Board which complements the ISAB.

The Report to the Evaluation Team

The Centre produced a well-constructed report for the evaluation.

Communication and Promotion

The Centre has been active in communication and promotion. The Centre has held a large number of partner meetings and has communicated its message in a large number of external meetings, workshops and (national and international) conferences. Furthermore, the Centre has organised a well-attended international conference to promote HELIX as a Centre.

The Centre produced a large number of books and publications, albeit possibly not in the most influential journals. The highly valuable and sometimes unique data already collected during Stage 3 (and likely still to be collected in Stage 4) can be used as a base for writing a substantial number of new and influential papers. A more active policy of co-publication, with foreign authorities in the field, foreign participants at the HELIX international conference or the hosts of the PhD students sent on 3-months internships at foreign universities, may help the Centre in reaching its goal of more rapidly increasing its standing and visibility outside Sweden and the Nordic countries.

Financial Management

The financial tables and the underlying data reporting the time spent on the Centre by its members give a good and probably complete picture of the Centre financial operations. A satisfactory explanation for the relatively high overhead cost of the Centre was given by the Director and the University representative on the Board. The evaluation panel was happy to note that several of the external (industrial, public sector and labour market) partners reported a higher in-kind contribution than foreseen in the budget. Such a reported extended spending is a clear sign the work of the Centre is being appreciated by the partner and has had substantial impact. It is assumed that the Centre will take adequate actions regarding partners not yet having fully met their financial commitments and make an effort to raise their level of involvement if not in Stage 3, then at least in Stage 4.

Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

Most senior academic staff and PhD students are Swedish. The necessary use of the Swedish language for the day-to-day work with the partners within the projects explains this fact. The Centre has been able to render its PhD positions very attractive, as it got 135 applications during its recruiting process. To make up for its rather national focus, the Centre is inviting international scholars both at senior and PhD level, and makes excellent use of its ISAB. A vivid example for this is the international symposium the Centre organised this year, to which eminent guest speakers were invited to give keynote presentations. Moreover, the Centre's PhD students are strongly encouraged to make visiting stays at other universities or Centres, and many of the students take advantage of this opportunity.

Mobility of Personnel between University and Industry

Mobility between academic, industrial, labor union or public partners is a key path to success for the scientific studies undertaken by the Centre. Indeed, for the PhD students making the studies, having easy and fast access to the partners is a huge asset. They spend considerable time at the partner's premises or with the partners in the field to collect data. Moreover, having access to data coming from very different partners gives more value to the theoretical models that are derived during the studies. The Centre has also attracted four industrial or organisational doctoral students in stage 3.

Gender Perspectives and Training for Senior Roles in Research

The genders are well balanced in the Centre. Moreover, gender issues are a part of projects in all clusters.

Training for Senior Roles in Research

The Centre has set up several very interesting training schemes for young scientists: the senior academic partners are involved in the teaching at undergraduate level, the Centre has set up a HELIX graduate school aimed at the Centre's own PhD students, but open to others. Four courses have been offered so far. More unusual is the emphasis on a multi-disciplinary approach, including for PhD students, who are trained to have discussions with the public at large, the partners and professors from very different fields. This is a challenge for the students, that the Centre helps them to manage well and that leads to young researchers having a very interesting profile.

The HELIX Academy is another interesting contribution of the Centre to education.

The Academy has existed for a year only, but already shows good results: for example, the next Academy meeting will be used to present the students' work to the Board.

Long term development during stage 4 and beyond

In its evaluation report and at interview, HELIX provided a cohesive plan of what it wants to achieve in Stage 4 and, to some extent, beyond. The evaluation team believes that the Centre can do even better in moving to secure a long-term future. Stretch targets in terms of finding partners from around the world, international research collaboration including co-publication with major figures in cognate groups, major funding from diverse sources, contract research commissioned by prestigious organisations, and quasi-popular presentations at forums like the World Economic Forum could all contribute to making an enhanced future more likely.

How the Centre addressed the recommendations of the previous Review

We commend the Centre for the professional way it addressed the recommendations from the previous review. All points have been carefully considered, and changes have been implemented when necessary.

Recommendation to Strengthen the Centre

In summary, our recommendation is:

- **Recommendation 1:** That HELIX uses Stage 4 to capitalise on its excellent achievements to date and also uses Stage 4 to construct an internationally visible, high-impact institute that will flourish after the VINN Excellence Centre funding finishes.

Recommendations to Vinnova

- That the financial reporting should be aligned with University practice
- That the evaluation criteria for Stage 4 are specified at the start of Stage 4
- That the final review (and possibly future Stage 3 and final reviews of other Centres) includes the physical presence of the specialists
- That the evaluation interviews be held on site.

Conclusion

HELIX meets all requirements for a VINN Excellence Centre. There is every opportunity that the entity HELIX could become sustainable if it takes appropriate actions along the lines discussed above.

The evaluation team recommends continued funding.

Mary O’Kane (Chair)

Helinä Melkas

Anja Skrivervik

Peter Totterdill

Sybrand van der Zwaag

13 Evaluation of Hero-m

A VINN Excellence Centre at Royal Institute of Technology, KTH

Introduction

On 6 November 2014, the Chair of the Centre Board, Anna Hultin Stigenberg, board members, the Head of Centre, Annika Borgenstam, colleagues of the Hero-m VINN Excellence Centre, PhD students, external partners, and university representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Alison McKay as generalists and Jilt Sietsma as specialist). The evaluation team also included Roger Reed as the remote specialist evaluator. At interview Mats Jarekrans, Anders Marèn and Thomas Eriksson were also present on behalf of Vinnova. We thank all members of the Centre and the Vinnova teams for their efforts in providing information for the evaluation via the self-evaluation report and the meeting with the evaluation team.

This evaluation is particularly focused on the output from the Centre in the form of scientific, societal and industrial results and the impact of this output. The Centre has a good focus on integrating science with industrial needs and specialises in: new materials, advanced stainless steels, high-strength steels, cemented carbides, sintered steels, and materials by design.

Long-term Vision, Mission and Strategy

The long-term vision, mission & strategy of Hero-m are all appropriate.

How the Centre addressed the recommendations of the previous Review

The Centre has addressed most of the recommendations of the previous evaluation well. However the demonstrator project could be more ambitious in its outlook and aims. Also more resource could be devoted to its delivery.

Centre Partners

The Centre has 14 industrial partners each of which is engaged with at least one research project and is well connected with the wider academic community. Processes for needs identification and articulation are strong and create a very effective industry pull for the basic research carried out in the Centre. The evidence of impact of the Centre’s research (see later in this report) indicates that industry engagement is strong and mechanisms to respond to industry needs highly effective.

Scientific Quality and Productivity

Research area, competence profile, people, facilities, critical size, and processes for ideas generation

The research concerns computer-aided materials engineering tools which are science-based, and is aimed at supporting the design of new engineering materials; the emphasis is on – but not limited to – alloys for structural use.

The members of the scientific consortium are working together in a highly effective and efficient manner. The scientific facilities available to the consortium are first-class, but also typical of what is available at comparable institutions around the world.

The outputs are commensurate with the amount of funding which has been made available. The spin-out activities via the company Thermo-Calc Software AB are world-leading; the latest software product TC-PRISMA has captured the imagination of the metallurgical community, as evidenced by the number of software sales and the number of countries in which it is being used.

The Centre is making stringent efforts to correct the gender imbalance within the scientific/engineering disciplines which is endemic worldwide. Progress is being made in this difficult area, which is to be applauded.

The change in research direction towards new cobalt-free carbide-based hard materials was taken after careful consultation with the industrial partners. It is supported by these reviewers.

The materials design activity, pioneered by Olson and co-workers, has been embraced by the Centre and in particular the industrial partners. For ideas generation, this has proven to be fruitful, and has broken down barriers between academia and industry.

The interview gave a good picture of the relation between the four generic projects and the applied projects. Results from the former are directly implemented in the latter. The Centre has chosen to concentrate the CALPHAD activity on metallic materials, in which no extension to corrosion is planned. The development of a Phase-Field Modelling package that is accessible by non-expert users forms a good initiative, but care should be taken that users do not consider it as a black-box application and that they remain critical of the simulation results. The ab-initio work blends in well in the multiple length scale approach of the research, and is especially important for the development and extension of databases. The Centre acknowledges that more emphasis on (mechanical) properties is needed to complete the intended scope and to maintain the interest of the programme for the industrial partners.

The scientific approach of the Centre enables an effective effort in one of the future challenges in materials science, which is the substitution of elements that should be avoided in alloys because of health reasons, environmental reasons or scarcity reasons. This can be used to further emphasize the effectiveness and importance of the chosen approach.

Scientific output and impact of scientific results

The target concerning at least 50 scientific publications within 5 years and at least 8 PhDs trained has already been met. It is suggested that the Centre define an ambitious aim for publications and graduations in the coming period. The Centre is highly visible from an international perspective, with talks given at more than 10 international conferences and symposia. The incorporation of highly trained PhD graduates within Swedish industry appears to these reviewers to be one of the most valuable impacts.

It is positive that the involvement of industrial researchers is through being co-authors of scientific papers of the Centre and that they present research results at international conferences.

A major goal is the continued development of software tools and associated databases. The Thermo-Calc software tool is now very well established, but there is a scientific need to build further applications-based models, which are coupled to it. The TC-PRISMA has now more than 50 licenses sold in more than 18 countries; by any criterion this must be regarded as a considerable success.

The database activity is very important and whilst this does not always have the greatest visibility, it needs continuing support. There is evidence that it is receiving this.

The impacts on the industrial partners Sandvik and Höganäs particularly in the area of cemented carbides and sintered steels respectively, are considerable, and materials modelling activities are aiding in the development of new cutting tool materials and process refinement. It is refreshing to see high technology companies such as these embracing the technology in an active way for the furthering of their businesses. Similarly, the benefits to Outokumpu Stainless – concerning the development of new grades of duplex stainless steels – must confer a technological advantage.

International comparators with other Centres and Collaborations

The third stage of Hero-m has been denoted 3D, in recognition of the ‘design’ of new materials as well as the three-dimensional modelling and experimental characterisation. As such it resembles closely the USA’s Materials Genome Initiative and other similar ones in China. Hero-m has made a good start in this activity.

Therefore, whilst there is little room for complacency, Hero-m maintains a world-leading position. This becomes evident when benchmarking against other university-based groups such as those based in Leoben, Oxford, Bochum, Penn State, etc.

Hero-m has maintained effective collaborations with a number of world-leading groups, particularly the Steel Research Group at Northwestern University, USA. It would appear that there is a growing relationship with the ICAMS activity at Ruhr-Universität Bochum. There are also new links emerging with the University of Rouen, Shanghai Jiao Tong University and the University of Science and Technology in Beijing, China. These international collaborations are to be applauded.

Critiques of research programmes, projects and outputs - science, methodology and technological outcomes

It is understood that there are no plans to change the main research direction, which seems to be well planned. The methodology chosen under the direction of Professor Ågren and others is scientifically and technological sound. However, the research portfolio of the Centre is quite broad. In the opinion of the reviewers it is beneficial for the effectiveness if the scope is not widened further.

There is a reasonable balance of efforts with long-term risk and short-term incremental steps. The major emphasis for Stage 4 is implementation of the tools and building on efforts to couple microstructure to properties; this is a major grand challenge in the field. The emphasis on phase field modelling is welcomed as is the increased efforts to be placed on demonstrator projects.

The applied research projects related to bulk metallic glasses, spinodal decomposition in stainless steels, sigma phase formation, martensite, bainite, powder compaction, cemented carbides and the new one on cobalt-free hard materials are endorsed by the reviewers. The choice of problems is industry- and application-driven according to the emphasis of the Swedish industrial concerns; this is an approach that relates to the character of the Centre, but also brings with it the danger of loss of focus.

Overall conclusion - scientific quality and productivity

The evidence provided confirms that the Centre continues to be highly successful, as judged by (i) the quality of publications which is of the very highest standard (ii) the new software products which are being designed, marketed and sold; these are world-leading (iii) the training of highly qualified personnel (iv) the use of the tools for the design of new materials and associated processes, which are industry-enabling and (v) the interaction with industrial partners, which is clearly mutually stimulating. All of this is aligned with the original Hero-m proposal. The productivity demonstrated by the researchers is very high. In the opinion of the reviewers, Sweden should be proud of its world-leading position in this field – researchers around the globe look at the reputation which has been built up with respect.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

Among the impacts of the Centre, it is clear that the participants are developing scientific knowledge to industrially relevant needs for new and improved metal related products. In addition, the Centre is educating graduate students in these fields and they should contribute to this field of study in their future careers. The Centre has published its results in 60+ publications (the Centre report would have benefited if these publications were further integrated in the report) and has also contributed to the TC-PRISMA software for precipitation modelling which has gained significant acceptance.

Major highlights of Centre industrial and societal output including commercialisation successes and benefits to society

The industrial partnerships and exchange of knowledge is a clear strength of this Centre as is the TC-PRISMA software for precipitation modelling. In addition, several product platforms were developed that benefitted industry including, for example:

- development of Sandvik Coromant's best-selling cemented carbide tools
- nano-scale decomposition of mixed Ti- and Zr-carbides to enhance the hardness of cemented carbides or cements for which Sandvik Coromant now plans to examine how the process can be scaled up to industrial production
- Höganäs has benefited from Hero-m studies that determine the spreading of the alloying elements during sintering of sintered steels which are being examined for improved commercial applications.

These are just a few examples of the translation research accomplished by Hero-m and point to productive/rewarding future effort.

Impact of Centre scientific, industrial and societal output on Centre partners and industry and society more generally

The Centre has had a successful publication and presentation record along with graduate theses. The students should be long-term ambassadors of the Centre. In addition, there is a strong record of research visitors and exchange programmes. As mentioned earlier, these accomplishments should be further documented in the programme reports.

Partner participation in Centre innovation and technology/results translation

This is a true strength of the Centre and the faculty and students appear to be well partnered and leverage connections with relevant partners both from industry and other international centres. The partnerships appear to be synergistically leveraging both expertise and capabilities. The PhD students explicitly mentioned the benefits of their collaboration with industrial researchers during the interview.

Critiques of Centre outputs and impact

The Centre could work more on preparing its PhD students for their future, beyond helping them in acquiring the necessary technological and scientific background. Encouraging them more strongly in, for instance, aiming for personal grants, organising overseas research visits and becoming more conscious about their role in future societal challenges involving materials would help them in being successful in their future careers.

The Centre is creating impact in many forms although much of it is difficult to quantify. Much of the Hero-m output is intertwined in industrial products with results from other sources; making it difficult to estimate the true value of Hero-m contributions. Models and simulation tools speed up time to market for new products developed by industry partners, so improving their competitiveness. Contributions to the development of software tools are creating increased sales for vendor companies and the Centre is creating new generations of highly trained material scientists for industry. Publications and presentations listed in the report are creating academic impact and at interview industry partners highlighted further impact from presentations made by industry partners based on Hero-m results. The design of new materials that respond to regulatory and societal drivers such as removing Co are likely to deliver short-to-medium-term impacts and the material design methods from the Centre could deliver longer-term impact to address longer-term needs such as W- and Ni-free materials and the creation of materials that can be made from locally available raw materials, so increasing the security of material supply. Implementation of tools, e.g. through improved user interfaces that can be used by a wider range of users, will extend the reach of the Centre's impact. Societal impact through the Harriet project is improving gender balance in the materials science area and, through follow-on projects, in 'comparable' sectors such as the film industry. Organisationally within KTH, Hero-m is recognised by KTH leaders as a highly functioning centre with excellent connections with industry.

Organisation and Management of the Centre

The Board is a core aspect of the success of the Centre. The wide range of outputs (both academic and industry/user focussed) provides strong evidence that the Centre is well run and operating as an effective and coherent entity. Evidence of the effectiveness and efficiency of the Centre leadership can be found in the quality of the Stage 3 report which is well presented and

informative. The transition to a new Head of Centre, with the former director acting in the role of Senior Scientific Advisor, appears to be an effective model that could be adopted in the development of other centres.

The International Scientific Advisory Board (ISAB) recognises the quality of the research and its impact on industry and society more widely.

The Centre has a very well-developed web site which reflects both the academic activity within the Centre and the current management structure.

The financial tables are convincing and the narrative associated with the tables helpful for readers.

The Centre is of world-leading quality and knows it. On some points this seems to cause a delay in making its intentions concrete. Two of these points, which were discussed at interview, are the concretization of the plans for the Centre beyond Stage 4 and the efforts to encourage the PhD students to broaden their horizons. Our recommendations address these issues.

Training Personnel of High Competence

The Centre has researchers with a diverse range of backgrounds. Researchers are encouraged to spend time in industry and have good access to facilities that are not available in the university. The Centre's research is influencing the education of Masters and undergraduate materials science students. At interview we met 15 PhD students; all articulated their individual research areas well but were less convincing when explaining how their research fitted into wider materials science research landscapes.

The Centre has created a range of software tools and training opportunities for use by material scientists. While knowledge and tools emerging from the Centre are being made available to this audience, the evaluation panel felt that there were underexploited opportunities for exposure of the Centre's research to wider engineering communities. For example, the hierarchical approach, material design method and associated software tools are likely to be of value to this wider audience at undergraduate level and above.

The Centre works proactively towards achieving gender balance and, through the Harriet projects, is sharing their good practice and learning with wider academic and industrial communities. It is good that the Harriet-2.0 project is visible on the Hero-m web site and that the project is at the forefront of thinking in this area.

Recommendation 1: That the Centre intensify its education activity and broaden its offerings in scope and target audiences.

Recommendation 2: That the Centre enrich the experience of the PhD students by broadening their horizons and improving their readiness for future careers as research leaders by:

- supporting them in applying for post-PhD grants
- strongly encouraging them to participate in entrepreneurship-related training
- providing more opportunities for them to explore longer-term future research challenges in materials science with current research leaders from academia and industry

- encouraging and providing incentives for them to work with international researchers in overseas laboratories as part of their PhD studies, for example, through mechanisms such as a series of international secondments.

Long term development during stage 4 and beyond

Hero-m has well-considered and realistic plans for Stage 4. The Board and management have been discussing how the Centre will evolve beyond Stage 4 but in planning for Stage 4 it is important that the Centre develop a more definite plan for continued funding for when the VINN Excellence funding ceases.

Recommendation 3: That the Centre includes in the Stage 4 Operational Plan details for continuation and funding of the Centre beyond Stage 4.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That the Centre intensify its education activity and broaden its offerings in scope and target audiences.
- **Recommendation 2:** That the Centre enrich the experience of the PhD students by broadening their horizons and improving their readiness for future careers as research leaders by:
 - supporting them in applying for post-PhD grants
 - strongly encouraging them to participate in entrepreneurship-related training
 - providing more opportunities for them to explore longer-term future research challenges in materials science with current research leaders from academia and industry
 - encouraging and providing incentives for them to work with international researchers in overseas laboratories as part of their PhD studies, for example, through mechanisms such as a series of international secondments.
- **Recommendation 3:** That the Centre includes in the Stage 4 Operational Plan details for continuation and funding of the Centre beyond Stage 4.

Conclusion

Hero-m is a research centre carrying out excellent research with good industry impact. It is appreciated by all its partners. Assuming the recommendations are addressed, the evaluation team recommends continued funding.

Mary O’Kane (Chair)

Alison McKay

Roger Reed

Jilt Sietsma

14 Evaluation of iPack

A VINN Excellence Centre at Royal Institute of Technology, KTH

Introduction

On 13 October 2015, the Chair of the Centre Board, Erwin Leichtle, board members, the Centre Director, Mark Smith, colleagues of the iPack VINN Excellence Centre, PhD students, external partners, and university representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Russell Morris as generalists and Bernard Weiss as specialist). The evaluation team also included Robert Mertens, as the remote specialist evaluator. At interview Mats Jarekrans and Tommy Schönberg were present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing information for the evaluation via the self-evaluation report, comments on the pre-interview report and the meeting with the evaluation team.

This evaluation is particularly focussed on the output from the Centre in the form of scientific, societal and industrial results and the impact of this output.

How the Centre addressed the recommendations of the previous Review

The previous Review made nine major recommendations to strengthen the Centre. In producing the Operational Plan for Stage 3, the Centre worked to address most of these recommendations. The outcome has led to some important improvements, such as the physical meetings in 2013, 2014 and 2015 of the International Scientific Advisory Board (ISAB). For many of the recommendations however the effectiveness of the responses is less clear and some of the actions taken do not seem to have been sustained or followed through. For example, the recommendation that “the Centre makes meaningful exchanges and collaborations with high profile international groups of similar interest” did not seem to have led to any major formal, productive collaborations involving the Centre *per se*, although individuals associated with the Centre continue to interact with such groups. While the Centre addressed the recommendation that it embrace “a proactive attitude in mitigating the gender balance at senior level” by appointing a female Board member, she left the Board and there are now no female Board members or senior managers in the Centre. Also, the recommendations of the 2014 ISAB do not seem to have been implemented to any major degree.

Long-term Vision, Mission and Strategy

The Centre significantly changed direction in Stage 3, winding back its work in intelligent packaging and moving more to applications in healthcare and the Internet of Things. This is reflected in the Mission and Vision given in the Stage 3 Operational Plan. However there still appears to be some confusion or at least sloppiness over exactly what the Centre is aiming to achieve with the Vision and Mission given in the report to the evaluation team being almost the same as the Vision and Mission given for Stage 2.

More generally, the report to the evaluation team was poor, failing to address input and impact issues effectively even though these were the central themes of the Stage 3 evaluation, as indicated in the Guidelines. Also the financial section of the report was problematic.

Centre Partners

The Centre has 11 industrial partners (several of these are SMEs), one public sector user partner, Landstinget Blekinge, and one university partner (KTH, which also involves KTH Holding). This is an appropriate partner mix.

The energy and drive of the industrial partners is clearly the strongest aspect of the Centre. On the other hand, the evaluation team received very mixed messages about the extent to which the core academic partner, KTH, views the importance of this Centre. This could not be clarified as no central university representative attended the interview.

Scientific Quality and Productivity

The scientific quality of the research is viewed as adequate, although there are several concerns that are covered in the following points.

The subject areas of the current individual projects are interesting and address applications that have a strong potential for industrial and commercial exploitation in Sweden and worldwide. They include the important topics of improving health and the environment and are the subject of many research projects in key laboratories around the world. KTH should be ideally placed to exploit these areas with STH and its link to the Karolinska with its excellent international reputation. iPack's research areas for Stage 3, with more emphasis on biomedical and healthcare applications and on the Internet of Things, are suitable and in line with significant increases in research in these fields worldwide. The shift away from packaging technologies is probably justified given the issues surrounding printing on rough surfaces.

The research output from Stage 3 in general meets expectations with regard to interactions with SMEs. However, despite the increased emphasis on biomedical and healthcare applications, it seems that the projects in these fields produced fewer outputs than the other iPack fields: the Centre published 26 journal papers in Stage 3 but only 6 in the biomedical field.

Most projects are bilateral between the KTH academics and a single company, a strategy that restricts broader opportunities for collaboration, which are often nurtured in successful programme-based institutes. Such an approach allows a better focus and avoids the role of the Centre being reduced to that of problem solvers for individual companies.

Despite this, several encouraging outcomes were discussed at the interview and some projects with industry have developed prototypes that are currently being evaluated. Hopefully they will be commercialised in the short term. However, it would have been more informative to provide more concrete results demonstrating the achievements to date.

Although the evaluation report states that the Centre maintains good relations with other international institutes, it is not clear which institutes this refers to and the extent of any interaction or collaboration. As noted above, there do not appear to be any established

international partnerships, although the Centre has identified some key comparator laboratories, including VTT, Eindhoven and Holst.

The SWOT analysis provided by the Centre shows a number of issues that we feel should have been addressed earlier, as they have impeded the development of the Centre. Many of them are concerned with IP, such as the time taken to obtain approval for patents, which is a key issue for the Centre.

Overall, while there are some pieces of good research being undertaken, the overall quality and productivity is only adequate, and is a little disappointing given the undoubtedly good researchers present in the Centre.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

The overriding impression given by the report submitted was of a Centre that was unsure of really what its own impact is, and was strategically weak in explaining where it was going. Unfortunately, much of this was reinforced by the interview. The Centre has undergone significant changes in ‘vision and mission’ since it was founded, moving from a smart packaging focus to a vision that is more closely aligned to medical technologies. This is a fairly drastic change, and while the rationale behind the change of direction is understandable, one cannot help but feel that the members of the Centre are still not certain in themselves as to their strategic direction and what they want to achieve. There still seemed to be vagueness in much of the discussion surrounding their plans for Stage 4.

The partner participation in Centre innovation and commercial translation of technology/results was not well addressed in the written report. However, it looked like the companies were heavily involved and there was a feeling that perhaps the industry partners are really the drivers of the innovation. This feeling was confirmed in the interview.

There are several exciting and productive developments that have emerged from collaborations between smaller companies and members of the Centre. Of particular note were the highlights presented on the Imsys, Kiwok and CathPrint innovations. These are good examples of bilateral collaborations where a strong technology driver has been supported by skills that are present in the Centre. However, there was evidence in the interview that the leadership of these projects was all coming from industry and, while there is no doubt that the academic scientists are making contributions, there is little evidence that the Centre as a whole is adding any significant value over and above that provided by the students and staff members working directly on the individual projects.

This view is backed up strongly by the fact that some of the companies involved have moved from funding the Centre with cash to a model where in-kind funding is used to target support to the individual, bilateral projects between the Centre and the respective companies. The evidence suggests that the companies see limited added value in providing cash funding for the Centre as a part of their collaboration.

One of the major success criteria (listed in Appendix 3 of the Guidelines for the 3rd Evaluation of VINN Excellence Centres) is that the Centre should:

- Set up innovation environments with effective innovation operations so that strong research and innovation milieus can be created (Centres of Excellence in Research and Innovation).

One cannot help but conclude that the Centre has failed on this criterion, and that what successful impacts there are do not rely on any added value provided by the Centre itself, but arise from industry-led bilateral collaborative projects that would not be disadvantaged by the loss of the Centre as an entity.

Organisation and Management of the Centre

The leadership in the Centre is mixed. The Chair of the Board gave a very accomplished performance in terms of his leadership. Similarly, the contributions from the other industrial partners present gave the impression of strong leaders in their own fields. Unfortunately, there was much less clarity from the academic members of the management team. It is clear that there have been significant changes in the leadership and management of the Centre in the recent past. However, the management did not give convincing answers when asked for self-evaluation of their own impact, and they did not show clarity of thinking when describing the strategies for Stage 4 and beyond.

The written report identifies an issue with the management structure that will be addressed during the next stage through a reorganisation. In keeping with the rest of the report, it is not altogether clear what the issue is or how it will be remedied. Indeed, the section on Organisation and Management does not mention any real issues that would suggest the need for another reorganisation (in fact it states that the management structures support the Centre in an “*efficient manner*”). The clear implication of a need for restructuring is that the management team structure, processes and performance are not viewed as sufficiently effective.

The report to the evaluation team is, in our opinion, substandard. It is heavy on jargon and somewhat repetitive. The interview clarified some issues, but still left many important questions unanswered. What we can say is that the Centre does not function as a single coherent entity with a settled strategic vision, despite the presence of excellent scientists and industrialists.

It is unfortunate that a number of questions raised in the initial report to the Centre were not addressed robustly and this left the evaluation team with the feeling that the Centre failed to see the relevance and importance of the issues.

Training Personnel of High Competence

The PhD student interview session went very well. The students are well disposed to the Centre and gave a good account of their roles within iPack. Those involved closely with the industry partners are very motivated by their participation in developing potential new products – they are clearly enjoying the experience. They were also very complimentary about the innovation training they received. There is no doubt that Masters and PhD students are well trained, but it would be helpful if data on destinations of students on graduation could be collected and made available to back up the assertions that graduated students are well received by Swedish employers.

There is a clear problem with gender balance in the management of the Centre. This may have something to do with the field itself, which may be inherently biased to one gender, but there is

a feeling that more needs to be done to ensure that the higher levels of management in particular are populated in a more balanced manner.

Long-term development during Stage 4 and beyond

The Centre's plans for Stage 4 are not yet very developed but to the extent that they exist, they involve a technical focus on healthcare and Internet of Things applications – sensible in the light of the current technical activities in the Centre – and a laudable intention to attract more partners.

The Chair of the Board made it clear that the Board was aware that the Centre had some problems but he expressed his determination that Stage 4 would see more focus and clear delivery on industry-oriented projects.

Plans for beyond Stage 4 are still vague, although some of the ideas raised at interview had potential.

Conclusion

iPack is not performing well as a VINN Excellence Centre. The added value of being a centre is lacking. In particular the Centre:

- fails to meet the VINN Excellence success criterion – “Set up innovation environments with effective innovation operations so that strong research and innovation milieus can be created (Centres of Excellence in Research and Innovation)”
- has weak overall output and impact, as compared with other VINN Excellence Centres despite some good examples of industry-led projects
- has poor academic leadership
- has management deficiencies, especially in finance
- is not sufficiently advanced in planning for Stage 4 and beyond.

However, as noted above, iPack does have a set of promising industry-led projects and good PhD students. These projects and students deserve some ongoing support but further support for iPack as a VINN Excellence Centre is unlikely to be a productive investment for Vinnova or for the Centre partners.

Recommendations to Vinnova

- That Vinnova formally close the iPack VINN Excellence Centre at the end at Stage 3.
- That Vinnova find a mechanism, at its discretion, to contribute to the funding of the PhD students.
- That Vinnova find a mechanism, at its discretion, to support a limited number of the best near-to-market, industry-led projects for up to two more years.

Mary O’Kane (Chair)

Robert Mertens

Russell Morris

Bernard Weiss

15 Evaluation of Mobile Life

A VINN Excellence Centre at Stockholm University

Introduction

On 13 November 2014, the Chair of the Centre Board, Mikael Ydholm, board members, the Centre Director, Kristina Höök, colleagues of the Mobile Life VINN Excellence Centre, PhD students, external partners, and University representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Anja Skrivervik as generalists and Susanne Bödker as specialist). The evaluation team also included Peter Wright as the remote specialist evaluator. At interview Jenni Nordborg, Mats Jarekrans, Magnus Cedergren and Thomas Eriksson were also present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing information for the evaluation via the self-evaluation report and during the clarifying meeting with the evaluation team.

This evaluation is particularly focused on the output from the Centre in the form of scientific, societal and industrial results and the impact of this output.

Long-term Vision, Mission and Strategy

We consider that Mobile Life’s research programme into technology and enjoyment as an understanding of people’s relationships to technology and their positive experiences in particular is crucial. But describing the mission and research area in terms of the single construct of enjoyment seems unnecessarily limiting. Furthermore, building this into a vision of ‘enjoyment services’ and ‘enjoyment society’ makes the research vision vulnerable to criticism, as was illustrated in the example of the ABB control room. The Centre recognizes the potential critical response that this focus invites (see page 1 of Stage 3 Report to the evaluation). The Centre is also at risk of ignoring elements that create productive change in society as it can be argued that innovation happens when we meet resistance, scarcity, opposition, and so on. This contradiction can hardly be ignored, since innovation is so strongly at the heart of what Mobile Life does. We would suggest that the group work towards a vision that avoids populist mis-readings of the research as frivolous, superficial, utopian, or ‘just about theme parks’.

In this context, the evaluation team agrees that the move towards an emphasis on creative and critical disruption is a good idea.

Recommendation 1: That in planning for Stage 4, the Centre continue its examination of the core intellectual drivers of the Centre and capture this in a revised Vision and Mission that motivate Stage 4 and help set the Centre up for beyond Stage 4.

The strategy for growth and the plan for a possible new Centre represent a coherent expression of the mission and strategy for sustainability. The team have reflected and built on their strengths and their thinking in this area is innovative. Section 4.3.1 on Future Research in the Report to the evaluation articulates the high-level research aims clearly. We were a little

confused over Section 4.3.2, which is a re-description (see Stage 3 Operational Plan) of existing projects rather than a proposal for future projects. This matter was resolved at interview.

The report has a brief section regarding ‘After Mobile Life’ plans. We agree that an abrupt ending in 2017 is problematic and that no matter what other plans are made, the embedding of the research into the mother departments should indeed be discussed and resolved. The idea of an Internet of Things Centre that would include more Computer Science research groups is promising. However, it would be worth considering whether or not the ‘Internet of Things’ is the right framing for future activities, or whether the vision needs to be aligned and integrated more with the continuation of the ‘enjoyment’ vision. In the eyes of the evaluation team, what Mobile Life is bringing to its partners is the ‘wackiness’ of introducing new and odd technological solutions as much as it is the enjoyment or the dark side of the Internet of Things. In this sense, pulling the forces together for the coming couple of years for a ‘moonshot’ seems like a necessary and viable exercise.

Recommendation 2: That the Centre make a ‘moonshot’ project a central feature of Stage 4.

How the Centre addressed the recommendations of the previous Review

The Centre received 10 recommendations in the evaluation of Stage 2. The Centre has paid real attention to these recommendations and has acted adequately upon all of them. This has clarified the management and administration of the Centre and has led to interesting and fruitful discussions about the research vision, mission and strategy. The evaluation team encourages the Centre to build upon these discussions in the preparation for Stage 4, in order to define a strategy enabling the intellectual sustainability of the Centre’s results beyond Stage 4.

Centre Partners

The Centre partners comprise two university partners (University of Stockholm and KTH), one research institute (SICS), eight industrial partners, one public partner (the City of Stockholm), SU Holding (which is owned by the University of Stockholm and takes care of IP and commercialization) and Kista Science City (which is a networking organization). Three industrial partners joined the Centre during Stage 3. Three partners are SMEs. This provides a well-balanced portfolio of partners, which all seem to profit from the research environment created by the Centre.

The Centre is a pre-competitive research arena where all partners can contribute and debate. The projects are selected in a bottom-up approach, where all stakeholders are consulted, leading to a good commitment of the partners in the projects, but potentially also to some difficulties in assessing the coherence of the outcomes. The articulation between partners and the Centre works well, leading to a vivid research community. The Centre has fostered three spinoffs, and is currently considering how these young companies could continue to benefit from the Centre’s environment and network without conflicts of interests.

Scientific Quality and Productivity

A number of issues were identified by the international evaluation team in 2011, and the International Scientific Advisory Board (ISAB) in June 2013. The Centre’s progress in

response to these has been excellent. However, some remaining issues are raised for consideration below.

Research area, competence profile, people, facilities, critical size, and processes for ideas generation

The Centre has world-leading research and development capabilities that span everything from hardware and software development through interaction design and user research, to media art, enterprise, and innovation.

The Centre has a strong international research profile in human-computer interaction with a focus on user enjoyment and the human-centred design of ubiquitous technologies. It has a high visibility (through publication and organization) at the CHI conference, the world's leading HCI venue.

The Centre has strong leadership and management and governance structures supporting a highly competent team of researchers, most of which have or are developing strong international profiles.

The Centre has very good collaborations with regional, national and international industry, which is, and has always been, part of its strength. These collaborations are growing, with major players in new sectors (e.g. IKEA, and ABB), which are not only utilizing the Centre's research, but also taking it in new directions. Spin-off companies are emerging, and the Centre is taking part in public policy debate. The Centre is developing a multi-tiered model of participation. It is to be commended for its resilience and breadth of engagement. Most importantly, there are excellent processes for partner engagement and knowledge exchange, focusing not just on new products and services but on strategic innovation in a pre-competitive arena. There are leadership challenges here, particularly in managing these many and diverse projects and partners while keeping a coherent research profile and focus. The Centre will need to continuously readjust the research profile to respond to this (see ISAB report).

Scientific output and impact of scientific results

The academic outputs are strong and growing in breadth. There was a strong presence at the ACM CHI conference, which is a high-impact, world-leading venue for HCI. The challenge from the last evaluation of raising the bar in terms of generality and depth has partly been addressed through publishing book- and journal-length contributions. This is to be encouraged into the future.

Based on the discussions with the PhD students and the general profile of the Centre, it is clear that the Centre produces young researchers with a strong interest in industry collaboration. This is likely to strengthen industrial research, among the Centre partners and outside. At the same time, it is important that some of the younger researchers take on the academic legacy of the Centre and aim for top international research careers.

International comparators with other Centres and collaborations

The Centre's record of international project collaboration is excellent. The mobility of personnel, which is an indicator of impact is good. It was difficult to determine exactly how many PhD students and staff had moved to international positions, but three have done postdocs

at other universities; one has moved on to a faculty position at another university; and five to industry.

Critiques of research programmes, projects and outputs - science, methodology and technological outcomes

The Centre's success at ACM CHI conferences is to be commended. But the broadening portfolio, which includes books and other HCI journals, allows a more in-depth exploration of the bigger issues emerging from the programme, and this is to be encouraged. As pointed out by the ISAB, other venues and traditions need to be explored to keep expanding the reach of publications.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

The Centre provided extensive description of its outputs and highlighted its impact by presenting three detailed case studies involving three of the industry partners – IKEA, ABB and the City of Stockholm. The case studies led to considerable discussion at interview especially regarding the ABB case study on control rooms. The Centre seems to have a realistic sense both of its contributions and their impact (and of the limitations). Working with a variety of firms in a pre-competitive mode has been important for partners to achieve their own commercial impacts with concepts derived from the Centre. The case studies give concrete details of some very particular impacts on partners.

Organisation and Management of the Centre

The Centre has appropriate governance and management with clear roles for the board, management team and project leaders. The Centre has a dedicated and highly involved Board and excellent leadership from the Director and her team.

The report provided to the evaluation is informative and complete. The financial reports are clear apart from the report on resources available but this matter was addressed satisfactorily before the interview. It is laudable that the industrial partners contribute significantly in cash and in kind.

The ISAB comprises six, high-profile persons from different fields relevant to the Centre. The last meeting took place in June 2013 and the ISAB provided a very valuable report with helpful and detailed guidance to the Centre. The evaluation team endorses the ISAB recommendations given in their report.

Training Personnel of High Competence

The Centre has managed to recruit high-level personnel both at senior and junior level. This seems to be due to the excellent working atmosphere and facilities provided by the Centre and the University. The mobility between industry and University is easy within the Centre both for junior and senior researchers. Moreover, the Centre is very active in promoting international mobility to its researchers. The Centre is highly involved in teaching, fostering multidisciplinary skills in its students. While the evaluation team was impressed by the commitment and the enthusiasm of the Centre's PhD students, there is slight concern about the fact that none of them were focused solely on a high-impact academic career.

The Centre has excellent gender balance.

Long term development during stage 4 and beyond

The Centre's process for Stage 4 planning is well advanced. The Centre has spent time reviewing the future research challenges in its fields, and plans to strengthen its understanding of the political and social context of technology use.

The Centre has also begun tentative discussions about options for beyond Stage 4. At interview they listed several possible scenarios, The evaluation team suggests this thinking should be sharpened as part of the process of planning for Stage 4 as the Centre has an opportunity to make strategic choices at this time (e.g. by targeting new partners which might be willing to support Mobile Life after VINN Excellence Centre funding finishes) which will set it up to be successful beyond Stage 4 and help it to retain the excellent features that have been developed through the life of Mobile Life so far.

Recommendation 3: That in planning for Stage 4, the Centre make conscious strategic choices that maximise its opportunities for funding beyond Stage 4 and involve partners and potential future partners in the planning process.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That in planning for Stage 4, the Centre continue its examination of the core intellectual drivers of the Centre and capture this in a revised Vision and Mission that motivate Stage 4 and help set the Centre up for beyond Stage 4.
- **Recommendation 2:** That the Centre make a 'moonshot' project a central feature of Stage 4.
- **Recommendation 3:** That in planning for Stage 4, the Centre make conscious strategic choices that maximise its opportunities for funding beyond Stage 4 and involve partners and potential future partners in the planning process.

Conclusion

Mobile Life is a good example of a VINN Excellence Centre performing at an appropriate level at the end of Stage 3. It is clear that the Centre partners are pleased with its output and impact. The evaluation team recommends continued funding.

Mary O'Kane (Chair)

Susanne Bödker

Anja Skrivervik

Peter Wright

16 Evaluation of ProNova

A VINN Excellence Centre at Royal Institute of Technology, KTH

Introduction

On 7 November 2014, the Chair of the Centre Board, Björn O. Nilsson, board members, the Centre Director, Per-Åke Nygren, colleagues of the ProNova VINN Excellence Centre, PhD students, external partners, and university representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Alison McKay as generalists and Kristiina Takkinen as specialist). The evaluation team also included Sabeth Verpoorte as the remote specialist evaluator. At interview Mats Jarekrans, Margareta Danielsson and Thomas Eriksson were also present on behalf of Vinnova. We thank all members of the Centre and the Vinnova teams for their efforts in providing information for the evaluation via the self-evaluation report and the meeting with the evaluation team.

This evaluation is particularly focused on the output from the Centre in the form of scientific, societal and industrial results and the impact of this output.

ProNova operates using a model that differs somewhat from that used by most of the other VINN Excellence Centres and from the model implied by the VINN Excellence Evaluation Guidelines. In ProNova partner companies (large and small) pay a common (relatively low) cash contribution but contribute in-kind resources differentially, depending on the level to which they wish to engage with particular Centre projects. While the industry partners are consulted extensively at the beginning of each Stage as to what projects they would like the Centre to engage in, the Board takes the final decision on exactly what will constitute the projects for that Stage. The Centre then aims to (and does) deliver top-level research in carrying out these projects so that industry partners can pick up top-level know-how through participating in the projects. However, the Centre does not use any specific industrial/economic targets as Centre key performance indicators. Rather the Centre has agreed with Vinnova that it be judged primarily on its scientific impact, confident that the partner companies will make good use of what they learn and that, long term, this will lead to good industrial impacts.

It was established at interview that this ProNova operating model had been agreed with Vinnova when the Centre was established and that, in retrospect, there clearly had been misunderstandings at previous evaluations as the relevant evaluation teams had not been made aware that this particular operating model applied to this Centre.

Recommendation to Vinnova

- That Vinnova revise the evaluation guidelines to indicate that VINN Excellence Centres should be evaluated against the agreed (with Vinnova) success criteria in each Centre’s Operational Plan for that Stage.

Long-term Vision, Mission and Strategy

The Vision, Mission and Strategy for the Centre are appropriate.

How the Centre addressed the recommendations of the previous Review

The Centre has addressed the recommendations of the previous evaluation reasonably given the misunderstanding about its operating model, referred to above.

Centre Partners

The Centre has a good range of industrial partners, each of which pays a cash membership fee to participate in the Centre. The participation of at least one non-academic partner in each Stage 3 project is a strength of the Centre. In response to Recommendation 7 from the Stage 2 evaluation, the Centre has established a way of calculating the in-kind value of antibody reagents.

Processes for needs identification and project selection are open and transparent within the Centre.

Scientific Quality and Productivity

Research area, competence profile, people, facilities, critical size, and processes for ideas generation

With the Centre in its 8th year of operation, the research area of protein technology remains extremely relevant for the medical and life sciences. Proteins come in an enormous variety of forms having a wide range of functions, from metabolism to immune response, DNA replication to structural and mechanical function. Much remains to be learned about the role of proteins in cellular processes, particularly those related to disease pathophysiology. Being able to detect and analyse proteins is thus essential for the further understanding of these processes.

There are three programme areas related to affinity tools and protein engineering, array technologies, and microfluidics. They form a complementary programme requiring researchers who have a skill set ranging from biotechnology through biochemistry to engineering. The competence profile of the Centre includes 38 researchers whose combined expertise covers all programme areas. The 13 academic project leaders are all recognized experts in their individual fields, and are active in terms of both written output and training young researchers. The facilities at the KTH and SciLifeLab appear to be excellent. The connection of ProNova with the Human Protein Atlas, which offers the Centre access to a huge set of greater than 21,900 antibodies for screening human proteins, offers researchers a unique and powerful tool.

As to the Centre's size, there are 12 projects, described as "small" in the report, running in parallel, and divided up fairly evenly over the three programmes. 38 researchers means an average of about 3 scientists per project – which more or less confirms the description "small". Given that there are 10 participating company partners, 12 is a good number of projects, with the possibility for companies to select and participate in their projects of choice. More projects for the same number of companies and academic researchers is not recommended, in the view of the evaluators, as this would dilute efforts in all projects and risk far fewer significant results. The companies are significantly different in their expertise and the products they represent, and there is industrial interest and active participation in most of the academic projects running. The Centre appears to have achieved a critical size to pursue most of the work proposed by the programme area leaders.

As described in the Plans for Development section of the Stage 3 evaluation report (pp, 28-31), it may be time to consolidate efforts into a smaller number of larger projects that build on results of more advanced Stage 3 projects. The idea of reorganizing the projects into two new programme areas (Next Generation Diagnostic and Global Views on Autoimmunity, and Anti-Drug Response and Allergy) is a good one, as it takes existing projects and recasts them into new fields. In this way, company interests in the Centre will be maintained and the mission of the Centre to impact products, services or standards in companies and society as a whole will achieve greater unity and a more concrete form.

Scientific output and impact of scientific results

Programme Area 1, "Affinity tools and protein engineering", contains five projects. In the project 1A (PIs Prof Ståhl and Dr Löfblom) an E.coli bacterial display system with an optimised expression vector has been developed based on earlier published and patented innovation of a German group. The patent is expiring around 2016 and after that this E.coli display system, which is now ready for construction of large libraries of biobinders, can be used by the ProNova industrial partners for the development of biopharmaceuticals. Affibody AB is the industrial partner providing know-how for library constructions and biobinder selections.

In the projects 1B (PI Prof Hober), 1C and 1E (PI Prof Eriksson Karlström) and 1D (PI Prof Nygren) the small Ig-binding domains of protein G have been engineered to achieve site-specific labelling of the Fc or Fab regions of an antibody molecule e.g. for immunoassay, immobilization and in vivo imaging applications. The advantage of this ProNova-invented technique is the capability to synthesize the labelling peptides domains chemically with desired functional groups. In the project 1B a variant of the C2 domain with two mutations and incorporated photo activable amino acid p-benzophenylalanine to two different positions, specific labels for human and mouse Fab fragments have been produced. Project 1C has further developed the ProNova method for site-specific labelling of antibodies for in vivo imaging applications. Variants of protein Z domain have been engineered to enhance the labelling efficiency of human and mouse IgG1, commonly used in therapy and diagnostics. A further approach includes conjugation of these site-specific labelled antibody molecules with optimized linkers to magnetic nanoparticles for molecular imaging applications. In the project 1D a homogeneous, one-step immunoassay for antigens has been established. The ProNova technique for site-specific covalent labelling of antibodies is further exploited to label antibodies (binding nearby epitopes) with sub-fragments of the reporter enzyme beta-lactamase. Applicability of this "mix-and-measure" assay is demonstrated for the model target HER2. In the project 1E (started in April 2013) the aim is to evaluate antibody labelling with 18F for site-specific photo conjugation to antibodies especially for PET imaging applications. The results of all these antibody labelling projects are scientifically interesting and could impact the product development of the industrial partners as stated e.g. by GE Healthcare Bio-Sciences, Genovis AB, Mabtech AB and AstraZeneca AB.

Programme Area 2, "Array technologies", contains three projects. In the project 2A, "Antibody characterization and purification" (PI Dr Rockberg), tools to characterize the nature of the antibody binding linear or conformational epitopes have been established using peptide arrays or Staphylococcal display. The characterization of the binding properties is important for the validation of best performing antibodies e.g. for immunoassays. The impact of this project is

clearly summarized by the industrial partners Affibody and SOBI AB exploiting the developed technique to map the conformational binding site of a therapeutic Affibody providing understanding of the binding mechanism of this drug candidate important for the further development phase.

In the project 2B, “Antigen microarrays and autoimmunity repertoires” (PI Prof Nilsson), the main aim is to exploit extensive peptide or protein domain arrays representing the human proteome for identification of autoimmune targets. This project exploits the unique large collection of human Protein Epitope Signature Tags (PrESTs) available to ProNova through the Human Protein Atlas project. The power of this technology was convincingly demonstrated by identification of new multiple sclerosis (MS) disease associated autoantigen candidates. Of the candidates anoctamin (ANO2) protein, also expressed in the brain, was revealed as a prominent MS target. This finding is highly interesting scientifically and moreover has an important impact providing tools for the development of more precise diagnostics and treatment of the MS disease.

In the project 2C, “Advancing antibody bead arrays for biomarker discovery” (PI Assoc Prof Schwenk), sensitive dual antibody based immunoassays are developed and optimized for validation and clinical assay set ups of protein biomarkers. The assay optimization has been done for CDH5 and FABP1 proteins identified during Stages 2 and 3 as biomarkers of liver failure in a single binder screening assay. The identification of the liver failure biomarkers is one of the key results of the ProNova programme. If further validation, that is currently going on in the IMI project SAFE-T, verifies that these proteins are new and improved safety biomarkers of liver toxicity, the impact for enhanced drug development process can be exceptionally high.

In the project 2D, “Immunosequencing (iSeq) for highly multiplex protein analysis” (PI Assoc.Prof Ahmadian), a miniaturized, multiplexed bead-assisted assay based on immunorecognition of the biomarker with DNA-labelled antibodies combined with high-throughput sequencing is under development. The developed multiplexed DNA-barcoding approach for labelling of valuable antibodies at nanogram scale is highly advantageous. The industrial partner Atlas Antibodies AB is providing the antibodies for the project.

The Programme Leader of the Microfluidics programme, Prof Andersson-Svahn, is well respected in the microfluidics community, as supported by the substantial number of invitations she has received for oral presentations both in Sweden and abroad over the past three years, at international conferences and institutes. Her particular strength in the past few years is the application of microfluidic approaches to clinically relevant problems which require high-throughput information generation. She has successfully established microdroplet technology in her lab for directed enzyme evolution, as well as high-density protein arrays on paper for allergen screening. Novozymes, the industry partner in this former work, comments on the fact that the company has direct access to training in this approach via ProNova, and sees promise for future developments in the company. ThermoFisher (formerly Phadia) is a large contributor of lateral flow assays to the market, and therefore has been involved in the allergen test strip development. Both developments are at the forefront of microfluidics research in terms of applications development. At the same time, the Andersson-Svahn group also carries out

technology developments to realize these applications. The pico injector, designed to inject pL amounts of reagents into microdroplets containing single cells or other biological entities, is an example of this. Her group, consisting of researchers with different backgrounds, is thus very versatile and inventive. Prof Andersson-Svahn and her coworkers have published in high-impact journals over the period 2012 to 2014. In fact, of the Centre's publications in 2012, her paper in *Angewandte Chemie* has garnered the most citations (29 – an impressive number in less than two years).

International comparators with other Centres and Collaborations

The Affinity Tools and Protein Engineering and Array Technologies programmes in the ProNova Centre are scientifically excellent and in the forefront when compared to other international groups. The ProNova Centre has unique access to the largest validated antibody resource against human proteome as well to the protein epitope signature tags (PrESTs) of whole human proteome generated in the Human Protein Atlas project. This unique position regarding human proteome specific reagents is efficiently exploited throughout the ProNova programme.

The Microfluidics programme in the ProNova Centre, though perhaps somewhat small, is excellent and compares well with other international groups. The programme has found an important niche, namely protein and (single) cell analysis. To the best of this reviewer's knowledge, the inclusion of microfluidics as a programme in a larger protein technology centre is quite unique.

Overall conclusion - scientific quality and productivity

The Affinity Tools and Protein Engineering and Array Technologies programmes are scientifically excellent and productive as measured by the publications in this highly competitive scientific field. The Microfluidics programme has demonstrated an excellent level of scientific quality and productivity. Prof Andersson Svahn's publications have outperformed those of her colleagues in terms of citations. She has become well known for her work in the area of microdroplets applied to biochemical and clinical problems.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

The Centre's scientific output is recognised as being excellent and of high academic impact. Its impact on industry is more diffuse, and so difficult to quantify directly. However, at interview the Centre Director presented an "impact landscape" that illustrated the different kinds of impact coming from the Centre and the industrial partners described the high value they associate with knowledge and know-how that is coming from the Centre. In addition, two company representatives presented very strong examples of how the Centre's work impacted their product development processes. These included results being used in the following ways: as the basis of proof-of-concept projects within companies; in the discovery and development of biomarkers; and as integral parts of the company's innovation processes.

Organisation and Management of the Centre

The governance and management of the Centre appear sound. The evaluation team notes the Centre intends to rethink the operation and composition of its International Scientific Advisory Board for Stage 4.

The management finances tables appear complete. The notes associated with the finance tables were very useful for the evaluation. The Centre was allocated 21.75 MSEK from Vinnova for Stage 3; there has been a small underspend on this because Stage 3 is not due for completion until March 2015. KTH is expected to contribute in excess of 26 MSEK and the industrial partners 1.24 MSEK in cash and in excess of 20 MSEK in kind.

Training Personnel of High Competence

The PhD students we met at the interview valued their membership in the Centre and noted that their engagement with industry partners through projects improves their appreciation of potential applications of their work. The students found their interactions with the wider industry group in Centre-run events useful and identified more opportunities for work experience, e.g. a week in a company doing lab work which a small number of students already receive, as an improvement opportunity.

Recommendation: That the Centre explores the provision of work experience opportunities for PhD students in partner companies.

Long-term development during stage 4 and beyond

The evaluation team notes the Centre's clear thinking about the issues to face for Stage 4. The Centre will work during Stage 4 to find a way to preserve valuable aspects of the Centre beyond Stage 4, noting that direct continuation at a lower level is unlikely because of the modest industry contributions. Bilateral projects are a possibility however.

Recommendation to Strengthen the Centre

In summary, our recommendation to the Centre is:

- **Recommendation:** That the Centre explores the provision of work experience opportunities for PhD students in partner companies.

Recommendation to Vinnova

- That Vinnova revise the evaluation guidelines to indicate that VINN Excellence Centres should be evaluated against the agreed (with Vinnova) success criteria in each Centre's Operational Plan for that Stage.

Conclusion

ProNova is performing well. The evaluation team recommends continued funding.

Mary O'Kane (Chair)

Alison McKay

Kristiina Takkinen

Sabeth Verpoorte

17 Evaluation of SAMOT

A VINN Excellence Centre at Karlstad University, KU

Introduction

On 10 October 2013, the Chair of the Centre Board, Charlotte Wäreborn Schultz, the Centre Director, Margareta Friman, colleagues of the SAMOT VINN Excellence Centre, PhD students, external partners, and university representatives, had a formal interview with the generalists of the international evaluation team at Vinnova to evaluate the Centre's performance in Stage 3. The scientific experts of the evaluation team, Glenn Lyons and Jon Sundbo, had already provided a report to the Centre on the research aspects of the Centre's operations and the Centre had provided a written response to this. At the formal interview the generalist evaluators, Mary O'Kane (Chair), Anja Skrivervik, and Sybrand van der Zwaag, addressed matters such as results and impacts, organisation and management, finance, interaction between industry partners and the university, and educational activities. We thank all members of the Centre and the Vinnova/VR team for their efforts in providing information for the evaluation.

Long-term Vision, Mission and Strategy

The Centre has maintained its long term Vision, Mission and Strategy as expressed in its Stage 3 application document. Its vision is that public transport can only be successful if it succeeds in combining the individual's requirements and wishes for simple, effective and flexible transportation with society's goals regarding the long-term sustainable development of cities and regions.

SAMOT's mission is to contribute actively toward the sector developing in accordance with this vision by conducting scientific research which is relevant and easily absorbable by the industry and the public organisations in the field. SAMOT intends to develop itself as a leading player in the special, newly emerging, transport sub-discipline within service marketing.

SAMOT's strategy is to work closely with the external partners while also contributing to the scientific concepts and literature in the field by conducting high-level research in three carefully selected themes.

Scientific Quality and Productivity

Research area, Competence Profile and Critical Size

SAMOT is a research centre about public transport. The Centre collaborates closely with the transport industry. It has a social science approach with emphasis on service and customer behaviour. SAMOT is noted for its service perspective and focuses upon a qualitative understanding of the behaviour of both users and providers of public transport. It is unusual to see a centre which has a focus on both public transport and marketing.

The Centre has established a national and international position within social and psychological transport research and has particularly developed an international standing in the field of researching the service and customer aspects of public transport. This field has benefited from

SAMOT's position in the Service Research Centre (CTF) at Karlstad University, which is an internationally recognized centre for service research, particularly focused on service marketing and customer behaviour. SAMOT has been evaluated twice during its existence and has attempted to use the recommendations from the evaluation reports to improve its scientific and dissemination performance.

Within its core research area, service marketing and customer behaviour, SAMOT has a clear competence profile and a sufficient size. Several competent researchers are employed and the Centre involves researchers from CTF and the business school of Karlstad University. Many relevant and competent researchers from abroad have been involved in the Centre's activities and publications. The number of PhD students in SAMOT could be seen as relatively modest. However, the interview clarified the popularity of SAMOT studentships and the opportunities students have in the SAMOT environment.

The core research area has been effectively pursued in terms of establishing new insights into travellers' perceptions, service offerings and the context for service delivery and effectiveness. The Centre is not unique in its pursuit of each of its three themes. However it remains distinctive and particularly so in terms of the concentration of contributions to knowledge it represents across a portfolio of projects within one centre. The disciplinary strengths appear to have been expanded beyond business administration and psychology bringing in further coverage – in particular economics.

Research programme and results

The research programme reflects the core competences of the Centre, i.e. service management and marketing and perceived customer quality. This is satisfactory since it provides research with the greatest chances for scientific results. The research productivity concerning number of articles, PhD degrees and participation in international conferences is high and meets all demands for an applied research centre. The publication list is impressive.

While not novel, SAMOT is part of an international vanguard of research that has been progressively recognising the importance of situating modal preference and travel experience in the wider context of people's daily lives and needs. SAMOT has certainly made some important contributions to this more mature understanding of travel.

Theme 1 seems valuable and ultimately important to the service perspective. However, it can be noted that little distinction between users and prospective users is apparent in the research results presented; there is also a need to be clear on the distinction between service quality and quality of travel experience. SAMOT's coverage of perceptions beyond those of the traveller only is appropriate and commendable. Socio-technical approaches are critical to service delivery which accounts for the competencies and behaviours of its human actors – both employees and users. The knowledge contributions of SAMOT to the nature and importance of service orientation and customer thinking in theme 2 add both to the depth of scientific insight on such matters but also to the mass of evidence and influence that can then feed across and shape the behaviours of those responsible for service development and delivery. The reporting is rather limited on its insights into what has been found however, in comparison to explaining what issues were investigated. This was however suitably addressed at interview with specific

examples underlining research achievement. Theme 3's rules of play become critical in realising the benefits of insights from themes 1 and 2. SAMOT has undertaken a significant amount of work in this area.

The SAMOT activities report for 2011-2013 conveys a solid performance in terms of research outputs and outputs in process. SAMOT has, in our overall assessment, demonstrated innovative research results, such as the development of customer satisfaction scales, employee behaviour towards customers and the phenomenon of misbehaviour, the use of ICT in transport service functions, the institutional frameworks, customer value through co-creation and CSR. The results as presented in articles and books have contributed to new scientific knowledge, particularly within the fields of service management and marketing and psychological understanding of customer behaviour.

Activities in terms of knowledge exchange are impressive. Funding applications show mixed fortunes, which is not unusual. The notable disappointment will no doubt concern the outcomes for ADAPT and SPRINT.

Overall conclusion regarding scientific quality and productivity

The sense that much has been achieved by SAMOT is compelling. The sum of the parts is itself respectable and adds a number of important contributions to this challenging and evolving area of better understanding the importance of a customer-centric approach to public transport service provision. Beyond this it is clear that through this concentration of research support in one Centre, the resultant multi- if not inter-disciplinarity and critical mass of activity has yielded added value with clear likelihood that the whole is greater than the sum of the parts.

SAMOT has fulfilled the expectations of an applied research centre such as the VINN Excellence Centres. SAMOT does not fail in any relevant aspects. The Centre's strength is in the collaboration with companies and the detailed empirical research. It can be recommended to continue SAMOT, however from a scientific point of view, also that the centre emphasizes more formalised international research collaboration and more radical theoretical progression.

Recommendation 1: That the Centre develops a strong focus on improving its international visibility and engagement through more researcher exchanges and visits with the aim of high impact joint publications with the external parties; through special-purpose meetings and conferences reflecting the unique proposition of the Centre; and through the development and implementation of a comprehensive SAMOT brand strategy. The international collaboration arrangements and activities should be formalised and periodically reviewed.

Centre partners

As SAMOT has a Mode 2 approach to research, the end-user partners are scientifically important and they fit well as industrial research partners. SAMOT's approach to ensuring needs-driven research through its Partner Council and design of projects is internationally leading and its grasp of the challenges that nevertheless prevail in collaboration is mature and well articulated. More concrete examples of how the research and its outcomes have been driven would have been helpful. This matter was, however, satisfactorily addressed at interview.

The contribution of external research partners is unclear. In the report SAMOT states that the Centre has collaborated with among others Kyoto University, the National University of Singapore and the Gadjah Mada University in Indonesia. However, much of this collaboration is about education including Masters and PhD scholarships and it is difficult to see if it includes core parts of the SAMOT research. Unfortunately it has not been possible to collect SAMOT's International Scientific Advisory Board to meetings. Although the self-assessment report indicates several international collaborations, for example in publishing books, it is not clear exactly how many collaborations there have been. As noted above in Recommendation 1, it is important that SAMOT focuses more on international collaboration within the Centre's core research and that this becomes more formalised, for example by SAMOT arranging international research conferences and seminars, formal agreements with foreign research institutions that implies real collaboration and extending the international scientific board.

Organisation and Management of the Centre

The Board's Role

The Board currently consists of 9 members from industry, public organisations and universities. A very large fraction of the Board was present during the interview. The general impression is that the Board is very much involved in and committed to the Centre. The Board plays an active role in discussing and selecting research proposals for funding. However, the Board does not quite perform its role in setting higher standards for the Management Team and the Centre as a whole. If the Board had taken this role, it could have led to the Centre not only delivering valuable services to the partners now, but also to a portfolio of more future-oriented projects. The Board meets relatively infrequently. In between formal meetings the evaluation panel understands there are informal contacts between individual Board Members and Centre personnel concerning Centre issues. The Board does not seem to have insisted the Centre raise its international academic profile, impact and visibility in spite of earlier evaluation advice to do so.

Management Team (MT) Structure, Processes and Performance

The MT is composed of four members and handles all actions. The 3 MT members other than the director are responsible for one of the three Centre themes each. The task of raising the external profile of the Centre has not been allocated to a specific MT member but was said to be implicitly embedded in each of the projects. While this strategy may work in terms of direct partner contacts, it does not work in terms of profiling the Centre as a whole.

A process seems to be in place to make sure that new proposals are properly discussed at all levels of the Centre. However, the criteria to grant projects are general and do not seem to take into account a strategic distribution of activities across the three Centre themes.

The International Scientific Advisory Board (ISAB)

As the Stage 2 evaluation team noted, so also does the Stage 3 evaluation team note that the Centre did not succeed in giving a proper role to the ISAB as the ISAB did not meet during the period of Stage 3. Thus the Centre missed a valuable opportunity to calibrate its performance against international standards and to get the type of friendly insightful advice that generally only happens face to face. We find this situation surprising and puzzling.

Recommendation 2: That the Centre intensify its use of the ISAB.

The Report to the Evaluation Team

It appeared that the Centre did put a lot of effort into compiling the report for the evaluators. Unfortunately, in the report the focus was put almost exclusively on describing the actions and processes undertaken. The Centre does not seem to have realised that for a report describing the performance in Stage 3 much more attention should have been given to describing the actual outcome of the research and the way the Centre ideas and results have been absorbed by the external partners and wider international community of academics and practitioners. However during the interview, several partners of the Centre presented clear and compelling examples of successfully absorbing the work of the Centre.

Communication and Promotion

The Centre has established an excellent communication with the industrial and public organisations connected to the Centre. They also produced a number of brochures and flyers for the public at large. Notwithstanding the fact that the Centre has an active policy of sending its PhD students to national and international conferences, the evaluation team is of the opinion that the Centre did not fully succeed in profiling the Centre in the international arena. In general, the Centre seems to respond to on-going developments nationally and internationally, rather than taking the initiative for setting up new larger scale initiatives. It has been suggested that the Centre may consider organising a big international conference to mark its 10-year anniversary and to announce its plan for the next stage.

Recommendation 3: That the Centre raise its ambition level. For this to be successful the Board needs to play a more critical role, asking probing questions and being more demanding in terms of insisting the Centre record and build on its excellent achievements with its end-user partners. The University has an important support role to play too, capitalising on the early investment and success of SAMOT by demanding more and higher impact which the centre is undoubtedly capable of delivering – and supporting it in doing so.

Financial Management

While the Centre seems to handle its internal financial business in an acceptable manner, the financial reporting, in particular reporting the in-kind contributions at the partners, falls short of the standards expected for a VINN Excellence Centre. Realistic reporting would have made the real involvement of the external partners clearer and could have strengthened the profile of the Centre.

Recommendation 4: That the Centre adjusts the financial tables to reflect the real contribution from partners.

Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The Centre has been successful in recruiting excellent PhD students, and appears attractive to students as it receives a high number of applications for each position. On the senior staff level, there does not seem to have been any new appointments during Stage 3, which is disappointing seeing the success of the projects fostered by the Centre, and we encourage the University to

better support the Centre on this point. A recruitment strategy would be welcome for Stage 4 and beyond.

Mobility of Personnel between University and Industry

The Centre encourages mobility between University and industry both at senior and PhD student levels. PhD students appreciate the fact that they have easy access to the public and industrial partners, who are readily available to answer their questions. However, it seems that only little use is made of the mobility opportunity at PhD level, and we encourage the Centre to set up schemes where the academic students spend more of their time at the public or industrial partners' premises or universities outside Sweden.

International mobility is commendable with the Centre attracting many international scholars from PhD students to professors for stays of various durations. Moreover, the Centre's PhD students have the opportunity and are encouraged to present their work at international conferences, or to participate in international summer schools.

Gender Perspectives

The Centre has an excellent gender balance in the academic staff, the board and among the partners.

Training for Senior Roles in Research

The Centre has been very active in teaching at various levels: several PhD and Master courses have been proposed to SAMOT students. Moreover, the Center is co-organising a two-year Master course aimed at students sent by the Indonesian Ministry of Transport, and twelve students are following the current editions. This co-operation is highly commendable and we suggest that the Centre capitalise more on it by trying to hire top Indonesian PhD students and by getting Indonesian partners (or associated partners) into the Centre.

Long term development during Stage 4 and beyond

The Centre has built a base that, if managed energetically and strategically, should make it very successful in Stage 4 in terms of output, impact and profile and this in turn should position it very well for a future beyond the VINN Centre of Excellence funding.

The evaluation team would like to stress that capitalising on this good base in the manner suggested is not trivial and will require determination and a certain ruthlessness of approach as well as critical support from all partners, the Board and the University.

Recommendation 5: That in finalising its plans for Stage 4 the Centre should develop a series of stretch targets in terms of deliverables for end-users, breakthrough concepts, high-reputation hires, scholarly publications including international joint publications, citations, visiting scholars, new partners including international partners, etc. and use these enhanced outputs as the basis for a determined strategy to attract prestigious funding from a range of sources national and international.

How the Centre addressed the recommendations of the previous Review

We were slightly disappointed with the way the Centre addressed the recommendations of the previous review, taking a rather defensive attitude instead of responding effectively to the

essentially constructive nature of review recommendations. For instance, the Centre should consider the following points:

- SAMOT would benefit greatly from formal interaction through the ISAB meeting as a whole preferably at the Centre. The ISAB would then be more likely to take the time to understand and comment on the Centre's goals, strategy, results and encountered problems.
- The Centre would largely benefit from a better qualitative and quantitative self-assessment of its results and impact, which are intrinsically very good. A sound vision on where it stands will be crucial for the Centre's preparation of its continuation after phase four.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That the Centre develops a strong focus on improving its international visibility and engagement through more researcher exchanges and visits with the aim of high impact joint publications with the external parties; through special-purpose meetings and conferences reflecting the unique proposition of the Centre; and through the development and implementation of a comprehensive SAMOT brand strategy. The international collaboration arrangements and activities should be formalised and periodically reviewed.
- **Recommendation 2:** That the Centre intensify its use of the ISAB.
- **Recommendation 3:** That the Centre raise its ambition level. For this to be successful the Board needs to play a more critical role, asking probing questions and being more demanding in terms of insisting the Centre record and build on its excellent achievements with its end-user partners. The University has an important support role to play too, capitalising on the early investment and success of SAMOT by demanding more and higher impact which the centre is undoubtedly capable of delivering – and supporting it in doing so.
- **Recommendation 4:** That the Centre adjusts the financial tables to reflect the real contribution from partners.
- **Recommendation 5:** That in finalising its plans for Stage 4 the Centre should develop a series of stretch targets in terms of deliverables for end-users, breakthrough concepts, high-reputation hires, scholarly publications including international joint publications, citations, visiting scholars, new partners including international partners, etc. and use these enhanced outputs as the basis for a determined strategy to attract prestigious funding from a range of sources national and international.

Recommendations to Vinnova

- That the financial reporting should be aligned with University practice
- That the evaluation criteria for Stage 4 are specified at the start of Stage 4
- That the final review (and possibly future Stage 3 and final reviews of other Centres) includes the physical presence of the specialists
- That the evaluation interviews be held on site.

Conclusion

The evaluation team is of the opinion that the Centre has produced satisfactory research results and has had a very good impact on its industrial and public sector partners during Stage 3.

During the interview the Centre presented concrete evidence of these results but this was not apparent from the documents submitted.

Although the Centre is developing well, it should raise its ambition level significantly in the final years of its operation. It has the research and industrial base to do so.

Assuming that the recommendations in this report are addressed, the evaluation team recommends continued funding.

Mary O’Kane (Chair) *Glenn Lyons*

Anja Skrivervik *Jon Sundbo*

Sybrand van der Zwaag

18 Evaluation of SuMo Biomaterials

A VINN Excellence Centre at Chalmers University

Introduction

On 12 September 2014, the Chair of the Centre Board, Claes Ahlneck, board members, the Centre Director, Anette Larsson, colleagues of the SuMo Biomaterials VINN Excellence Centre, PhD students, external partners, and university representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Sybrand van der Zwaag as generalists and Dominique Langevin as specialist). The evaluation team also included Mika Lindén as the remote specialist evaluator. At interview Mats Jarekrans, and Thomas Eriksson were also present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing information for the evaluation via the self-evaluation report and the clarifying meeting with the evaluation team.

This evaluation is particularly focused on the output from the Centre in the form of scientific, societal, industrial, and education results and the impact of this output. The Centre certainly serves the needs expressed by the industrial partners and conducts scientific research at an adequate level.

Long-term Vision, Mission and Strategy

The long-term Vision, Mission and Strategy formulated in the report are unchanged with respect to that in Stage 2. They are formulated from an academic perspective and the alignment with the VINNEX Centre concept was not fully obvious. However, during interview the alignment of the Centre to the needs of the industrial partner and hence to the VINNEX Centre concept was made clear in a convincing manner. The Centre is in the process of developing its strategy how to enter Stage 4 and has set up a working group to think about how to proceed after Stage 4.

How the Centre addressed the recommendations of the previous Review

The Centre received 15 recommendations from the Stage 2 evaluation. All recommendations are addressed and acted upon in the spirit as indicated in the set of recommendations. These changes resulted in some improvements in the management and functioning of the Centre. Also the financial situation has improved significantly and the Centre passed successfully an external financial audit. The financial tables now provide more realistic data upon which the Centre can be evaluated. During Stage 3 a new Centre director was appointed to replace the previous director who took up a new position abroad and the Board elected a new chairman.

Centre Partners

The Centre has 1 academic partner, 1 research institute partner and 7 industrial partners. All industrial partners are large national or international companies. During the years of existence of the Centre, three industrial partners have left and three new partners (AkzoNobel, TetraPak and Stora Enso) joined. The presentation at interview by the Stora Enso representative explaining their reasons for joining SuMo albeit at this relatively late stage was very

convincing. The Centre is in discussion with yet another company contemplating to join the Centre. The Centre partners expressed great satisfaction with the current set of (commercially non-competing) comparably sized industrial partners and the resulting opportunity to jointly enter scientific project without fear of loss of confidential information.

Scientific Quality and Productivity

Research area, competence profile, people, facilities, critical size, and processes for ideas generation

The Centre aims to investigate the connections between microscopic structures, chemical composition and transport properties in soft biomaterials and ultimately design materials with tailored transport properties. SuMo is unique in this respect. During the first stages of the Centre, a *toolbox* was developed containing various experimental techniques, theoretical models and simulations.

A large number of scientists and technicians is involved, about 160 in stage 3, and the activity is split into four main modules:

- 1 Experimental characterization of flow and diffusion
- 2 Characterization of microstructures
- 3 Simulations and theoretical models of the transport
- 4 Material design

Many other researchers worldwide investigate these different topics, however the Centre is original in combining them in order to design materials. Apart from developing the simulation tool, the SuMo researchers are mainly using established knowledge and applying it to materials of interest to the participating industries. They ultimately aim at new materials design, which will be a truly original output.

Scientific output and impact of scientific results

The main outputs mentioned in the report are the development of the simulation tool and of the theoretical modeling; the development of the FRAP and NMR techniques; and the development of new materials. During the previous evaluation in September 2011, it was recommended that SuMo choose several model systems in order to check if the tools developed were state of the art. For instance, techniques such as FRAP and NMR were not giving consistent results with the complex materials tested. The discrepancies between the two techniques are now rationalized : in the material studied, a phase-separated biopolymer gel, it was found that the FRAP probes distributed unevenly between the different micro-phases, whereas NMR measures an average transport. This notable progress will now make possible to characterize differences in local transport in the very complex materials to be studied within SuMo in Stage 4. Indicators were also established to clarify whether FRAP data should be analyzed using the classical obstruction-diffusion model or a binding-diffusion model. These nice achievements will be of great importance for other researchers using the FRAP technique.

Another interesting output concerning characterisation methods is the newly developed method based on environmental scanning electron microscopy that can provide direct visual information about the local water transport in materials. The results obtained on films of cellulose blends

were of considerable interest to the industry partners. The technique of NMR flow imaging is now operational. In connexion with swelling issues, interest on polymer extensional properties arose, and a new method to measure these properties was developed.

The software used for the simulations, Gesualdo, is now able to account for diffusion and flow in microstructured (heterogeneous) polymer gels. In the cases studied so far, there is no need for taking into account issues such as surface potential, wetting or swelling that could become challenging with other materials.

The materials module has now the largest number of projects, as expected during the normal progress of the Centre. The work on nanocellulose has progressed nicely. Interesting results on the role of aspect ratio and surface modification on water solubility were obtained. Another project dealt with nanocellulose self-assembly with promising results on assembly promoted by shear flow. Very stable emulsions were produced with these particles.

Other significant results were obtained such as:

- Studies of alginate gels showed that by choosing the gelation methodology, it is possible to tailor the mass transport of nanometre sized diffusants (as well as the elasticity/plasticity and the rupture strength of the gels).
- The drug release from pellets coated with films comprising ethyl cellulose (EC) and andhydroxypropyl cellulose (HPC) evidenced that the molecular weight of EC affects the hindrance to drug diffusion by affecting the phase separated microstructure of the coating.

An interesting output appears to be the growing interactions between academic and industrial partners. Various systems made with silica particles of interest for Akzo Nobel were studied. The software developed (Gesualdo) was integrated in internal platforms of several industries. AstraZeneca implemented a technology platform with tools able to determine release of substances by film coatings.

There were 66 SuMo publications in international journals and 3 patents during Stage 3 -not a very high number, taking the large number of project leaders into account. The mean number of publications per project leader is 3-4 within the time frame given. Furthermore, the number of publications per individual project leader varies greatly from 0 to 15, which shows that there is an imbalance in SuMo activities which cannot only be explained by activity area differences.

International comparators with other Centres and Collaborations

There are no directly comparable other centres to SuMo. It is also difficult to judge the activity in the different modules in comparison to what is done elsewhere. The report only mentions the achievements of the SuMo researchers without attempting to compare them with similar investigations reported in the literature. For instance, researchers working in the field of porous media now know how to prepare materials with controlled porosity and tortuosity. Since this is one of the aims of SuMo, it would have been nice to discuss the work done in comparison with these other approaches.

Also, one of the problems seems still to be the 3D imaging. Electron microscopy is better suited to solid materials, soft materials may be affected by vacuum conditions, even in the environmental microscopes. Researchers working with coatings or thin materials

(submillimetric thickness) now use confocal infrared microscopes which could be perfect for SuMo.

A long list of active international collaborators is given, but the number of publications including one of the collaborators as co-author is very small, and is mainly focused on collaborations with microscopists in Belgium. New international collaborations would certainly be valuable

Critiques of research programmes, projects and outputs - science, methodology and technological outcomes

It was recommended in the 2011 evaluation to extend the software elaborated to account for deformation of the material during diffusion or flow. This is still an issue that needs to be addressed in the near future. The effect of solubility of solvent/solutes begins to be addressed, but not the surface chemistry. It also remains to extend the simulations to materials with pores smaller than 500nm, as a number of these materials are now being studied within SuMo. It is recommended that more attention is given to understanding how bulk properties change in confinement, including surface charging, and how surface chemical effects influence mass transport and how these parameters can be taken into account in the modelling.

As much of the experimental work will be focused on soft gels while most of the modelling work will be focused on solid gels, it remains unclear how the modelling results will aid in the materials design, which is stated to be one of the main objectives.

Overall conclusion - scientific quality and productivity

In conclusion, the productivity improved significantly since the last evaluation, but remains limited, in particular in term of patents. The scientific difficulties (3D imaging, measuring diffusion in opaque media, implementing the software) do not seem to have been overcome. Of course, these issues are difficult, but they deserve to be addressed.

Recommendation 1: That the simulation tool be extended to account for material deformation and other effects specific to confinement: electrostatics, surface chemistry, structural changes in the case of flow of complex fluids.

Recommendation 2: That the Centre make better use of its international links and develop new international cooperations to produce higher impact science and outcomes for the benefit of SuMo partners.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

Industrial partners in SuMo are clear that they are satisfied with the way the Centre works citing particularly the Centre's very practical focus on partners' needs and the safe environment the Centre provides for companies from differing industry sectors to discuss common pre-competitive problems and have these problems addressed within the SuMo research programme.

The Centre's scientific output is adequate. The Centre is confident that the number of scientific publications will rise in Stage 4 as Centre projects are wrapped up.

One particular output from SuMo is the Gesualdo software package. The evaluation team notes that the Board is currently discussing whether or not to invest in this software package with a view to having it maintained and available to SuMo partners after the Centre's VINN Excellence funding finishes.

Organisation and Management of the Centre

SuMo has a dedicated Board. The Board has established a process of detailed partner consultations in order to help the Centre partners make an informed decision on whether or not to continue SuMo after Stage 4 finishes. The Board provides good support to the Director.

The Director is clearly committed to the success of the Centre but may benefit from interactions with more experienced centre directors.

The International Scientific Advisory Board (ISAB) is composed of four members in good academic standing. The ISAB meets the Centre annually. The ISAB's August 2014 report calls for more precision and detail to aid it in understanding the quality of Centre outputs better.

Financial management seems to have improved in comparison to the version presented at stage 2.

The Centre's report to the Evaluation Team was unsatisfactory, lacking detail on the quality of the Centre's output and impact of the Centre's work to date. Even though the Centre addressed these matters well at interview, the evaluation team remains concerned that the quality of report signals a fundamental problem with the Centre's ability to present itself effectively and communicate its achievements fairly. This issue seems to be a persistent problem in SuMo as related matters were noted in the previous evaluation report and are implicit in the ISAB report. It is imperative this matter be addressed as good communication will be essential for establishing a good post-Stage 4 future for SuMo.

Recommendation 3: That the Centre improve its report writing and Centre communication more generally.

Training Personnel of High Competence

SuMo has a range of initiatives aimed at building competence. Its PhD programme provides students with good opportunities to work with industry, to attend conferences and to work in laboratories in other countries as needed.

Long term development during stage 4 and beyond

The Centre has a clear strategy for Stage 4 which is a natural evolution from Stage 3 in which there will be more emphasis on direct delivery of results for industrial partners which maintaining at least the current academic quality. As noted the Board is currently engaged with partners in a process to inform a decision on SuMo's future post Stage 4.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- **Recommendation 1:** That the simulation tool be extended to account for material deformation and other effects specific to confinement: electrostatics, surface chemistry, structural changes in the case of flow of complex fluids.
- **Recommendation 2:** That the Centre make better use of its international links and develop new international cooperations to produce higher impact science and outcomes for the benefit of SuMo partners.
- **Recommendation 3:** That the Centre improve its report writing and Centre communication more generally.

Conclusion

SuMo Biomaterials is performing at a reasonable level for a VINN Excellence Centre at the end of Stage 3.

Assuming the recommendations are addressed, the evaluation team recommends continued funding.

Mary O’Kane (Chair)

Dominique Langevin

Mika Lindén

Sybrand van der Zwaag

19 Evaluation of WINGQUIST

A VINN Excellence Centre at Chalmers University

Introduction

On 15 September 2014, the Chair of the Centre Board, Bo Anulf, board members, the Centre Manager, Rikard Söderberg, colleagues of the WINGQUIST VINN Excellence Centre, PhD students, external partners, and university representatives had a formal interview with three members of the evaluation team (Mary O’Kane (Chair) and Sybrand van der Zwaag as generalists and Kristian Martinsen as specialist). The evaluation team also included Claudia Eckert as the remote specialist evaluator. At interview Mats Jarekrans, Tero Stjernstoff and Thomas Eriksson were also present on behalf of Vinnova. We thank all members of the Centre and the Vinnova team for their efforts in providing information for the evaluation via the self-evaluation report and during the clarifying meeting with the evaluation team.

This evaluation is particularly focused on the output from the Centre in the form of scientific, societal, industrial, and education results and the impact of this output. The Centre certainly serves the needs expressed by the industrial partners and conducts scientific research at a level which is very effective towards meeting the needs of the industrial partners but is not seen by the scientific community as setting new academic standards.

Long-term Vision, Mission and Strategy

The text describing the vision, mission and strategy of the Centre has been reformulated as recommended in the previous evaluation. The new text is clear and describes the Centre well. The new section on the 10-year perspective on the vision is interesting and convincing.

How the Centre addressed the recommendations of the previous Review

The Centre received seven recommendations at Stage 2. The Centre seems to have taken appropriate measures in response to each of the recommendations. However, the underlying message of recommendations 2 and 3, an optimal positioning of the Centre in the broader technical and academic community, still applies. The evaluation team is of the opinion that the international academic visibility and leadership of the Centre can be raised without loss of Centre partner satisfaction.

Centre Partners

The Centre involves one university, one research institute and 8 industrial partners of different size and maturity. The industrial partners are active in the field of automotive, aerospace, drilling equipment and tank monitoring systems. Four of the current industrial partners joined the Centre during Stage 2, which is a clear sign of the growing reputation of the Centre amongst the near-Gothenburg-located industries. No new international companies based outside Sweden joined the Centre. All Centre partners present at interview expressed great satisfaction with the Centre even to the degree that they would assist in maintaining the Centre in case the Vinnova funding was to come to an end. It was also mentioned that the partner-partner interactions as a

result of their joint participation in the Centre have led to some fruitful collaborations outside the Centre.

Scientific Quality and Productivity

The Centre has an impressive range of long-term stable industry partners and is in an internationally very privileged position to have long-term continuity in carrying out applied research. Like other groups in their position the Centre has to balance meeting the needs of industry and making scientific contributions.

Research area, competence profile, people, facilities, critical size, and processes for ideas generation

The research area of the Centre covers specific needs from industry and combines knowledge from different areas such as product development, manufacturing engineering, automation and control, computer science and mathematics.

The Centre has built an impressive team of people and is exemplary in bringing industry experts and expertise into their research. The openness on the Centre including the industry partners is impressive. The university facilities are excellent and the Centre can draw on additional industrial resources through its close industry connections. The Centre has a critical size of professors, post docs and PhD students. They might benefit from a few more people who concentrate on the scientific output of the various research streams. The Centre has a good process of negotiating research questions with industry both driving their own research plans and listening to the industry needs. Some of this could be made clearer in terms of the relation of research questions and the priority in which they could be resolved. This might also help the Centre to articulate the balance between academic contribution and support for industry. On the other hand, the Centre has a two-way approach to the generation of the research questions. The bi-weekly seminars have an important mission for collaboration in the Centre. The fact that a large part of the researchers engaged in the Centre are internally recruited can however be a barrier to adopting radical new ideas. Although the Centre researchers clearly are aware and monitoring the state-of-the art within the field, there could have been more academic discussions on alternative methods and models; and an engagement with the deeper underlying questions.

Scientific output and impact of scientific results

The Centre has made impressive progress in increasing the number publications from the group over the last reporting period. However the number of papers is not the only quality measure. The Centre could have had more emphasis on writing papers with high number of citations and high impact ratio such as CIRP keynote papers. The Centre has in stage 3 chosen to focus on applied research where the papers mainly focus on examples and case studies in industry applying methods and tools developed in the Centre. Considering that the time the research has been going on, the number of more influential journal papers could probably be higher. There is scope for more reflective authoritative publications drawing on a range of projects and the breadth of industry experience. The Centre could also be more strategic in contributing to academic debates, for example through systematically contributing to special issues in the field.

As an exceptionally industry-focused research group WINGQUIST also has an opportunity to take part in debating the nature of scientific research in product development in a scientific context; and share their experience of combining academic work with work with industry.

International collaboration

In comparison to other international centres WINGQUIST has an exceptional degree of collaboration with industry and access to industry. Their record of bringing people from industry into the Centre and placing their own PhD students in industry is outstanding. It is particularly remarkable that these links are continued beyond PhD level. Considering the size of the group and the diversity of the research activities the level of international collaboration could be increased and the Centre could reach out to other leading groups in the areas. In particular the report does not allude to collaboration with groups in Sweden and elsewhere that are working on complementary areas, such as organisation science, HCI or design theory, which could provide additional insights.

Critiques of research programmes, projects and outputs - science, methodology and technological outcomes

While the Centre has articulated both a vision and research questions in individual areas, the reports provide no clear sequence of the research questions and therefore no picture of the dependency between the different questions and the communality between the answers to each of these questions. There are no doubt shared underlying models and tools and challenges that could be articulated. Their research touches on many fundamental questions for which at present no academic consensus exists. A research road map for individual research areas might help the group to direct its effort and resources. This might also allow them to express the risks associated with resolving the research questions in a general manner rather than developing solutions that meet the needs of particular collaborators.

Most research questions seem to have been addressed in conjunction with one of the industry partners. In the next phase the Centre might have the opportunity to apply their findings, tools and methods to other partners to corroborate the work and show a potentially wider impact and applicability. The wider impact of their work on industry could be explored further through European projects or international collaboration. The Centre is part of several EU projects, which gives it an opportunity to do this.

There is scope for deeper reflection on the applicability of both research methods and findings in their research. The Centre could also engage with more fundamental research questions and have an explicit collaboration with researchers who do. The position the WINGQUIST focus on a fully virtual product realization within a broader view to product and process development (including human aspects) could be explored in Stage 4 of the Centre.

Overall conclusion - scientific quality and productivity

Overall the Centre has a good balance between industrial impact and scientific quality and productivity. The high quality of the work with such excellent industry collaborations opens the potential to further improve its academic standing by increasing the number of authoritative journal publications and other academic leadership roles where the Centre would be ideally placed to lead the debate or even start it.

Output and Impact - output from and impact of the Centre in the form of societal and industrial results with particular focus on impact on Centre partners

The evaluation team is very positive about the way the Centre listens to the needs of the industrial partners and aligns its effort accordingly. The Centre developed an interesting manner of defining its research programme according to so-called Research Questions. These were defined during intensive discussion meetings between the Centre and its partners. Most importantly these questions were also used to monitor the research progress as well as the final result (often culminating in: “implemented at partner”). At interview, the evaluation team learned that the Research Questions were not numbered in order of priority or relevance. In the meeting all PhD students were able to immediately link their work to one or more of the research questions formulated. This was seen by the evaluation team as a very convincing demonstration of how the current approach via Research Questions makes the Centre function at its very high level of effectiveness.

The Centre is a very good example of academic-industry collaboration. Industry partners cited several examples of how their particular companies benefited directly from Centre research projects and as well as from more indirect but still impactful exposure to developments for other companies involved in the Centre. The Centre successfully fosters an open internal culture with frequent technical seminars which all partners can attend.

Examples of the output of the Centre and the way it is used at the industrial partners are given. It is not always clear how the new tools contribute to the functioning of the industrial partners, but the personal statements of some senior industrial partners suggest a high degree of satisfaction with the products delivered. The Centre has taken steps to bring some of the results also to industries not belonging to the Centre. Spin-off companies and commercially available software packages has been established for that purpose. The impact of the Centre on the educational programmes at Chalmers is present and of the degree to be expected from a VINN Excellence Centre. The Centre reports excellent facilities but from the report it is not very clear whether these facilities are also actively used by the industrial partners.

The evaluation team noted that the Centre is successfully working to attract more conferences and scientific meetings to Gothenburg in areas of direct relevance to the Centre.

However the evaluation team suggests that the Centre could have an even higher impact on its industrial partners if it could find ways to engage even more effectively with the underlying debates in its field and to find ways to monitor developments, especially disruptive developments, in the field and engage actively in discussing the implications of such developments for research and industry in an ongoing way with partners.

Organisation and Management of the Centre

The Board and management of the Centre are working well. The Board is very engaged and the management is well organised.

The Centre has defined 10 steering parameters to monitor its performance. The steering parameters chosen are appropriate for such a Centre but could be extended with stretch targets which could help lift the Centre’s performance to even higher levels in Stage 4 and beyond.

There is an International Scientific Advisory Board (ISAB) consisting of well-qualified experts in the field. Unfortunately the report produced by ISAB in 2013 is not very informative and gives almost no information on the perception of the ISAB members on the functioning of the Centre. This would seem to be a missed opportunity to get valuable feedback on Stage 3 and useful guidance for Stage 4 and beyond.

The report to the Evaluation Team is well laid out and easy to read.

Training Personnel of High Competence

The Centre has an appropriate programme for postgraduate education. It was clear that the students have a clear idea of how their work fits in with the Centre as a whole. They very much valued the feedback they received through Centre seminars and through industry implementations.

The evaluators have noticed that a large number of the researchers are internally recruited. Although there is no indication that this is a drawback to the Centre, it might be a hindrance for radical new ideas and outside influence. We suggest the centre to open up for postdoctoral positions seeking mainly persons from disciplines not currently in the Centre and from outside the Chalmers sphere.

The Centre has also been diligent in ensuring it influences the undergraduate curriculum.

Long term development during Stage 4 and beyond

The plans for Stage 4 are appropriate.

The evaluation team noted that the industrial partners and the University indicated that they intended to continue the Centre beyond Stage 4 and were already working to secure funding for this.

Recommendations to Strengthen the Centre

In summary, our recommendation is:

- That the Centre, while maintaining its excellent alignment with industrial needs, should make more effort to establish its academic leadership. In doing so it should become a more effective conduit for new developments from other leading groups in the field to its industry partners.

Conclusion

WINQUIST is a good example of a VINN Excellence Centre performing at an appropriate level at the end of Stage 3 and brings real value to the industry partners. The evaluation team recommends continued funding.

Mary O’Kane (Chair)

Claudia Eckert

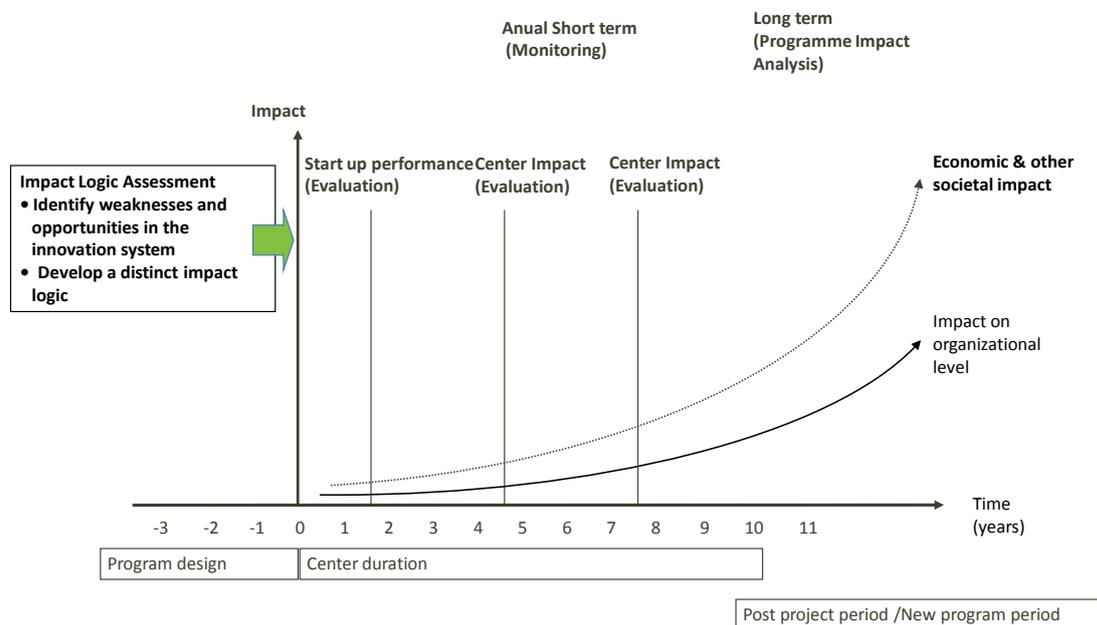
Kristian Martinsen

Sybrand van der Zwaag

Appendix A. Guidelines – Group 1

Summary

The purpose of the evaluation is *to evaluate the output from the Centres in the form of scientific, societal and industrial results*. The output of the evaluation is given in the form of recommendations to Vinnova for its financial decisions and other uses, e.g. reporting to the government and to the centre itself. Vinnova will also get recommendations how to improve the VINN Excellence Center Programme which is intended to run for up to 10 years. The building-up and development of the Centres is based on stepwise funding and a follow-up process. This guideline is designed specific for the third evaluation.



Source: Vinnova

Background

The Programme background

This document constitutes the guidelines for the evaluation of Centres with financing through the VINN Excellence Centre programme. The programme aim is to create and develop vigorous academic research milieus in which industrial and/or public partners actively participate in order to derive long-term benefits for society. The programme is also a link in the governmental effort to develop university-industry interaction.

The overall objective of the programme is to promote sustainable growth in Sweden. This means that the programme should create new, internationally competitive concentrations of highly qualified experts with the task of conducting problem-oriented and, as a rule, multidisciplinary research and ensuring that the knowledge and technology generated will lead to new products, processes and services. The research activities involve intense collaboration

between the participating partners. Hence each of these Centres is a strong research milieu positioned in a strong innovative environment. Ideas outside the core activities of the participating actors can also be utilised and further developed, e.g. by the set-up and development of new high-tech and research-based companies.

A number of industrial companies, research institutes and/or public services together with a university constitute the parties of a Centre. The parties contribute jointly to the Centre's research programme, financially or in the form of active work, in kind contribution. Their collaboration and the financing are manifested in a contract based on the Model Contract for VINN Excellence Centres before the actual execution of the research programme

The VINN Excellence Centre programme requires a substantial engagement from industrial and/or public partners. For a typical VINN Excellence Centre the ten-year turnover is 210 MSEK with a governmental cash contribution of 63 MSEK. The remaining contribution is normally equally shared by the university (50%) and the industrial and/or public partners (50%).

Vinnova is running other research and innovation programmes. For more information please visit the homepage for Vinnova.

Evaluation background

The VINN Excellence Centre programme is intended to run for up to 10 years. The building-up and development of the Centres is based on stepwise funding and a follow-up process.

The start up phase for a VINN Excellence Centre is entirely during stage 1, which comprises the initial two years. Vinnova covers up to SEK 7 million of the expenses during stage 1 (as a rule SEK 2,5 million for the first year and SEK 4,5 million for the second year), provided that the industrial, research institute and public partners contribute with at least the same amount. After the first stage the VINNOVA annual contribution to a Centre is expected to increase to SEK 7 million per year (SEK 1 million \approx approx. € 106.000/US\$ 143 000).

In the document "General Terms and Conditions for Financing of VINN Excellence Centres" for stage 2, § 8 and § 9 stated that Vinnova intends to conduct its third evaluation during year 7. The parties of the centre undertake to contribute to the evaluation by placing, when so requested, all necessary documents needed for the evaluation at Vinnova's disposal.

Where earlier evaluations have focused rather much on aspects such as methodologies, organization, partner involvement, educational efforts, personnel etc, this third evaluation will primarily focus on results and impact from scientific, industrial and societal point of view.

In order to fulfil the main purpose of the evaluation, the evaluation has to be completed in good time (preferably 3 months) before the expiration of stage 3. The eighteen VINN Excellence Centres will be evaluated in different groups during the period October 2013 – September 2015. The first group will be evaluated in October 2013 - see appendix 1.

The evaluation team

Each Centre will be evaluated by a team of international experts. Two experts in the team will have the competence and the task to evaluate the Centre from a scientific point of view. 2-3 persons in the team will have a more "generalist" experience from similar programmes for

university – industry research collaboration. These “generalist” experts will look at the Centre from a general point of view. The scientific experts will give written statements in the evaluation of one specific Centre while the “generalist” experts will participate in the evaluation interview of two or more Centres. Each Centre has to suggest at least six scientific experts. All of these experts have clear declarations of no existing conflicts of interest with the corresponding Centre. From that list Vinnova will decide on whom to invite.

The task of the evaluators

This third evaluation of the Centres will be carried out during year 7 of the centre’s operation.

Its primary purpose is to evaluate the output from the Centres in the form of scientific and industrial results.

Thus, the evaluation will focus on scientific and industrial/public sector achievements to date and that could be produced/implemented within some years. For a successful evaluation Centres will need to demonstrate that new products or processes have been, or soon will be, taken up by industry/public sector, i. e. evidence of concrete results of centre-generated innovation that has been applied in industry.

All centres should during the evaluation address the following three points during the review procedure (interview):

- 1 Concrete evidence within the Centre theme of at least two cases (preferably 3-5) of joint projects between the industry/public sector people and the academic researchers that went from joint conception to research to development to production/service in use on the market.
- 2 Concrete evidence - via proof of technological/other breakthroughs, advancements, transition to industry/public sector, etc. - that competence for Sweden in the knowledge (technical) area of the Centre has been enhanced.
- 3 Concrete evidence - like new courses, new programmes, also those that have contributed to 2. – that transfer of Centre results into teaching and education has occurred.

These three points can also be highlighted in the centre report if appropriate. The evaluators will also form an opinion concerning the approach and measures taken so far by individual Centres to judge the potential for their long-term development. This includes both the major results that the Centre wishes to achieve and see in stage 4 and beyond stage 4. Evaluators may offer suggestions for remedial action to enhance the prospects for long-term Centre success.

As a basis for the evaluations of the VINN Excellence Centres VINNOVA has formulated a number of success criteria (see appendix 3). Centres are asked to prepare reports (prior to the evaluation) according to the guidelines in appendix 4.

The evaluation team will make the evaluation in the context of the success criteria.

The scientific experts on the evaluation team will review the Centre report sections:

- Research Area, Competence Profile and Critical Size
- Centre Partners (from the point of view of research contribution)
- Research Program and results

They will offer their perspective on the research results in the context of the Vision, Mission and Strategy and financial aspects with respect to support of research and industrial agenda.

The "generalist" experts on the evaluation team will review the Centre report sections:

- Impact on partners
- Financial Report for stage 3
- Organisation and Management of the Centre.
- Personnel of High Competence

And

- Centre Partners (from the point of view of organisational effectiveness)

They will offer their perspective on the Centre organisation in the context of the Vision, Mission and Strategy. They will also comment on the organisation of the report.

Although the individual Centres will be the main focus, the evaluators may also comment on the concept and organisation of VINN Excellence Centre programme.

Organisation of the evaluation

The composition of the evaluation team is decided by Vinnova. The evaluation team that execute the interviews (generalists) decides on the distribution of work among its members.

The basic documentation, in principle for the evaluation:

- the Centre report to the evaluation team, delivered by the Centres to Vinnova,
- the operational plan of stage 3 (If the operational plan has been upgraded during stage 3 the new version should be submitted to Vinnova)
- last report of the International Scientific Advisory Board
- the evaluation report of stage 2.

These documents will be distributed by Vinnova to all of the evaluators not later than 6 weeks prior to the evaluation. The experts will deliver their maximum 2 pages statement to Vinnova four weeks prior to evaluation. These documents will be distributed to each centre for comments and to evaluation team. Centres comments should be delivered to Vinnova and transferred to the evaluation team not later than two weeks prior to evaluation.

Each evaluation starts with the evaluation 1 hour pre-meeting before evaluation interviews begin and ends when the evaluation report is completed during the same day. The goal is that the first draft of the evaluation report should be finished the day interview is performed. The experts will participate by phone during the pre-meeting.

The generalist evaluation team is during the interview session interested in meeting:

- the Centre Director,
- the Chairman of the Centre Board of Directors and all board members
- half of representatives from the industrial and public partners (both groups if relevant) including at least two from SMEs (if relevant),

- university staff incl. representatives from the Vice-Chancellor's office,
- half of all research leaders and/or program directors active within the Centre, and
- half of all doctoral students.

Vinnova staff will be present at the site visits. The staff will act as administrators/observers and will not take active part in the evaluation, but can add information during work sessions.

Each evaluation will take place over *one* day between 10.00 – 13.00 in Stockholm at Vinnova. The generalist evaluation team meet all main parties from the Centre (see above). The Centre should prepare a presentation on the overall centre vision, mission, organization and operation of no longer than 15 minutes, leaving ample time for questions and discussion. The sessions will be chaired by one of the generalists who will have responsibility for guiding the pace and direction of the interview. See detailed schedule in appendix 2.

The evaluation report is due approximately 5 weeks after the interview sessions.

The VINN Excellence Centres will be evaluated in different groups during the period October 2013 - October 2015, the first group in October 2013 - see appendix 1.

Centre arrangements in connection to the evaluation

The Centres are asked to propose at least six scientific experts for the evaluation and send the suggestions to Vinnova on request. It is important that the Centres can guarantee no conflict of interest with the proposed experts.

The basic documentation from each Centre (the Centre report including the financial report) will be distributed by Vinnova to the members of the evaluation team not later than 6 weeks prior to the evaluation. The template for the Centre report is presented in appendix 4.

The Centre report should be submitted electronically (pdf-files) to Vinnova and be available at Vinnova not later than dates presented in appendix 2.

Financial reporting from each Centre shall be submitted to Vinnova no later than dates presented in appendix 2.

The Centre will also provide to Vinnova the last report of the International Scientific Advisory Board. If the operational plan has been upgraded during stage 3 the centre is responsible to send this as a pdf-file to Vinnova not later than six weeks prior to evaluation. These documents, along with the evaluation report (stage 3) of the Centre, will be provided to the evaluation team by Vinnova. Vinnova requires, prior to the evaluation, copies of the IP agreements that each Centre's university has signed with each of the staff and students of the Centre (in accordance with the Centre Agreement). Those documents should be sent as a PDF file (s) to Vinnova not later than dates presented in appendix 2.

See delivery dates for all documents for each group of evaluation in appendix 2.

Furthermore the Centres should:

- invite Centre representatives to the interview sessions in Stockholm

- inform Centre representatives about time and place for interview (see appendix 2)
- send a list of Centre representatives that will come to the interview two weeks prior to the interview
- travel/accommodations of Centre representatives should be covered by centre or partner.
- provide paper copies of presentations at the start of evaluation interview
- provide name cards for the table for all participants during the interview
- provide to the evaluators access to password-protected parts of Centre web sites where project plans and reports should be available one month prior to the evaluation. This information should be sent to Vinnova.

Finally the Centre leader should confidentially review, with respect to facts, the first draft of the evaluation report from the evaluation team and deliver the results of their review to Vinnova within one week of receiving the draft report.

Report of the generalist evaluation team

The work of the evaluation team shall result in a report on the VINN Excellence Centres evaluated. Each centre evaluation report should be the consensus view of the evaluation team. The evaluation team shall be unanimous in its recommendations.

Each report will have a section dealing with each Centre as outlined:

- Impact on partners and plans for development
- Organisation and Management of the Centre. Financial Report for stage 3 Personnel of High Competence, Centre Partners (from the point of view of organisational effectiveness)
- Research Area, Competence Profile and Critical Size, Centre Partners (from the point of view of research contribution), Research Program and results

Another section will deal with comments on the concept of the VINN Excellence Centre programme, including discussion of any identified structural and organisational problems.

Following the submission of the final report from the evaluators, Vinnova requests a discussion with each Centre regarding the recommendations in the evaluation team's report. The focus of the discussion will be on present and potential output and outcome for all partners, financial support and any structural matters. In the discussion priorities of actions will be included.

Handling and distribution of the evaluation report

The report from the evaluation team will be presented to Vinnova. The report will also be openly circulated to all Centres and, on request, to any other agency or person who have expressed an interest in this type of information.

Remuneration to the evaluators

Vinnova will pay for all costs for evaluation team members including travel, accommodation etc. According to Vinnova's standards for international evaluations, remuneration of € 1200/day is paid to each member on the generalist evaluation team for the evaluation of a specific Centre. Each expert have a remuneration of € 1200 (per centre).

Appendix 1, Group of interviews 2013²

Group 1

CENTER	DATES
ECO2	9 October
SAMOT	10 October
HELIX	11 October

² Group 2-7 of centres will be evaluated during autumn 2014-2015

Appendix 2, Delivery dates and Detail Time Schedule

Group 1

DOCUMENT	LATEST DELIVERY TO VINNOVA
IP AGREEMENTS	23 August
FINANCIAL REPORT	23 August
CENTRE REPORT INCLUDING FINAL FINANCIAL REPORT	23 August
LAST REPORT OF THE INTERNATIONAL SCIENTIFIC ADVISORY BOARD	23 August
UPDATED OPERATIONAL PLAN (ONLY IF UPDATED)	23 August
DELIVERY FROM VINNOVA OF EXPERT EVALUATION REPORT TO EACH CENTRE	9 September
COMMENTS FROM CENTRES ON EXPERT EVALUATION REPORT SENT TO VINNOVA	13 September

Evaluation group 1

October 9-11, 2013

All evaluation take place at VINNOVA, Mäster Samuel's Gata 56, 4 floor, Stockholm. Contact: Mattias Lundberg 0708-949169.

ECO2

Wednesday, October 9, 2013, ECO2

09:00 – 9:45 Pre-meeting generalist, experts (via phone/Skype) and VINNOVA

10:00 - 13:00 Generalist Evaluation Session

13.00 - 14.00 Lunch

14:00 - 22.00 ECO2 report writing incl. dinner

SAMOT

Thursday, October 10, 2013, SAMOT

09:00 – 9:45 Pre-meeting generalist, experts (via phone/Skype) and VINNOVA

10:00 - 13:00 Generalist Evaluation Session

13.00 - 14.00 Lunch

14:00 - 22.00 SAMOT report writing incl. dinner

HELIX

Friday, October 11, 2013, HELIX

09:00 – 9:45 Pre-meeting generalist, experts (via phone/Skype) and VINNOVA

10:00 - 13:00 Generalist Evaluation Session

13.00 - 14.00 Lunch

14:00 - 22.00 HELIX report writing incl. dinner

Appendix 3, Success Criteria for VINN Excellence Centres

In brief, successful VINN Excellence Centres are characterised by the following:

- Promoting sustainable growth by ensuring that new knowledge and new technological developments generated lead to new products, processes and services.
- Leading international research in different fields in collaboration between the private and public sectors, universities and colleges, research institutes and other organisations which conduct research.
- Research programmes are set up and carried out in collaboration between the various participants in order to solve key issues.
- The majority of work is conducted at a university or a college to achieve a critical size and interaction between research, post-graduate education and graduate education.
- Long-term implementation with comprehensive evaluations prior to new agreement periods to secure long-term effects and international excellence.
- Long-term collaborative finance from private and public sectors, the university/college and financing governmental agencies, to be able to recruit, develop and keep people with leading international competence.
- The activities are overseen by a board where the participants from the public and private sectors hold the majority in order to secure the direction of the Centres towards the requirements of the private and public sectors, i.e. needs-driven research.
- Set up in innovation environments with effective innovation operations so that strong research and innovation milieus can be created (Centres of Excellence in Research and Innovation).

When completing the evaluation it will also be considered:

- The gender perspective in the research programme; and
- Equality aspects and active promotion of an equal balance of gender.

Appendix 4, Instructions and template for Centre Reports to the Evaluation Team

Each of the Centres to be evaluated has to submit a report to Vinnova, electronically (pdf-files). The reports will be forwarded to the evaluation team by Vinnova. Guidelines for report contents and length follow. Facts about the Centre are to be compiled in section 10. It is recommended that other sections of the report refer to and emphasize these basic facts in order to put them in the relevant context. The Centre Report should be co-authored by all members of the management team of the centre, e.g. they are all signatories of the report, and the report should be approved by the board prior to release (to Vinnova).

All pages indicated below are maximum

Title page bearing the signatures of the co-authors and, indicating approval, the signature of the chair of the board

Summary (maximum 1 page (all pages indicated below are maximum))

- Progress and prospects of the Centre, important quantitative (and qualitative?) results for Swedish growth, highlights, breakthroughs, etc.
Provide a summary of how results have been utilized by partners.

Long-term Vision, Mission and Strategy (0,5 page)

- Provide a ten-year perspective on the Vision, Mission and Strategy of the Centre in the context of the Success Criteria, see appendix 3.

Research Area, Competence Profile and Critical Size (2 pages)

- Briefly describe the core competency of the Centre's research team both in terms of research competency (e.g. we have strength in molecular biology, metabolomics and large scale computation) and personnel.
- Describe the facilities that the Centre has developed or plans to develop to support the program.
- Describe the personnel and facilities available to the Centre (through collaboration within or beyond the university) that contribute to establishing competence profile for the research of the Centre.
- State the position of the Centre in relation to internationally leading groups.
- Comment on new types of collaborations since establishing the Centre.
- Describe the value added being a Centre compared to other ways of research collaboration.

Comment on the Centre with respect to "critical size".

Centre Partners - Companies and public service partners (2 pages)

For each of the partners describe:

- their corporate profile (number of employees, main products, location of operations etc.).
- how their business interests are aligned with the Centre research efforts
- how they interact with the Centre (including planning, personnel and facilities).
- How many years they have been active partners of the Centre

Concerning the overall strategy and considering the Centre as a whole:

- describe and give examples for the way in which key issues are identified by partners to stimulate needs-driven research.
- describe and give examples for the mechanisms for innovation and translation of technology into new products, processes, and services.
- Give examples for what measures have been taken to achieve strong links and integration between academia and companies/public services, and among companies/public services.

Research Program and results (5 pages)

- Provide an overview of the research program and its major results.
- Provide brief descriptions of the research projects, led by either academic or industrial partners. In addition to basic science and methodology, describe the need the research addresses, the question to be answered and the industrial objectives.
- Provide a summary statement concerning research productivity. (Particulars of research output are to be listed in the Appendices under Publications and Presentations Activity and International Activity.).
- Changes in research direction.

Impact on partners (and the rest of the society) (10 pages)

- Provide an overview of how results have been utilized by partners to establish new products processes and services.
- Provide brief descriptions of the current plans for implementation of results.
- Provide a description of how the partners anticipate to use and implement the results from the Centre.

Financial Report for stage 2 (1 pages)

- Discuss any concerns regarding financing matters.
- Describe existing sources of non-Centre funds supporting related research.
- Describe the nature of in kind contributions, both personnel, equipment, testing, etc. It is important to be as complete as possible in reporting of in kind contributions so that the evaluators can see the true magnitude and understand the nature of the in kind contributions.

Organisation and Management of the Centre (1 page)

- Describe the role, relationship and activities of the organizational units in the Centre, e.g Board of Directors, Management team, International Scientific Advisory Board.
- Comment on the scientific/industrial leadership of the Centre.
- Describe and give examples for the development processes of the Centre, e.g. result implementation in industry/public sector, project selection, project review, project termination etc. Describe how often these different processes are employed in the Centre activities.
- What steps are taken to stimulate innovation processes from ideas/results to products and services? Give examples and indicate how often these processes have been employed during the last stage.
- Describe the status and role of the Centre vis-à-vis the:
 - partners
 - university organisational units.
 - central administration.
 - the Faculty.

- other Centres.
- Comment on things that work well and things that don't. Give examples.
- Describe the communication procedures to Centre participants and partners?
- Describe measures and give examples taken to provide equality of opportunity, particularly but not only, from a gender perspective.

Personnel of High Competence (1 pages)

- Describe and give examples for measures taken to stimulate mutual personal mobility between the industrial/public services partners and academic milieus.
- Describe and give examples for the contribution of the Centre to university education (graduate and undergraduate): e.g. courses taught, seminars given, students supervised other than those already listed under research projects, etc.
- What measures have been taken to recruit, develop and keep people with leading international competence?
- What is the percentage of students associated with the Centre who's first degree is from:
 - another University?
 - outside Sweden?
- What measures have been taken to provide opportunities for students to travel or study abroad?
- What measures have been taken to improve equal opportunities and gender balance

Plans for Development (5 pages)

- Describe the plan for development of the Centre over the next two years (stage 4) in relation to the long-term objectives. Concentrate on results and implementation of results in industry/public sector.
- Describe the plan for development of the Centre beyond stage 4.

Further information (1 page)

- Please provide information of particular interest to the evaluation team that has not been covered in any other section of the guidelines.

Facts about the Centre

A *CV* in summary of the Centre Director (1 pp)

B *Centre Partners*

TABLE 1: List Centre Partners (Companies/public sector units), the name, position and location of the key contact

C *Board of Directors*

TABLE 2: List the name, position, company, and location of the members of the Board of Directors

D *Management Team*

TABLE 3: List the name, position in the University, role on the team for the persons in the Management Team

E *International Scientific Advisory Board*

TABLE 4: List the name, position, university/company, location for the members of the International Scientific Advisory Board, list the dates of all ISAB meetings in stage 2.

F *Research Program*

TABLE 5: Research Projects and Staff (for each project: project title, project leader, staff

and student names, start/end date, and person-years by year (include company and public sector personnel also)).

G *Publication and Presentation Activity*

TABLE 6: List publications, patents, theses, posters, presentations, invited lectures, etc. Include work funded by VINNOVA. Also include other closely related work funded by other means, indicating that other funding was used by an asterisk*.

H *International Activity*

TABLE 7: List collaborations with international researchers, visits outside Sweden (conferences, seminars, university visits, etc.), and foreign visitors to the Centre. Include work funded by VINNOVA. Also include other closely related work funded by other means, indicating that other funding was used by an asterisk*.

I *Financial Reports* (use the templates in appendix 5 (in the attached Excel file “Financial Report for stage 2”)

TABLE 8: Overall resources available

TABLE 9: Overall expenditures

TABLE 10: Research personnel

TABLE 11: Project expenditures

TABLE 12: Related research grants

J *Websites*

Provide relevant websites for the Centre, the University, research partners, research collaborators, etc.

- (Provide access to password-protected parts of centre web sites where project plans and reports should be available.)

Response to the evaluation report before start of stage 3 (2 pages)

- Present the outcome (the implementation) of each recommendation given from the evaluation in end of stage 2 (before start of stage 3). You can refer to other chapters in this report, if appropriate.

Appendix 5, Templates for the Financial Statements of stage 3 (will be sent to the Centre as MS Excel)

Instructions	
The tables have autosum function	
Table 8 Resources	This table should present the overall resources available (cash as well as in-kind) for center activities, one row for each financial source. Budget figures for year 8 (12 months) should be included. Outcome for year 8 should be for first six months (or other suitable period for year 8 - write date for outcome). Include all contributions that support the Centre activities.
Table 9 Expenditures	All expenses for the center at an aggregated level.
Table 10 Personel	List all personnel working in the centre. Preferably group them in order to use the information in other parts of the report. Do only report person over 5 % FTE.
Table 11 Projects	All projects should be listed here. Follow up that resources have been used for learning activities and communication (5% of VINNOVA funding), list of projects and financial size. Include all contributions that supports the Centre activities
Table 12 Related Grants	List of additional funding that explicitly strengthens the center activities without directly financing it. Only indicate grant that are bigger than € 70 000.

VINN Excellence Center:	
Dnr:	
Year 6:	200x-xx-xx - - 200x-xx-xx
Year 7:	200x-xx-xx - - 200x-xx-xx
Year 8:	200x-xx-xx - - 200x-xx-xx

Table 9: Overall Expenditures

Please indicate the actual time of year 8 that cover the outcome

List all expenses for the centre at an aggregated level.

	Year 6:						Year 7:					
	Budget (kSEK)			Outcome (kSEK)			Budget (kSEK)			Outcome (kSEK)		
	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total
Salaries (from "Staff sheet")												
External services												
Equipment												
Material, running costs etc.												
Travel												
Other												
Overhead costs												

Sum

	Year 8:						Summary Stage 3					
	Budget (kSEK)			Outcome (kSEK)			Budget (kSEK)			Outcome (kSEK)		
	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total
Salaries (from "Staff sheet")												
External services												
Equipment												
Material, running costs etc.												
Travel												
Other												
Overhead costs												

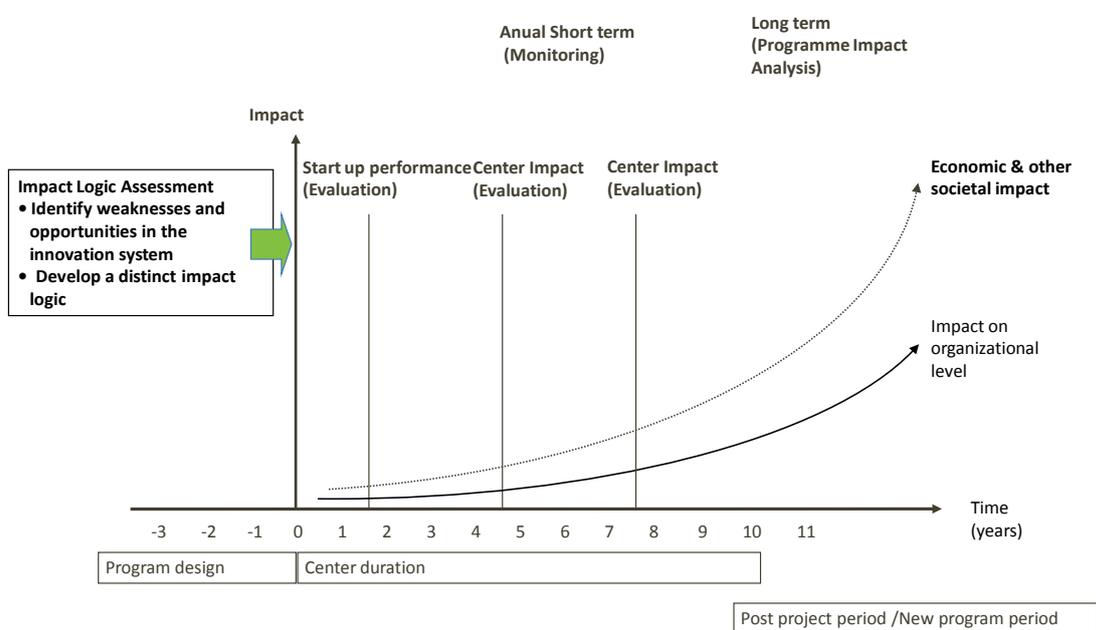
Sum

Appendix B. Guidelines – Group 2 – 3

Summary

The primary purpose of the evaluation is *to evaluate the output from the Centres in the form of scientific, societal and industrial results*. The output of the evaluation is given in the form of recommendations to Vinnova for its financial decisions and other uses, e.g. reporting to the government and to the Centre itself. Vinnova will also get recommendations how to improve the VINN Excellence Center Programme which is intended to run for up to 10 years. The building-up and development of the Centres is based on stepwise funding and a follow-up process. This guideline is designed specifically for the third evaluation.

Impact logic of VINN Excellence Center



Source: Vinnova

Background

The Programme background

This document constitutes the guidelines for the evaluation of Centres with financing through the VINN Excellence Centre programme. The programme aim is to create and develop vigorous academic research milieus in which industrial and/or public partners actively participate in order to derive long-term benefits for society. The programme is also a link in the governmental effort to develop university-industry interaction.

The overall objective of the programme is to promote sustainable growth in Sweden. This means that the programme should create new, internationally competitive concentrations of highly qualified experts with the task of conducting problem-oriented and, as a rule, multidisciplinary research and ensuring that the knowledge and technology generated will lead

to new products, processes and services. The research activities involve intense collaboration between the participating partners. Hence each of these Centres is a strong research milieu positioned in a strong innovative environment. Ideas outside the core activities of the participating actors can also be utilised and further developed, e.g. by the set-up and development of new high-tech and research-based companies.

A number of industrial companies, research institutes and/or public services together with a university constitute the parties of a Centre. The parties contribute jointly to the Centre's research programme, financially or in the form of active work, in kind contribution. Their collaboration and the financing are manifested in a contract based on the Model Contract for VINN Excellence Centres before the actual execution of the research programme

The VINN Excellence Centre programme requires a substantial engagement from industrial and/or public partners. For a typical VINN Excellence Centre the ten-year turnover is 210 MSEK with a governmental cash contribution of 63 MSEK. The remaining contribution is normally equally shared by the university (50%) and the industrial and/or public partners (50%).

Vinnova is running other research and innovation programmes. For more information please visit the homepage for Vinnova.

Evaluation background

The VINN Excellence Centre programme is intended to run for up to 10 years. The building-up and development of the Centres is based on stepwise funding and a follow-up process.

The start up phase for a VINN Excellence Centre is entirely during stage 1, which comprises the initial two years. Vinnova covers up to SEK 7 million of the expenses during stage 1, provided that the industrial, research institute and public partners contribute with at least the same amount. After the first stage the Vinnova annual contribution to a Centre is expected to increase to SEK 7 million per year.

In the document "General Terms and Conditions for Financing of VINN Excellence Centres" for stage 2, § 8 and § 9 stated that Vinnova intends to conduct its third evaluation during year 7. The parties of the centre undertake to contribute to the evaluation by placing, when so requested, all necessary documents needed for the evaluation at Vinnova's disposal.

Where earlier evaluations have focused rather much on aspects such as methodologies, organization, partner involvement, educational efforts, personnel etc, this third evaluation will primarily focus on results and especially the impact of results from scientific, industrial and societal point of view.

In order to fulfil the main purpose of the evaluation, the evaluation has to be completed in good time (preferably 3 months) before the expiration of stage 3. The eighteen VINN Excellence Centres will be evaluated in different groups during the period October 2013 – September 2015. The first group will be evaluated in October 2013 - see appendix 1.

The evaluation team

Each Centre will be evaluated by a team of international experts. Two experts in the team will have the competence and the task to evaluate the Centre from a scientific point of view. 2-3

persons in the team will have a more “generalist” experience from similar programmes for university-industry/public sector research collaboration. These “generalist” experts will look at the Centre from a general point of view. The scientific experts will evaluate one specific Centre while the “generalist” experts will participate in the evaluation of two or more Centres. Each Centre has to suggest at least eight scientific experts. It is important that the Centres can guarantee no conflict of interest with the proposed experts.

The task of the evaluators

This third evaluation of the Centres will be carried out during year 8 of the Centre’s operation.

Its primary purpose is to evaluate the output from the Centres in the form of scientific, societal and industrial results and the impact of these results on end-users, in particular the partners in the Centre.

Thus, the evaluation will focus on scientific and industrial/public sector achievements to date and results that have been produced/implemented over the last few years. For a successful evaluation, Centres will need to demonstrate that new products or processes have been, or soon will be, taken up by industry/public sector, i.e. with evidence of concrete results of Centre-generated innovation that has been applied in industry or the public sector.

All Centres should, during the evaluation, address the following three points both in the Centre report and at interview:

- A Concrete evidence within the Centre theme of at least two cases (preferably 3-5) of joint projects between the industry/public sector people and the academic researchers that went from joint conception to research to development to production/service in use on the market.
- B Concrete evidence - via proof of technological/other breakthroughs, advancements, transition to industry/public sector, etc. - that competence for Sweden in the knowledge (technical) area of the Centre has been enhanced.
- C Concrete evidence - like new courses, new programmes, also those that have contributed to B. – that transfer of Centre results into teaching and education has occurred.

The evaluators will form an opinion on the approach and measures taken so far by individual Centres to judge the potential for their long-term development. This includes both the major results that the Centre wishes to achieve and see in stage 4 and also beyond stage 4. Evaluators may offer suggestions for remedial action to enhance the prospects for long-term Centre success.

As a basis for the evaluations of the VINN Excellence Centres Vinnova has formulated a number of success criteria (see appendix 3). Centres are asked to prepare reports (prior to the evaluation) according to the guidelines in appendix 4.

The evaluation team will make the evaluation in the context of the success criteria.

The scientific experts on the evaluation team will review the Centre report sections:

- Research Area, Competence Profile and Critical Size

- Research Program and Results
- Centre Partners (from the point of view of research contribution)

They will offer their perspective on the research results in the context of the Vision, Mission and Strategy and financial aspects with respect to support of research and industrial agenda.

The "generalist" experts on the evaluation team will review the Centre report sections:

- Centre Partners (from the point of view of organisational effectiveness)
- Impact on partners
- Financial Report for Stage 3
- Organisation and Management of the Centre
- Personnel of High Competence

They too will offer their perspective on the Centre organisation and impact in the context of the Vision, Mission and Strategy. They will also comment on the organisation of the report.

Section *Plans for Development* is of interest for the evaluation team to see the future plans for development of the research- and innovation milieu.

Although the individual Centres will be the main focus, the evaluators may also comment on the concept and organisation of VINN Excellence Centre programme.

Organisation of the evaluation

The composition of the evaluation team is decided by Vinnova. The evaluation team that conducts the interviews decides on the distribution of work among its members.

The basic documentation, in principle, for the evaluation is as follows:

- the Centre report to the evaluation team, delivered by the Centres to Vinnova
- the operational plan of Stage 3 (If the operational plan has been upgraded during Stage 3 the new version should be submitted to Vinnova)
- the most recent report of the International Scientific Advisory Board
- the evaluation report of Stage 2

These documents will be distributed by Vinnova to all of the evaluators not later than 6 weeks prior to the evaluation. The evaluation team will deliver its pre-interview draft evaluation report including queries (maximum 4 pages) to Vinnova four weeks prior to the evaluation interview. This draft report will then be sent to the Centre for comment. The Centre's comments should be delivered to Vinnova for transfer to the evaluation team not later than two weeks prior to evaluation interview.

See detail delivery dates in Appendix 2.

Each evaluation session starts with the evaluation team introductory meeting the day (evening) before the evaluation interview and ends when the evaluation report is completed during the same day. The goal is that the first draft of the final evaluation report should be finished on the

day of the interview. Experts not attending the interview will participate by phone during the introductory meeting and in the post-interview discussion.

During the interview session the evaluation team is interested in meeting:

- the Centre Director
- the Chairman of the Centre Board of Directors and several board members
- representatives from several of the industrial and public partners (both groups if relevant) including at least two from SMEs (if relevant)
- university staff incl. representatives from the Vice-Chancellor's office,
- as many as possible of the research leaders and/or program directors active within the Centre
- as many as possible of the doctoral students

Vinnova staff will be present at the site visits. The staff will act as administrators/observers and will not take active part in the evaluation, but can add information during work sessions.

Each evaluation interview will take place over *one* day between 9.00 – 13.30. The evaluation team meet all main parties from the Centre (see above) as a group. The Centre should prepare a presentation focusing particularly on the Centre's results to date and the impact of these results on end-users, in particular the partners in the Centre. The presentation should be timed to take no longer than 30 minutes, leaving ample time for questions and discussion, noting that when the presentation is given, the members of the evaluation team will generally ask questions through the presentation. Thus the presentation is best thought of as the 'organizing thread' for the interview. The sessions will be chaired by one of the generalists who will have responsibility for guiding the pace and direction of the interview. At least 30 minutes of the interview will be devoted to a doctoral-students-only meeting with the evaluation team. See detailed schedule in appendix 2.

The evaluation report is due approximately 5 weeks after the interview sessions.

The VINN Excellence Centres will be evaluated in different groups during the period October 2013 - October 2015, the first group in October 2013 - see appendix 1.

Centre arrangements in connection with the evaluation

The Centres are asked to propose at least eight scientific experts for the evaluation and send the suggestions to Vinnova. It is important that the Centres can guarantee no conflict of interest with the proposed experts.

The basic documentation from each Centre (the Centre report including the financial report) will be distributed by Vinnova to the members of the evaluation team not later than 6 weeks prior to the evaluation. The template for the Centre report is presented in appendix 4.

The Centre report should be submitted electronically (pdf-files) to Vinnova and be available at Vinnova not later than dates presented in appendix 2.

Financial reporting from each Centre shall be submitted to Vinnova no later than dates presented in appendix 2. The Centre must be prepared to have dialog with Vinnova concerning

potential clarification and provision of additional information to the financial report before the interview.

The Centre will also provide to Vinnova the most recent report of the International Scientific Advisory Board. If the operational plan has been upgraded during stage 3 the Centre should send this as a pdf-file to Vinnova not later than six weeks prior to evaluation. These documents, along with the evaluation report (of Stage 3) of the Centre, will be provided to the evaluation team by Vinnova. Vinnova requires, prior to the evaluation, copies of the IP agreements that each Centre's university has signed with each of the staff and students of the Centre (in accordance with the Centre Agreement). Those documents should be sent as a PDF file (s) to Vinnova not later than dates presented in appendix 2.

See delivery dates for all documents for each group of evaluation in appendix 2.

Furthermore the Centres should:

- book a location for the interview sessions - see detail time planning of each individual centre in appendix 2. For the centre Faste and FUNMAT the interview will be at Vinnova in Stockholm. Vinnova book location/lunch for those centres
- send address to Vinnova for the location where the interview take place
- arrange light lunch/coffee for the 30 minutes brake (approximately 11.00)
- invite Centre representatives to the interview sessions
- inform Centre representatives about time and place for interview (see appendix 2)
- send a list of Centre representatives that will come to the interview two weeks prior to the interview
- note that for Faste and FUNMAT travel/accommodations of Centre representatives should be covered by centre or partner
- provide paper copies of presentations at the start of evaluation interview
- provide name cards for the table for all participants during the interview
- provide to Vinnova access arrangements for evaluators to password-protected parts of Centre web sites where project plans and reports should be available one month prior to the evaluation
- provide to Vinnova any comments on and respond to any queries in the pre-interview draft evaluation report at least two weeks before the evaluation interview. This information should be sent to Vinnova not later than dates presented in appendix 2

Finally the Centre leader should confidentially review, with respect to facts, the first draft of the final evaluation report from the evaluation team (after interview) and deliver any comments to Vinnova within one week of receiving the draft final report.

Report of the evaluation team

The work of the evaluation team shall result in a report on the VINN Excellence Centres evaluated. Each Centre evaluation report should be the consensus view of the evaluation team. The evaluation team shall be unanimous in its recommendations.

Each report will focus particularly on the output from the Centres in the form of scientific and industrial results and the impact of these results on end-users, in particular the partners in the Centre, and will have sections dealing with each Centre as outlined:

- Impact of Centre results on partners and others and plans for development in Stage 4 and beyond
- Organisation, Management and Finances of the Centre
- Centre Partners
- Research Area, Competence Profile and Critical Size, Centre Partners (from the point of view of research contribution)
- Research Program and Results
- Personnel of High Competence

Another section will deal with comments on the concept of the VINN Excellence Centre programme, including discussion of any identified structural and organisational problems.

Following the submission of the final report from the evaluators, Vinnova requests a discussion with each Centre regarding the recommendations in the evaluation team's report. The focus of the discussion will be on present and potential output and outcome for all partners, financial support and any structural matters. In the discussion priorities of actions will be included.

Handling and distribution of the evaluation report

The report from the evaluation team will be presented to Vinnova. The report will also be openly circulated to all Centres and, on request, to any other agency or person who have expressed an interest in this type of information.

Remuneration to the evaluators

Vinnova will pay for all costs for evaluation team members including travel, accommodation etc. According to Vinnova's standards for international evaluations, remuneration of € 1200/day is paid to each member on the generalist evaluation team for the evaluation of a specific Centre. Each expert has a remuneration of € 1200 (per centre).

Appendix 1, Groups of interviews 2014³

Group 2

CENTER	DATES
BIOMATCELL	10 September
CHASE	11 September
SUMO	12 September
WINGQUIST	15 September
GHZ	16 September

Group 3

CENTER	DATES
HERO M	6 November
PRONOVA	7 November
FUNMAT	10 November
FASTE	11 November
CESC	12 November
MOBILE LIFE	13 November

³ AFC, iPACK and BiMaC Innovation centres will be evaluated during 2015. ECO 2, HELIX and SAMOT was evaluated 2013.

Appendix 2, Delivery dates and Detail Time Schedule

Group 2

DOCUMENT	LATEST DELIVERY TO VINNOVA
IP AGREEMENTS	25 July
FINANCIAL REPORT	25 July
CENTRE REPORT INCLUDING FINAL FINANCIAL REPORT	25 July
LAST REPORT OF THE INTERNATIONAL SCIENTIFIC ADVISORY BOARD	25 July
UPDATED OPERATIONAL PLAN (ONLY IF UPDATED)	25 July
ADDRESS TO VINNOVA FOR THE LOCATION WHERE THE INTERVIEW TAKE PLACE	25 July
DELIVERY FROM VINNOVA OF DRAFT EVALUATION REPORT TO EACH CENTRE NLT	18 August
COMMENTS FROM CENTRES ON DRAFT EVALUATION REPORT SENT TO VINNOVA NLT	25 August

Group 3

DOCUMENT	LATEST DELIVERY TO VINNOVA
IP AGREEMENTS	19 September
FINANCIAL REPORT	19 September
CENTRE REPORT INCLUDING FINAL FINANCIAL REPORT	19 September
LAST REPORT OF THE INTERNATIONAL SCIENTIFIC ADVISORY BOARD	19 September
UPDATED OPERATIONAL PLAN (ONLY IF UPDATED)	19 September
ADDRESS TO VINNOVA FOR THE LOCATION WHERE THE INTERVIEW TAKE PLACE	19 September
DELIVERY FROM VINNOVA OF DRAFT EVALUATION REPORT TO EACH CENTRE NLT	13 October
COMMENTS FROM CENTRES ON DRAFT EVALUATION REPORT SENT TO VINNOVA NLT	20 October

Evaluation group 2

September 9-16, 2014

All evaluation takes place in Göteborg.

BIOMATCELL

Tuesday, September 9, Hotel

19.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Wednesday, September 10, Göteborg University.

09:00 – 11.00. Evaluation session

11.00 - 11.30 Brake for light lunch/coffee

11.30 - 13.30. Evaluation session

CHASE

Wednesday, September 10, Hotel

19.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Thursday, September 11, Chalmers

09:00 – 11.00. Evaluation session
11.00 - 11.30 Brake for light lunch/coffee
11.30 - 13.30. Evaluation session

SuMo

Thursday, September 11, Hotel

19.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Friday, September 12, Chalmers

09:00 – 11.00. Evaluation session
11.00 - 11.30 Brake for light lunch/coffee
11.30 - 13.30. Evaluation session

WINGQUIST

Sunday, September 14. Hotel

19.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Monday, September 15, Chalmers

09:00 – 11.00. Evaluation session
11.00 - 11.30 Brake for light lunch/coffee
11.30 - 13.30. Evaluation session

GHZ

Monday, September 15. Hotel

19.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Tuesday, September 16, Chalmers

09:00 – 11.00. Evaluation session
11.00 - 11.30 Brake for light lunch/coffee
11.30 - 13.30. Evaluation session

Evaluation group 3

November 5 - 13, 2014

All evaluation takes place in Stockholm

Hero-m

Wednesday, November 5, Hotel

19.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Thursday, November 6, KTH.

09:00 – 11.00. Evaluation session
11.00 - 11.30 Brake for light lunch/coffee
11.30 - 13.30. Evaluation session

ProNova

Thursday, November 6, Hotel

19.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Friday, November 7, KTH.

09:00 – 11.00. Evaluation session
11.00 - 11.30 Brake for light lunch/coffee
11.30 - 13.30. Evaluation session

FUNMAT

Sunday, November 9. Hotel

19.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Monday, November 10, Vinnova

09:00 – 11.00. Evaluation session
11.00 - 11.30 Brake for light lunch/coffee
11.30 - 13.30. Evaluation session

Faste

Monday, November 10. Hotel

19.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Tuesday, November 11, Vinnova

09:00 – 11.00. Evaluation session
11.00 - 11.30 Brake for light lunch/coffee
11.30 - 13.30. Evaluation session

CESC

Tuesday, November 11, Hotel

19.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Wednesday, November 12, KTH.

09:00 – 11.00. Evaluation session
11.00 - 11.30 Brake for light lunch/coffee
11.30 - 13.30. Evaluation session

Mobile Life

Wednesday, November 12, Hotel

19.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Thursday, November 13, Stockholm University

09:00 – 11.00. Evaluation session
11.00 - 11.30 Brake for light lunch/coffee
11.30 - 13.30. Evaluation session

Appendix 3, Success Criteria for VINN Excellence Centres

In brief, successful VINN Excellence Centres are characterised by the following:

- Promoting sustainable growth by ensuring that new knowledge and new technological developments generated lead to new products, processes and services.
- Leading international research in different fields in collaboration between the private and public sectors, universities and colleges, research institutes and other organisations which conduct research.
- Research programmes are set up and carried out in collaboration between the various participants in order to solve key issues.
- The majority of work is conducted at a university or a college to achieve a critical size and interaction between research, post-graduate education and graduate education.
- Long-term implementation with comprehensive evaluations prior to new agreement periods to secure long-term effects and international excellence.
- Long-term collaborative finance from private and public sectors, the university/college and financing governmental agencies, to be able to recruit, develop and keep people with leading international competence.
- The activities are overseen by a board where the participants from the public and private sectors hold the majority in order to secure the direction of the Centres towards the requirements of the private and public sectors, i.e. needs-driven research.
- Set up in innovation environments with effective innovation operations so that strong research and innovation milieus can be created (Centres of Excellence in Research and Innovation).

When completing the evaluation it will also be considered:

- The gender perspective in the research programme; and
- Equality aspects and active promotion of an equal balance of gender.

Appendix 4, Instructions and template for Centre Reports to the Evaluation Team

Each of the Centres to be evaluated has to submit a report to Vinnova, electronically (pdf-files). The reports will be forwarded to the evaluation team by Vinnova. Guidelines for report contents and length follow. Facts about the Centre are to be compiled in section 10. It is recommended that other sections of the report refer to and emphasize these basic facts in order to put them in the relevant context. The Centre Report should be co-authored by all members of the management team of the Centre, e.g. they are all signatories of the report, and the report should be approved by the board prior to release (to Vinnova).

Above all it is important for the Centre to “tell its story” especially, for this evaluation, with regard to the output from the Centre in the form of scientific, societal and industrial results and the impact of these results on end-users, in particular the partners in the Centre. If the recommended format is not conducive to this, judicious variation of the format is allowed.

All pages indicated below are maximum

Title page bearing the signatures of the co-authors and, indicating approval, the signature of the chair of the board

Summary (maximum 1 page (all pages indicated below are maximum))

- Progress and prospects of the Centre, important quantitative (and qualitative) results for Swedish growth, highlights, breakthroughs, etc.
- Summarise the major outputs from the Centre in the form of scientific, societal and industrial results.
- Provide a summary of how results have been utilized by partners.

Long-term Vision, Mission and Strategy (0,5 page)

- Provide a ten-year perspective on the Vision, Mission and Strategy of the Centre in the context of the Success Criteria, see appendix 3. Indicate if there have been any significant changes in the Vision, Mission and Strategy of the Centre during Stage 3.

Research Area, Competence Profile and Critical Size (2 pages)

- Briefly describe the core competency of the Centre's research team both in terms of research competency (e.g. we have strength in molecular biology, metabolomics and large scale computation) and personnel.
- Describe the facilities that the Centre has developed or plans to develop to support the program.
- Describe the personnel and facilities available to the Centre (through collaboration within or beyond the university) that contribute to establishing competence profile for the research of the Centre.
- State the position of the Centre when compared with internationally leading groups.
- Comment on new types of collaborations since establishing the Centre.
- Describe the value added by being a Centre compared to other methods of research collaboration.
- Comment on the Centre with respect to "critical size".

Research Program and Results (5 pages)

- Provide a detailed overview of the research program highlighting the major research results.

- Provide brief descriptions of the research projects, led by either academic or industrial partners. In addition to basic science and methodology, describe the need the research addresses, the questions to be answered and the industrial objectives.
- Provide a summary statement concerning research productivity. (Particulars of research output are to be listed in the Appendices under Publications and Presentations Activity and International Activity).
- Describe any major changes in research direction.

Centre Partners - companies and public service partners (2 pages)

For each of the partners describe:

- their corporate profile (number of employees, main products, location of operations etc.).
- how their business interests are aligned with the Centre research efforts
- how they interact with the Centre (including planning, personnel and facilities).
- how many years they have been active partners of the Centre

Concerning the overall strategy and considering the Centre as a whole:

- describe and give examples of the way in which key issues are identified by partners to stimulate needs-driven research.
- describe and give examples of the mechanisms for innovation and translation of technology into new products, processes, and services.
- give examples of what measures have been taken to achieve strong links and integration between academia and companies/public services, and among companies/public services.

Impact on partners (and the rest of society) (10 pages)

- Provide a detailed overview of the major industrial and societal results achieved by the Centre and describe how these results and the research results have been utilized by partners and others to establish new products, processes and services to date.
- In particular, provide concrete evidence within the Centre theme of at least two cases (preferably 3-5) of joint projects between the industry/public sector people and the academic researchers that went from joint conception to research to development to production/service in use on the market.
- Also provide concrete evidence - via proof of technological/other breakthroughs, advancements, transition to industry/public sector, etc. - that competence for Sweden in the knowledge (technical) area of the Centre has been enhanced.
- For results utilisation that is proposed for the future, provide a description of how the partners anticipate using and implementing the results from the Centre.

Financial Report for stage 3 (1 page)

- Discuss any concerns regarding financing matters.
- Describe existing sources of non-Centre funds supporting related research.
- Describe the nature of in-kind contributions, both personnel, equipment, testing, etc. It is important to be as complete as possible in reporting of in-kind contributions so that the evaluators can see the true magnitude and understand the nature of the in-kind contributions.

Organisation and Management of the Centre (1 page)

- Describe the role, relationship and activities of the organizational units in the Centre, e.g. Board of Directors, Management team, International Scientific Advisory Board.
- Comment on the scientific/industrial leadership of the Centre.
- Describe and give examples for the development processes of the Centre, e.g. result implementation in industry/public sector, project selection, project review, project termination etc.
- What steps are taken to stimulate innovation processes from ideas/results to products and services? Give examples and indicate how often these processes have been employed during the last stage.
- Describe the status and role of the Centre vis-à-vis the:
 - partners
 - university organisational units.
 - central administration.
 - the Faculty.
 - other Centres.
- Comment on things that work well and things that don't. Give examples.
- Describe the communication procedures to Centre participants and partners.
- Describe measures taken to provide equality of opportunity, particularly but not only, from a gender perspective.

Personnel of High Competence (2 pages)

- Describe and give examples for measures taken to stimulate mutual personal mobility between the industrial/public services partners and academic milieus.
- Describe and give examples of the contribution of the Centre to university education (graduate and undergraduate): e.g. courses taught, seminars given, students supervised other than those already listed under research projects, etc.
- In particular, provide concrete evidence - like new courses, new programmes in the knowledge (technical) area of the Centre - that transfer of Centre results into teaching and education has occurred.
- What measures have been taken to recruit, develop and keep people with leading international competence?
- What is the percentage of students associated with the Centre whose first degree is from:
 - another University?
 - outside Sweden?
- What measures have been taken to provide opportunities for students to travel or study abroad?
- What measures have been taken to improve equal opportunities and gender balance?

Plans for Development (3 pages)

- Describe the plan for development of the Centre over the next two years (Stage 4) in relation to the long-term objectives. Concentrate on results and implementation of results in industry/public sector.
- Describe the plan for development of the Centre beyond stage 4.

Further information (1 page)

- Please provide information of particular interest to the evaluation team that has not been covered in any other section of the guidelines.

Response to the evaluation report (stage 2) before start of stage 3 (2 pages)

- Present the outcome (the implementation) of each recommendation given from the evaluation in end of stage 2 (before start of stage 3). You can refer to other chapters in this report, if appropriate.

Facts about the Centre

A *CV* in summary of the Centre Director (1 pp)

B *Centre Partners*

TABLE 1: List Centre Partners (Companies/public sector units), the name, position and location of the key contact

C *Board of Directors*

TABLE 2: List the name, position, company, and location of the members of the Board of Directors

D *Management Team*

TABLE 3: List the name, position in the University, role on the team for the persons in the Management Team

E *International Scientific Advisory Board*

TABLE 4: List the name, position, university/company, location for the members of the International Scientific Advisory Board, list the dates of all formal ISAB meetings in stage 3.

F *Research Program*

TABLE 5: Research Projects and Staff (for each project: project title, project leader, staff and student names, start/end date, and person-years by year (include company and public sector personnel also)).

G *Publication and Presentation Activity*

TABLE 6: List publications (with citations and journal impact factors), patents, theses, posters, presentations, invited lectures, etc. Include work funded by Vinnova. Also include other closely related work funded by other means, indicating that other funding was used by an asterisk*.

H *International Activity*

TABLE 7: List collaborations with international researchers, visits outside Sweden (conferences, seminars, university visits, etc.), and foreign visitors to the Centre. Include work funded by Vinnova. Also include other closely related work funded by other means, indicating that other funding was used by an asterisk*.

I *Financial Reports* (use the templates in appendix 5 (in the attached Excel file “Financial Report for stage 3”))

TABLE 8: Overall resources available

TABLE 9: Overall expenditures

TABLE 10: Research personnel

TABLE 11: Project expenditures

TABLE 12: Related research grants

J *Websites*

Provide relevant websites for the Centre, the University, research partners, research collaborators, etc.

- (Provide access to password-protected parts of centre web sites where project plans and reports should be available.)

Appendix 5, Templates for the Financial Statements of stage 3 (will be sent to the Centre as MS Excel)

Instructions	
The tables have autosum function	
Table 8 Resources	This table should present the overall resources available (cash as well as in-kind) for center activities, one row for each financial source. Budget figures for year 8 (12 months) should be included. Outcome for year 8 should be for first six months (or other suitable period for year 8 - write date for outcome). Include all contributions that support the Centre activities.
Table 9 Expenditures	All expenses for the center at an aggregated level.
Table 10 Personnel	List all personnel working in the centre. Preferably group them in order to use the information in other parts of the report. Do only report person over 5 % FTE. The cash contribution refers to the cash contribution from partners except for host University if applicable.
Table 11 Projects	All projects should be listed here. Follow up that resources have been used for learning activities and communication (5% of VINNOVA funding), list of projects and financial size. Include all contributions that supports the Centre activities
Table 12 Related Grants	List of additional funding that explicitly strengthens the center activities without directly financing it. Only indicate grant that are bigger than € 70 000.

VINN Excellence Center:	
Dnr:	
Year 6:	200x-xx-xx - - 200x-xx-xx
Year 7:	200x-xx-xx - - 200x-xx-xx
Year 8:	200x-xx-xx - - 200x-xx-xx

Table 9: Overall Expenditures

Please indicate the actual time of year 8 that cover the outcome

List all expenses for the centre at an aggregated level.

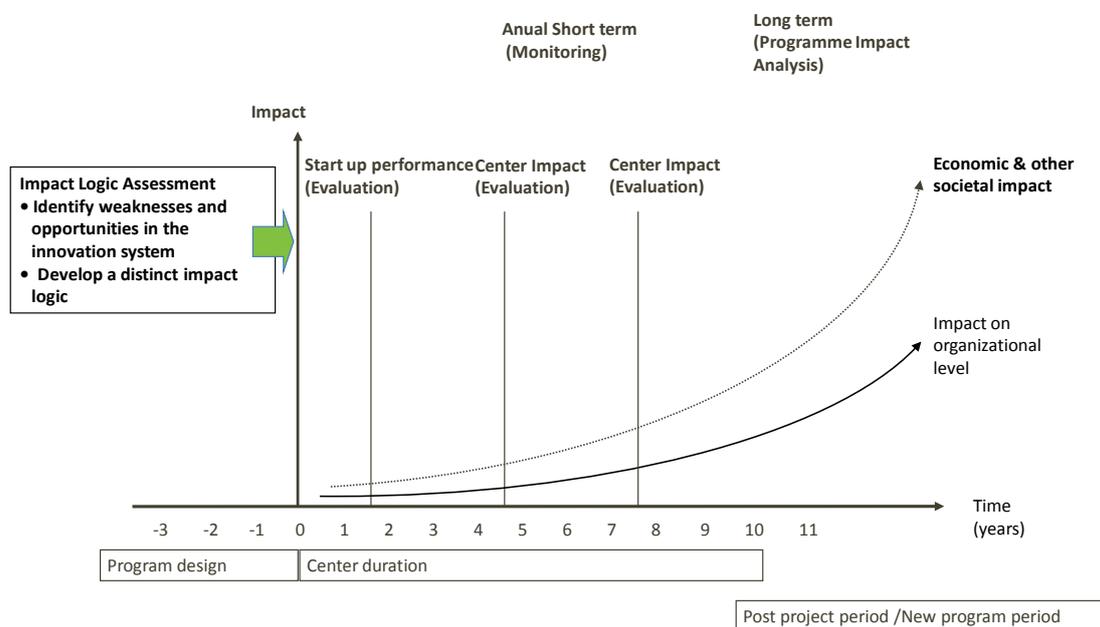
	Year 6:						Year 7:					
	Budget (kSEK)			Outcome (kSEK)			Budget (kSEK)			Outcome (kSEK)		
	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total
Salaries (from "Staff sheet")												
External services												
Equipment												
Material, running costs etc.												
Travel												
Other												
Overhead costs												
Sum												

	Year 8:						Summary Stage 3					
	Budget (kSEK)			Outcome (kSEK)			Budget (kSEK)			Outcome (kSEK)		
	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total
Salaries (from "Staff sheet")												
External services												
Equipment												
Material, running costs etc.												
Travel												
Other												
Overhead costs												

Appendix C. Guidelines – Group 4

Summary

The primary purpose of the evaluation is *to evaluate the output from the Centres in the form of scientific, societal and industrial results*. The output of the evaluation is given in the form of recommendations to Vinnova for its financial decisions and other uses, e.g. reporting to the government and to the Centre itself. Vinnova will also get recommendations how to improve the VINN Excellence Center Programme which is intended to run for up to 10 years. The building-up and development of the Centres is based on stepwise funding and a follow-up process. This guideline is designed specifically for the third evaluation.



Source: Vinnova

Background

The Programme background

This document constitutes the guidelines for the evaluation of Centres with financing through the VINN Excellence Centre programme. The programme aim is to create and develop vigorous academic research milieus in which industrial and/or public partners actively participate in order to derive long-term benefits for society. The programme is also a link in the governmental effort to develop university-industry collaborative interaction.

The overall objective of the programme is to promote sustainable growth in Sweden. This means that the programme should create new, internationally competitive concentrations of highly qualified experts with the task of conducting problem-oriented and, as a rule, multidisciplinary research and ensuring that the knowledge and technology generated will lead to new products, processes and services. The research activities involve intense collaboration

between the participating partners. Hence each of these Centres is a strong research milieu positioned in a strong innovative environment. Ideas outside the core activities of the participating actors can also be utilised and further developed, e.g. by the set-up and development of new high-tech and research-based companies.

A number of industrial companies, research institutes and/or public services together with a university constitute the parties of a Centre. The parties contribute jointly to the Centre's research programme, financially or in the form of active work, in kind contribution. Their collaboration and the financing are manifested in a contract based on the Model Contract for VINN Excellence Centres before the actual execution of the research programme

The VINN Excellence Centre programme requires a substantial engagement from industrial and/or public partners. For a typical VINN Excellence Centre the ten-year turnover is 210 MSEK with a governmental cash contribution of 63 MSEK. The remaining contribution is normally equally shared by the university (50%) and the industrial and/or public partners (50%).

Vinnova is running other research and innovation programmes. For more information please visit the homepage for Vinnova.

Evaluation background

The VINN Excellence Centre programme is intended to run for up to 10 years. The building-up and development of the Centres is based on stepwise funding and a follow-up process.

The start up phase for a VINN Excellence Centre is entirely during stage 1, which comprises the initial two years. Vinnova covers up to SEK 7 million of the expenses during stage 1 (as a rule SEK 2,5 million for the first year and SEK 4,5 million for the second year), provided that the industrial, research institute and public partners contribute with at least the same amount. After the first stage the Vinnova annual contribution to a Centre is expected to increase to SEK 7 million per year.

In the document "General Terms and Conditions for Financing of VINN Excellence Centres" for stage 2, § 8 and § 9 stated that Vinnova intends to conduct its third evaluation during year 8. The parties of the centre undertake to contribute to the evaluation by placing, when so requested, all necessary documents needed for the evaluation at Vinnova's disposal.

Where earlier evaluations have focused rather much on aspects such as methodologies, organization, partner involvement, educational efforts, personnel etc, this third evaluation will primarily focus on results and impact from scientific, industrial and societal point of view.

In order to fulfil the main purpose of the evaluation, the evaluation has to be completed in good time (preferably 3 months) before the expiration of stage 3. The seventeen VINN Excellence Centres will be evaluated in different groups during the period October 2013 – October 2015, see appendix 1.

The evaluation team

Each Centre will be evaluated by a team of international experts. Two experts in the team will have the competence and the task to evaluate the Centre from a scientific point of view. 2 persons in the team will have a more "generalist" experience from similar programmes for

university-industry/public sector research collaboration. These “generalist” experts will look at the Centre from a general point of view. The scientific experts will evaluate one specific Centre while the “generalist” experts will participate in the evaluation of two or more Centres. Each Centre has to suggest at least eight scientific experts. It is important that the Centres can guarantee no conflict of interest with the proposed experts.

The task of the evaluators

This third evaluation of the Centres will be carried out during year 8 of the Centre’s operation.

Its primary purpose is to evaluate the output from the Centres in the form of scientific, societal and industrial results and the impact of these results on end-users, in particular the partners in the Centre.

Thus, the evaluation will focus on scientific and industrial/public sector achievements to date and results that have been produced/implemented over the last few years. For a successful evaluation, Centres will need to demonstrate that new products or processes have been, or soon will be, taken up by industry/public sector, i.e. with evidence of concrete results of Centre-generated innovation that has been applied in industry or the public sector.

All Centres should, during the evaluation, address the following three points both in the Centre report and at interview:

- A Concrete evidence within the Centre theme of at least two cases (preferably 3-5) of joint projects between the industry/public sector people and the academic researchers that went from joint conception to research to development to production/service in use on the market.
- B Concrete evidence - via proof of technological/other breakthroughs, advancements, transition to industry/public sector, etc. - that competence for Sweden in the knowledge (technical) area of the Centre has been enhanced.
- C Concrete evidence - like new courses, new programmes, also those that have contributed to B. – that transfer of Centre results into teaching and education has occurred.

The evaluators will form an opinion on the approach and measures taken so far by individual Centres to judge the potential for their long-term development. This includes both the major results that the Centre wishes to achieve and see in stage 4 and also beyond stage 4. Evaluators may offer suggestions for remedial action to enhance the prospects for long-term Centre success.

As a basis for the evaluations of the VINN Excellence Centres Vinnova has formulated a number of success criteria (see appendix 3). Centres are asked to prepare reports (prior to the evaluation) according to the guidelines in appendix 4.

The evaluation team will make the evaluation in the context of the success criteria.

The scientific experts on the evaluation team will review the Centre report sections:

- Research Area, Competence Profile and Critical Size
- Research Program and Results

- Centre Partners (from the point of view of research contribution)

They will offer their perspective on the research results in the context of the Vision, Mission and Strategy and financial aspects with respect to support of research and industrial agenda.

The "generalist" experts on the evaluation team will review the Centre report sections:

- Centre Partners (from the point of view of organisational effectiveness)
- Impact on partners
- Financial Report for Stage 3
- Organisation and Management of the Centre.
- Personnel of High Competence

They too will offer their perspective on the Centre organisation and impact in the context of the Vision, Mission and Strategy. They will also comment on the organisation of the report.

Section *Plans for Development* is of interest for the evaluation team to see the future plans for development of the research- and innovation milieu.

Although the individual Centres will be the main focus, the evaluators may also comment on the concept and organisation of VINN Excellence Centre programme.

Organisation of the evaluation

The composition of the evaluation team is decided by Vinnova. The evaluation team that conducts the interviews decides on the distribution of work among its members.

The basic documentation, in principle, for the evaluation is as follows:

- the Centre report to the evaluation team, delivered by the Centres to Vinnova,
- the operational plan of Stage 3 (If the operational plan has been upgraded during Stage 3 the new version should be submitted to Vinnova)
- the most recent report of the International Scientific Advisory Board
- the evaluation report of Stage 2.

These documents will be distributed by Vinnova to all of the evaluators not later than 6 weeks prior to the evaluation. The evaluation team will deliver its pre-interview draft evaluation report including queries (maximum 4 pages) to Vinnova four weeks prior to the evaluation interview. This draft report will then be sent to the Centre for comment. The Centre's comments should be delivered to Vinnova for transfer to the evaluation team not later than two weeks prior to evaluation interview.

See detail delivery dates in Appendix 2.

Each evaluation interview session starts with the evaluation team introductory meeting the day (evening) before the evaluation interviews and ends when the evaluation report is completed. It ends when the evaluation report is completed during the same day. The goal is that the first draft of the final evaluation report should be finished on the day of the interview. Experts not

attending the interview will participate by phone during the pre-meeting and in the post-interview discussion.

During the interview session the evaluation team is interested in meeting:

- the Centre Director,
- the Chairman of the Centre Board of Directors and several board members
- representatives from several of the industrial and public partners (both groups if relevant) including at least two from SMEs (if relevant),
- university staff incl. representatives from the Vice-Chancellor's office,
- as many as possible of the research leaders and/or program directors active within the Centre, and
- as many as possible of the doctoral students.

Vinnova staff will be present at the site visits. The staff will act as administrators/observers and will not take active part in the evaluation, but can add information during work sessions.

Each evaluation interview will take place over *one* day between 9.00 – 12.30. The evaluation team meet all main parties from the Centre (see above) as a group. The Centre should prepare a presentation focusing particularly on the Centre's results to date and the impact of these results on end-users, in particular the partners in the Centre. The presentation should be timed to take no longer than 30 minutes, leaving ample time for questions and discussion, noting that when the presentation is given, the members of the evaluation team will generally ask questions through the presentation. Thus the presentation is best thought of as the 'organizing thread' for the interview. The sessions will be chaired by one of the generalists who will have responsibility for guiding the pace and direction of the interview. At least 30 minutes of the interview will be devoted to a doctoral-students-only meeting with the evaluation team. See detailed schedule in appendix 2.

The evaluation report is due approximately 5 weeks after the interview sessions.

Fourteen of the VINN Excellence Centres has been evaluated and three more will be evaluated during October 2015 - see appendix 1.

Centre arrangements in connection with the evaluation

The Centres are asked to propose at least eight scientific experts for the evaluation and send the suggestions to Vinnova on request. It is important that the Centres can guarantee no conflict of interest with the proposed experts.

The basic documentation from each Centre (the Centre report including the financial report) will be distributed by Vinnova to the members of the evaluation team not later than 6 weeks prior to the evaluation. The template for the Centre report is presented in appendix 4.

The Centre report should be submitted electronically (pdf-files) to Vinnova and be available at Vinnova not later than dates presented in appendix 2.

Financial reporting from each Centre shall be submitted to Vinnova no later than dates presented in appendix 2. The Centre must be prepared to have dialog with Vinnova concerning

potential clarification and provision of additional information to the financial report before the interview.

The Centre will also provide to Vinnova the most recent report of the International Scientific Advisory Board. If the operational plan has been upgraded during stage 3 the Centre should send this as a pdf-file to Vinnova not later than six weeks prior to evaluation. These documents, along with the evaluation report (of Stage 3) of the Centre, will be provided to the evaluation team by Vinnova. Vinnova requires, prior to the evaluation, copies of the IP agreements that each Centre's university has signed with each of the staff and students of the Centre (in accordance with the Centre Agreement). Those documents should be sent as a PDF file (s) to Vinnova not later than dates presented in appendix 2.

See delivery dates for all documents for each group of evaluation in appendix 2.

Furthermore the Centres should:

- book a location for the interview sessions - see detail time planning of each individual centre in appendix 2. For the centre FASTE and FUNMAT the interview will be at Vinnova in Stockholm. Vinnova book location for those centres.
- send address to Vinnova for the location where the interview take place
- arrange sandwiches/coffee for the 15 minutes brake (approximately 10.30)
- invite Centre representatives to the interview sessions
- inform Centre representatives about time and place for interview (see appendix 2)
- send a list of Centre representatives that will come to the interview two weeks prior to the interview
- note that for Antidiabetic Food Centre (AFC) travel/accommodations of Centre representatives should be covered by centre or partner.
- provide paper copies of presentations at the start of evaluation interview
- provide name cards for the table for all participants during the interview
- provide to Vinnova access arrangements for evaluators to password-protected parts of Centre web sites where project plans and reports should be available one month prior to the evaluation
- provide to Vinnova any comments on and respond to any queries in the pre-interview draft evaluation report at least two weeks before the evaluation interview. This information should be sent to Vinnova not later than dates presented in appendix 2.

Finally the Centre leader should confidentially review, with respect to facts, the first draft of the final evaluation report from the evaluation team (after interview) and deliver any comments to Vinnova within one week of receiving the draft final report.

Report of the evaluation team

The work of the evaluation team shall result in a report on the VINN Excellence Centres evaluated. Each Centre evaluation report should be the consensus view of the evaluation team. The evaluation team shall be unanimous in its recommendations.

Each report will focus particularly on the output from the Centres in the form of scientific and industrial results and the impact of these results on end-users, in particular the partners in the Centre, and will have sections dealing with each Centre as outlined:

- Impact of Centre results on partners and others and plans for development in Stage 4 and beyond
- Organisation, Management and Finances of the Centre
- Centre Partners
- Research Area, Competence Profile and Critical Size, Centre Partners (from the point of view of research contribution)
- Research Program and Results
- Personnel of High Competence

Another section will deal with comments on the concept of the VINN Excellence Centre programme, including discussion of any identified structural and organisational problems.

Following the submission of the final report from the evaluators, Vinnova requests a discussion with each Centre regarding the recommendations in the evaluation team's report. The focus of the discussion will be on present and potential output and outcome for all partners, financial support and any structural matters. In the discussion priorities of actions will be included.

Handling and distribution of the evaluation report

The report from the evaluation team will be presented to Vinnova. The report will also be openly circulated to all Centres and, on request, to any other agency or person who have expressed an interest in this type of information.

Remuneration to the evaluators

Vinnova will pay for all costs for evaluation team members including travel, accommodation etc. According to Vinnova's standards for international evaluations, remuneration of € 1200/day is paid to each member on the generalist evaluation team for the evaluation of a specific Centre. Each expert has a remuneration of € 1200 (per centre).

Appendix 1, Interviews 2015

Group 4

CENTER	DATES
AFC	13 October
IPACK	14 October
BIMAC INNOVATION	15 October

Appendix 2, Delivery dates and Detail Time Schedule

Group 4

DOCUMENT	LATEST DELIVERY TO VINNOVA
IP AGREEMENTS	31 August
FINANCIAL REPORT	31 August
CENTRE REPORT INCLUDING FINAL FINANCIAL REPORT	31 August
LAST REPORT OF THE INTERNATIONAL SCIENTIFIC ADVISORY BOARD	31 August
UPDATED OPERATIONAL PLAN (ONLY IF UPDATED)	31 August
ADDRESS TO VINNOVA FOR THE LOCATION WHERE THE INTERVIEW TAKE PLACE	31 August
DELIVERY FROM VINNOVA OF DRAFT EVALUATION REPORT TO EACH CENTRE NLT	21 September
COMMENTS FROM CENTRES ON EVALUATION REPORT SENT TO VINNOVA NLT	28 September

Evaluation group 4

October 13-15, 2015

All evaluation takes place in Stockholm.

AFC

Monday, October 12, Hotel

18.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Tuesday, October 13, Vinnova.

09:00 - 10:30 Presentation of centre and discussion

10:30 - 10:45 Coffe break

10:30 - 11:15 Meeting with PhDs

11:15 – 12:30 Continuation of discussions

12:30 End of interview session

iPACK

Tuesday, October 13, Hotel

18.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Wednesday, October 14, KTH

09:00 - 10:30 Presentation of centre and discussion

10:30 - 10:45 Coffe break

10:30 - 11:15 Meeting with PhDs

11:15 – 12:30 Continuation of discussions

12:30 End of interview session

BiMaC Innovation

Wednesday, October 14, Hotel

18.00. Introductory meeting evaluation team and Vinnova at hotel. One expert on phone.

Thursday, October 15, KTH

09:00 - 10:30 Presentation of centre and discussion

10:30 - 10:45 Coffe break
10:30 - 11:15 Meeting with PhDs
11:15 – 12:30 Continuation of discussions
12:30 End of interview session

Appendix 3, Success Criteria for VINN Excellence Centres

In brief, successful VINN Excellence Centres are characterised by the following:

- Promoting sustainable growth by ensuring that new knowledge and new technological developments generated lead to new products, processes and services.
- Leading international research in different fields in collaboration between the private and public sectors, universities and colleges, research institutes and other organisations which conduct research.
- Research programmes are set up and carried out in collaboration between the various participants in order to solve key issues.
- The majority of work is conducted at a university or a college to achieve a critical size and interaction between research, post-graduate education and graduate education.
- Long-term implementation with comprehensive evaluations prior to new agreement periods to secure long-term effects and international excellence.
- Long-term collaborative finance from private and public sectors, the university/college and financing governmental agencies, to be able to recruit, develop and keep people with leading international competence.
- The activities are overseen by a board where the participants from the public and private sectors hold the majority in order to secure the direction of the Centres towards the requirements of the private and public sectors, i.e. needs-driven research.
- Set up in innovation environments with effective innovation operations so that strong research and innovation milieus can be created (Centres of Excellence in Research and Innovation).

When completing the evaluation it will also be considered:

- The gender perspective in the research programme; and
- Equality aspects and active promotion of an equal balance of gender.

Appendix 4, Instructions and template for Centre Reports to the Evaluation Team

Each of the Centres to be evaluated has to submit a report to Vinnova, electronically (pdf-files). The reports will be forwarded to the evaluation team by Vinnova. Guidelines for report contents and length follow. Facts about the Centre are to be compiled in section 10. It is recommended that other sections of the report refer to and emphasize these basic facts in order to put them in the relevant context. The Centre Report should be co-authored by all members of the management team of the Centre, e.g. they are all signatories of the report, and the report should be approved by the board prior to release (to Vinnova).

Above all it is important for the Centre to “tell its story” especially, for this evaluation, with regard to the output from the Centre in the form of scientific, societal and industrial results and the impact of these results on end-users, in particular the partners in the Centre. If the recommended format is not conducive to this, judicious variation of the format is allowed.

All pages indicated below are maximum

Title page bearing the signatures of the co-authors and, indicating approval, the signature of the chair of the board

Summary (maximum 1 page)

- Progress and prospects of the Centre, important quantitative (and qualitative) results for Swedish growth, highlights, breakthroughs, etc.
- Summarise the major outputs from the Centre in the form of scientific, societal and industrial results.
- Provide a summary of how results have been utilized by partners.

Long-term Vision, Mission and Strategy (0,5 page)

- Provide a ten-year perspective on the Vision, Mission and Strategy of the Centre in the context of the Success Criteria, see appendix 3. Indicate if there have been any significant changes in the Vision, Mission and Strategy of the Centre during Stage 3.

Research Area, Competence Profile and Critical Size (2 pages)

- Briefly describe the core competency of the Centre's research team both in terms of research competency (e.g. we have strength in molecular biology, metabolomics and large scale computation) and personnel.
- Describe the facilities that the Centre has developed or plans to develop to support the program.
- Describe the personnel and facilities available to the Centre (through collaboration within or beyond the university) that contribute to establishing competence profile for the research of the Centre.
- State the position of the Centre when compared with internationally leading groups.
- Comment on new types of collaborations since establishing the Centre.
- Describe the value added by being a Centre compared to other methods of research collaboration.
- Comment on the Centre with respect to "critical size".

Research Program and Results (5 pages)

- Provide a detailed overview of the research program highlighting the major research results.

- Provide brief descriptions of the research projects, led by either academic or industrial partners. In addition to basic science and methodology, describe the need the research addresses, the questions to be answered and the industrial objectives.
- Provide a summary statement concerning research productivity. (Particulars of research output are to be listed in the Appendices under Publications and Presentations Activity and International Activity).
- Describe any major changes in research direction.

Centre Partners - companies and public service partners (3 pages)

For each of the partners describe:

- their corporate profile (number of employees, main products, location of operations etc.).
- how their business interests are aligned with the Centre research efforts
- how they interact with the Centre (including planning, personnel and facilities).
- how many years they have been active partners of the Centre

Concerning the overall strategy and considering the Centre as a whole:

- describe and give examples of the way in which key issues are identified by partners to stimulate needs-driven research.
- describe and give examples of the mechanisms for innovation and translation of technology into new products, processes, and services.
- give examples of what measures have been taken to achieve strong links and integration between academia and companies/public services, and among companies/public services.

Impact on partners (and the rest of society) (10 pages)

- Provide a detailed overview of the major industrial and societal results achieved by the Centre and describe how these results and the research results have been utilized by partners and others to establish new products, processes and services to date.
- In particular, provide concrete evidence within the Centre theme of at least two cases (preferably 3-5) of joint projects between the industry/public sector people and the academic researchers that went from joint conception to research to development to production/service in use on the market.
- Also provide concrete evidence - via proof of technological/other breakthroughs, advancements, transition to industry/public sector, etc. - that competence for Sweden in the knowledge (technical) area of the Centre has been enhanced.
- For results utilisation that is proposed for the future, provide a description of how the partners anticipate using and implementing the results from the Centre.

Financial Report for stage 3 (1 page)

- Discuss any concerns regarding financing matters.
- Describe existing sources of non-Centre funds supporting related research.
- Describe the nature of in-kind contributions, both personnel, equipment, testing, etc. It is important to be as complete as possible in reporting of in-kind contributions so that the evaluators can see the true magnitude and understand the nature of the in-kind contributions.

Organisation and Management of the Centre (1 page)

- Describe the role, relationship and activities of the organizational units in the Centre, e.g. Board of Directors, Management team, International Scientific Advisory Board.
- Comment on the scientific/industrial leadership of the Centre.
- Describe and give examples for the development processes of the Centre, e.g. result implementation in industry/public sector, project selection, project review, project termination etc.
- What steps are taken to stimulate innovation processes from ideas/results to products and services? Give examples and indicate how often these processes have been employed during the last stage.
- Describe the status and role of the Centre vis-à-vis the:
 - partners
 - university organisational units.
 - central administration.
 - the Faculty.
 - other Centres.
- Comment on things that work well and things that don't. Give examples.
- Describe the communication procedures to Centre participants and partners.
- Describe measures taken to provide equality of opportunity, particularly but not only, from a gender perspective.

Personnel of High Competence (2 pages)

- Describe and give examples for measures taken to stimulate mutual personal mobility between the industrial/public services partners and academic milieus.
- Describe and give examples of the contribution of the Centre to university education (graduate and undergraduate): e.g. courses taught, seminars given, students supervised other than those already listed under research projects, etc.
- In particular, provide concrete evidence - like new courses, new programmes in the knowledge (technical) area of the Centre - that transfer of Centre results into teaching and education has occurred.
- What measures have been taken to recruit, develop and keep people with leading international competence?
- What is the percentage of students associated with the Centre whose first degree is from:
 - another University?
 - outside Sweden?
- What measures have been taken to provide opportunities for students to travel or study abroad?
- What measures have been taken to improve equal opportunities and gender balance?

Plans for Development (3 pages)

- Describe the plan for development of the Centre over the next two years (Stage 4) in relation to the long-term objectives. Concentrate on results and implementation of results in industry/public sector.
- Describe the plan for development of the Centre beyond stage 4.

Further information (1 page)

- Please provide information of particular interest to the evaluation team that has not been covered in any other section of the guidelines.

Response to the evaluation report (stage 2) before start of stage 3 (2 pages)

- Present the outcome (the implementation) of each recommendation given from the evaluation in end of stage 2 (before start of stage 3). You can refer to other chapters in this report, if appropriate.

Facts about the Centre

A *CV* in summary of the Centre Director (1 pp)

B *Centre Partners*

TABLE 1: List Centre Partners (Companies/public sector units), the name, position and location of the key contact

C *Board of Directors*

TABLE 2: List the name, position, company, and location of the members of the Board of Directors

D *Management Team*

TABLE 3: List the name, position in the University, role on the team for the persons in the Management Team

E *International Scientific Advisory Board*

TABLE 4: List the name, position, university/company, location for the members of the International Scientific Advisory Board, list the dates of all formal ISAB meetings in stage 3.

F *Research Program*

TABLE 5: Research Projects and Staff (for each project: project title, project leader, staff and student names, start/end date, and person-years by year (include company and public sector personnel also)).

G *Publication and Presentation Activity*

TABLE 6: List publications (with citations and journal impact factors), patents, theses, posters, presentations, invited lectures, etc. Include work funded by Vinnova. Also include other closely related work funded by other means, indicating that other funding was used by an asterisk*.

H *International Activity*

TABLE 7: List collaborations with international researchers, visits outside Sweden (conferences, seminars, university visits, etc.), and foreign visitors to the Centre. Include work funded by Vinnova. Also include other closely related work funded by other means, indicating that other funding was used by an asterisk*.

I *Financial Reports* (use the templates in appendix 5 (in the attached Excel file “Financial Report for stage 3”))

TABLE 8: Overall resources available

TABLE 9: Overall expenditures

TABLE 10: Research personnel

TABLE 11: Project expenditures

TABLE 12: Related research grants

J *Websites*

Provide relevant websites for the Centre, the University, research partners, research collaborators, etc.

- (Provide access to password-protected parts of centre web sites where project plans and reports should be available.)

Appendix 5, Templates for the Financial Statements of stage 3 (will be sent to the Centre as MS Excel)

Instructions	
The tables have autosum function	
Table 8 Resources	This table should present the overall resources available (cash as well as in-kind) for center activities, one row for each financial source. Budget figures for year 8 (12 months) should be included. Outcome for year 8 should be for first six months (or other suitable period for year 8 - write date for outcome). Include all contributions that support the Centre activities.
Table 9 Expenditures	All expenses for the center at an aggregated level.
Table 10 Personel	List all personnel working in the centre. Preferably group them in order to use the information in other parts of the report. Do only report person over 5 % FTE.
Table 11 Projects	All projects should be listed here. Follow up that resources have been used for learning activities and communication (5% of VINNOVA funding), list of projects and financial size. Include all contributions that supports the Centre activities
Table 12 Related Grants	List of additional funding that explicitly strengthens the center activities without directly financing it. Only indicate grant that are bigger than € 70 000.

VINN Excellence Center:	
Dnr:	
Year 6:	200x-xx-xx - - 200x-xx-xx
Year 7:	200x-xx-xx - - 200x-xx-xx
Year 8:	200x-xx-xx - - 200x-xx-xx

Table 9: Overall Expenditures

Please indicate the actual time of year 8 that cover the outcom

List all expenses for the centre at an aggregated level.

	Year 6:						Year 7:					
	Budget (kSEK)			Outcome (kSEK)			Budget (kSEK)			Outcome (kSEK)		
	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total
Salaries (from "Staff sheet")												
External services												
Equipment												
Material, running costs etc.												
Travel												
Other												
Overhead costs												

Sum

	Year 8:						Summary Stage 3					
	Budget (kSEK)			Outcome (kSEK)			Budget (kSEK)			Outcome (kSEK)		
	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total
Salaries (from "Staff sheet")												
External services												
Equipment												
Material, running costs etc.												
Travel												
Other												
Overhead costs												

Sum

Vinnova´s publications

January 2016

See vinnova.se for more information

Vinnova Analysis

VA 2015:

- 01 Årsbok 2014 - Svenskt deltagande i europeiska program för forskning & innovation
- 02 Samverkansuppgiften i ett historiskt och institutionellt perspektiv
- 03 Långsiktig utveckling av svenska lärosätens samverkan med det omgivande samhället - Effekter av forsknings- och innovationsfinansiärens insatser
- 04 Företag i Tåg- och järnvägsbranschen i Sverige - 2007-2013
- 05 FoU-program för Små och Medelstora Företag - Metodologiskt ramverk för effektanalyser
- 06 Small and beautiful - The ICT success of Finland & Sweden
- 07 National Research and Innovation Councils as an Instrument of Innovation Governance - Characteristics and challenges
- 08 Kartläggning och behovsinventering av test- & demonstrationsinfrastruktur

VA 2014:

- 01 Resultat från 18 VINN Excellence Center redovisade 2012 - Sammanställning av enkätresultaten. (For English version see VA 2014:02)
- 02 Results from 18 VINN Excellence Centres reported in 2012 - Compilation of the survey results. (For Swedish version see VA 2014:01)
- 03 Global trends with local effects - The Swedish Life Science Industry 1998-2012
- 04 Årsbok 2013 - Svenskt deltagande i europeiska program för forskning och innovation.
- 05 Innovations and new technology - what is the role of research? Implications for public policy. (For Swedish version see VA 2013:13)
- 06 Hälsoekonomisk effektanalys - av forskning inom programmet Innovationer för framtidens hälsa.
- 07 Sino-Swedish Eco-Innovation Collaboration - Towards a new pathway for shared green growth opportunity.
- 08 Företag inom svensk massa- och pappersindustri - 2007-2012
- 09 Universitets och högskolors samverkansmönster och dess effekter

VA 2013:

- 01 Chemical Industry Companies in Sweden
- 02 Metallindustrin i Sverige 2007 - 2011
- 03 Eco-innovative Measures in large Swedish Companies - An inventory based on company reports
- 04 Gamla möjligheter - Tillväxten på den globala marknaden för hälso- och sjukvård till äldre
- 05 Rörliga och kopplade - Mobila produktionssystem integreras
- 06 Företag inom miljötekniksektorn 2007-2011
- 07 Företag inom informations- och kommunikationsteknik i Sverige 2007 - 2011
- 08 Snabbare Cash - Effektiv kontanthantering är en tillväxtmarknad
- 09 Den svenska maritima näringen - 2007 - 2011
- 10 Long Term Industrial Impacts of the Swedish Competence Centres
- 11 Summary - Long Term Industrial Impacts of the Swedish Competence Centres. Brief version of VA 2013:10
- 12 Företag inom svensk gruv- och mineralindustri 2007-2011
- 13 Innovationer och ny teknik - Vilken roll spelar forskningen. (For English version see VA 2014:05)
- 14 Företag i energibranschen i Sverige - 2007-2011
- 15 Sveriges deltagande i sjunde ramprogrammet för forskning och teknisk utveckling (FP7) - Lägesrapport 2007-2012
- 16 FP7 and Horizon 2020

Vinnova Information

VI 2015:

- 01 Insatser för innovationer inomHälsa
- 02 FFI Årsrapport 2014 - Samverkan för stark svensk fordonsindustri och miljöanpassade samt säkra transporter
- 03 Social innovation - Exempel
- 04 Social innovation
- 05 Årsredovisning 2014
- 06 Sweden needs FFI (for Swedish version see VI 2015:10)
- 07 Innovation för ett attraktivare Sverige - Underlag till regeringens politik för forskning, innovation och högre utbildning 2017-2020 - Huvudrapport
- 08 Förutsättningar för innovationspolitik i Sverige - Underlag till regeringens politik för forskning, innovation och högre utbildning 2017-2027 - Analysrapport
- 09 Utmaningsdriven innovation - Samhällsutmaningar som tillväxtpotentialer (for English version see VI 2015:11)
- 10 Sverige behöver FFI (for English version see VI 2015:06)
- 11 Challenge-Driven Innovation - Societal challenges as opportunities for growth (for Swedish version see VI 2015:09)

VI 2014:

- 01 Tjänsteinnovationer 2007
- 02 Innovationer som gör skillnad - en tidning om innovationer inom offentliga verksamheter
- 03 Årsredovisning 2013
- 04 VINNVÄXT - A programme renewing and mowing Sweden ahead
- 05 Replaced by VI 2015:01
- 06 Din kontakt i EU:s forsknings- och innovationsprogram
- 07 VINNOVA - Sveriges innovationsmyndighet. (For English version see VI 2014:10)
- 08 Visualisering - inom akademi, näringsliv och offentlig sektor
- 09 Projektkatalog Visualisering - inom akademi, näringsliv och offentlig sektor
- 10 VINNOVA - Sweden´s Innovation Agency (For Swedish version see VI 2014:07)

VI 2013:

- 01 Branschforskningsprogrammet för skogs- & träindustrin - Projektkatalog 2013
- 02 Destination Innovation- Inspiration, fakta och tips från Ungas Innovationskraft

- 03 Inspirationskatalog - Trygghetsbostäder för äldre
- 04 Replaced by VI 2015:11
- 05 Replaced by VI 2013:14
- 06 Årsredovisning 2012
- 07 Trygghetsbostäder för äldre - en kartläggning
- 08 Äldre entreprenörer med sociala innovationer för äldre - en pilotstudie kring en inkubatorverksamhet för äldre
- 09 Fixartjänster i Sveriges kommuner - Kartläggning och samhällsekonomisk analys. (For brief version see VINNOVA Information VI 2013:10)
- 10 Sammanfattning Fixartjänster i Sveriges kommuner - Kartläggning. (Brief version of VINNOVA Information VI 2013:09)
- 11 Replaced by VI 2014:10
- 12 Replaced by VI 2013:19
- 13 När företag och universitet forskar tillsammans - Långsiktiga industriella effekter av svenska kompetenscentrum
- 14 No longer available
- 15Handledning - för insatser riktade mot tjänsteverksamheter och tjänsteinnovation
- 16 Replaced by VI 2013:22
- 17 Innovationer på beställning - tidning om att efterfråga innovationer i offentlig sektor
- 18 Replaced by VI 2014:06
- 19 Arbetar du inom offentlig sektor och brinner för innovationsfrågor? - VINNOVA är Sveriges innovationsmyndighet och arbetar för att offentlig sektor ska vara drivkraft för utveckling och användning av innovationer
- 20 Programöversikt 2014 - Stöd till forskning och innovation
- 21 OECDs utvärdering av Sveriges innovationspolitik - En sammanställning av OECDs analys och rekommendationer.
- 22 Att efterfråga innovation - Tankesätt och processer

Vinnova Report

VR 2016:

- 01 Third Evaluation of VINN Excellence Centres - AFC, BiMaC Innovation, BIOMATCELL, CESC, CHASE, ECO2, Faste, FUNMAT, GHz, HELIX, Hero-m, iPack, Mobile Life, ProNova, SAMOT, SuMo & WINGQUIST
- 02 Third Evaluation of Berzelii Centres - Exselent, UPSC & Uppsala Berzelii Centre

VR 2015:

- 01 Bumpy flying at high altitude? - International evaluation of Smart Textiles, The Biorefinery of the Future and Peak Innovation
- 02 From green forest to green commodity chemicals - Evaluating the potential for large-scale production in Sweden for three value chains
- 03 Innovationstävlingar i Sverige - insikter och lärdomar
- 04 Future Smart Industry - perspektiv på industriomvandling
- 05 Det handlar om förändring - Tio år som följeforskare i Triple Steelix
- 06 Evaluation of the Programme Multidisciplinary BIO - The strategic Japanese-Swedish cooperation programme 2005 - 2014
- 07 Nätverksstyrning av transportinnovation
- 08 Ersättningsystem för innovation i vård och omsorg - En studie av åtta projekt som utvecklar nya ersättningsmodeller

VR 2014:

- 01 Väger till välfärdinnovation - Hur ersättningsmodeller och impact bonds kan stimulera nytänkande och innovation i offentlig verksamhet
- 02 Jämställdhet på köpet? - Marknadsfeminism, innovation och normkritik
- 03 Googlemodellen - Företagsledning för kontinuerlig innovation i en föränderlig värld
- 04 Öppna data 2014 - Nulägesanalys
- 05 Institute Excellence Centres - IEC - En utvärdering av programmet
- 06 The many Faces of Implementation
- 07 Slututvärdering Innovationsslussar inom hälso- och sjukvården

VR 2013:

- 01 Från eldsjälsvivna innovationer till innovativa organisationer - Hur utvecklar vi innovationskraften i offentlig verksamhet?
- 02 Second International Evaluation of the Berzeli Centra Programme
- 03 Uppfinningars betydelse för Sverige - Hur kan den svenska innovationskraften utvecklas och tas tillvara bättre?
- 04 Innovationsslussar inom hälso- och sjukvården - Halvtidsutvärdering

- 05 Utvärdering av branschforskningsprogrammen för läkemedel, bioteknik och medicinteknik
- 06 Vad ska man ha ett land till? - Matchning av bosättning, arbete och produktion för tillväxt
- 07 Diffusion of Organisational Innovations - Learning from selected programmes
- 08 Second Evaluation of VINN Excellence Centres - BiMaC Innovation, BIOMATCELL, CESC, Chase, ECO2, Faste, FunMat, GigaHertz, HELIX, Hero-m, iPACK, Mobile Life, ProNova, SAMOT, SuMo & Wingquist
- 09 Förkommersiell upphandling - En handbok för att genomföra FoU-upphandlingar
- 10 Innovativa kommuner - Sammanfattning av lärdomar från åtta kommuner och relevant forskning
- 11 Design av offentliga tjänster - En förstudie av designbaserade ansatser
- 12 Erfarenheter av EU:s samarbetsprogram - JTI-IKT (ARTEMIS och ENIAC)

VR 2012:

- 01 Utvärdering av Strategiskt gruvforskningsprogram - Evaluation of the Swedish National Research Programme for the Mining Industry
- 02 Innovationsledning och kreativitet i svenska företag
- 03 Utvärdering av Strategiskt stålforskningsprogram för Sverige - Evaluation of the Swedish National Research Programme for the Steel Industry
- 04 Utvärdering av Branschforskningsprogram för IT & Telekom - Evaluation of the Swedish National Research Programme for IT and Telecom
- 05 Metautvärdering av svenska branschforskningsprogram - Meta-evaluation of Swedish Sectoral Research Programme
- 06 Utvärdering av kollektivtrafikens kunskapslyft
- 07 Mobilisering för innovation - Studie baserad på diskussioner med 10 koncernledare i ledande svenska företag
- 08 Promoting Innovation - Policies, Practices and Procedures
- 09 Bygginnovationers förutsättningar och effekter
- 10 Den innovativa vården
- 11 Framtidens personresor - Slutrapport. Dokumentation från slutkonferens hösten 2011 för programmet Framtidens personresor
- 12 Den kompetenta arbetsplatsen
- 13 Effektutvärdering av Produktionslyftet - Fas 1: 2007-2010



Vinnova - strengthening Sweden's innovativeness

POST: Vinnova SE-101 58 Stockholm Sweden OFFICE: Mäster Samuelsgatan 56
+46 8 473 30 00 vinnova@vinnova.se vinnova.se