

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*

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Title: 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*

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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 billion in various initiatives.

VINNOVA is a Swedish government agency working under the Ministry of Enterprise, Energy and Communications 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.

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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 extremely 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 program VINN Excellence Center Program in 2005 funding 4 centres and in 2007 funding 15 centres. These centres have now been operating for over five years and this report presents the results of the second evaluation of these centers.

The evaluation of stage two, year 3-5, of VINN Excellence Centers is focused on the long-term output and outcome to the partners; industrial-, public- and academic partners. The evaluation is an opportunity to give advice and recommendations on how each center can become even more efficient and effective.

Based on the evaluation results, VINNOVA has decided that 17 out of 19 centers will be approved for a third period.

On behalf of VINNOVA I want to express our great appreciation to all the international evaluators. I especially want to give our gratitude and sympathy for the generalist evaluators, Anne H Anderson, Douglas Reeve, Per Stenius, Bob Johnston, Alison McKay, Mary O'Kane, Heidi Dreyer, Anja Skrivervik, and Sybrand van der Zwaag that has met 19 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 Center Program and VINNOVA as such.

VINNOVA in November 2013

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 Programme level – Overall impressions and recommendations

Preamble

The generalists were impressed with the amount of very significant scientific and technological work being undertaken by the VINN Excellence centres and the highly capable people that are working in and being developed in the centres. Swedish industrial and public sector partners have contributed greatly to the value adding capacity of the centres which has begun to and will continue to contribute to the growth of the Swedish economy and the betterment of Swedish society.

Evaluation Team Documentation, Composition and Processes

The evaluation process was initiated by VINNOVA by specifying the content and length of specific elements of the reports that each centre was to submit to the evaluation team. The reports were required to include high-level statements of vision and purpose and detailed descriptions of goals, results, methodologies, organization, partner involvement, educational efforts, personnel and finances. Evaluators were also provided with the Operational Plan for Stage 2, the Stage 1 evaluation report, and the most recent report from the International Scientific Advisory Board.

The centres dedicated significant effort in preparing these reports and many did so in an exemplary fashion. In a few cases reports did not provide a full and clear picture of the accomplishments of the centre.

Each evaluation team consisted of experts with high-level, international expertise in the field of the centre and generalists with broad, international knowledge of university-industry research; typically there were at least two of each on each evaluation team. To evaluate the nineteen VINN Excellence centres, thirty-eight experts were commissioned by VINNOVA to address matters concerning research vision, strategy, projects, progress and translation of technology to society. Nine generalists were commissioned by VINNOVA to address matters such as organisation and management, finance, interaction between partners and the university, gender aspects, and educational activities. Generalists were commissioned to evaluate multiple centres providing a perspective for comparing practices across centres and ultimately at the program level. The evaluation process at the centre site involved a series of meetings, usually within a 48 hour period: an introduction and briefing with VINNOVA; the experts' interview with the centre; the team's interview with PhD students; the team's interview with the centre on generalist matters; conferring with VINNOVA personnel on background; and finally, team deliberations and report writing (excluding VINNOVA personnel). In addition to their particular responsibilities, experts and generalists worked closely as a team and were, as a team, responsible for the report on the centre that was made to VINNOVA.

The drama and intensity of the interview should not be underestimated. Senior centre staff are not only on show to the evaluation team but also to their colleagues. There is thus considerable personal pressure on senior staff during the interview, particularly on the directors. It would be beneficial to have an additional 30 minute interview at the completion of the generalist interview, at which only the Director, Deputy Director, Business Manager and Chairman of the Board attend. This select group could make confidential statements and respond to any further sensitive questioning.

Recommendation:

- That the generalists' interview be extended to include an additional 30 minutes attended only the Director, Deputy Director, Business Manager and Chairman of the Board.

The generalists recognize the substantial effort made by the centres to prepare for the evaluations, both in documentation and in presentations. We appreciate the unfailing cooperation and courtesy of centre personnel.

The generalists view is that the composition and processes of the evaluation team provided an efficient and effective means of assessing the progress and prospects of a centre. The generalists are pleased to report that, in our view, the calibre of the experts was, without exception, outstanding. Also we can happily report that the evaluation teams were always collegial, productive and high-minded.

1.1 Centre Performance and the Implications for Program Improvement

Overall Recommendations and Assessment

Each evaluation team began its deliberations with a preliminary bottom-line recommendation to VINNOVA to: 1) fund; or 2) adjourn the evaluation to allow the centre to make corrections and be re-evaluated; or 3) not fund. The team would then discuss particular recommendations to strengthen the centre and after thorough deliberation on those, return to the bottom line recommendation to VINNOVA. The recommendations to VINNOVA for the 19 VINN Excellence Centres were:

Fund – 14 centres

Adjourn – 5 centres

Subsequently 3 of the adjourned centres undertook the necessary changes and were funded, 2 were closed.

The 19 VINN Excellence centres can be broadly ranked in three categories:

Excellent: Excellent, international-calibre research, strong organization, and significant industrial impact - 6 centres were found to be excellent.

Acceptable: Strength and or promise in research, organization and impact with some need for improvement - 10 centres were found to be acceptable.

Unacceptable: 5 Centres were found to have unacceptable performance in one or more of research, organization and impact requiring substantive remediation - 3 of the adjourned centres undertook the necessary changes and were funded, 2 were closed.

Note that the generalists did not find any VINN Excellence centre that reached the level of world leading in all respects: science, organization, and impact.

The evaluation teams made a total of 218 recommendations to 18 VINN Excellence centres (not including the 19th centre NGIL which was closed). Per centre, the average was 12 and with the range from 4 to 20 recommendations. The number of recommendations is an indicator of the number of concerns the evaluation team had and for the magnitude of the remedial action that was deemed necessary for the centre. The evaluation teams sometimes found that recommendations from the first round evaluation (VINNOVA's report published in 2009) had still not been acted upon. We also note that many of the recommendations made in the first round of evaluations were identified to VINNOVA as requiring program level remedial action by VINNOVA and yet the deficiencies have persisted.

A number of the common recommendations were made to multiple centres. These often repeated recommendations might logically lead again to recommendations to VINNOVA for changes in policy and or procedures for management and/or evaluation of centres. Note that an evaluation team's intent is to strengthen the centre they evaluate and to strengthen the VINN Excellence program. Feedback with improvement of a centre in mind is given at several levels of increasing import: comment, suggestion and recommendation.

What follows is an enumeration of the recommendations made to individual centres grouped so as to show patterns that led to program level observations and recommendations.

Vision, Strategy and Organization

Problem areas identified in 2009 included: ineffective vision statements; absence of transparent processes for selection, review and termination of projects; unclear organizational structures, systems, and processes; and lack of visual identity. Visual identity issues have generally been resolved.

Ten centres received recommendations concerning vision statements and strategy requiring actions such as: revise vision statement, renew strategic plan; report progress against strategic plan; provide metrics for progress in uptake by industry; report progress against the recommendations of the last evaluation; devise means of speedier translation from university to industry.

Eight centres were given recommendations for improved project management calling for actions such as: formalize project selection process; increase transparency of selection process; increase rigour of project review; evaluate projects against success criteria; evaluate projects against key performance indicators; improve linkages between projects; and consolidate and integrate project portfolio.

Many of the early stage organizational problems have been resolved and there were only five centres given new recommendations for improved centre management: increase size of the

management team; formalize roles of those on the management team; develop succession plan for the Director.

There were a number of issues concerning organization of centre Boards. Twelve centres received recommendations for improvement, for instance: better representation from the senior levels of university, increased representation of SMEs; renewal of Board membership to eliminate any appearance of conflict of interest; and in a few cases, increase Board activity and responsibility.

Centre Leadership

Since the launch of the competence research centre programs in 1996, a strong and continuous improvement in Centre leadership has been observed. In many cases this is a direct result of successful efforts by VINNOVA to promote leadership skills through courses and regular meetings between Centre leaders.

Internationalization

International activity, as a broad category, received considerable attention from evaluators, with recommendations for a number of methods by which centres can raise the level of their work to international standards. Many centres were found to be insufficiently international in areas such as benchmarking, collaborations, publications, funding and recruitment. It must be noted that “leading international research” is one of the success criteria of the VINN Excellence program.

One VINNOVA strategy for increasing internationalism in VINN Excellence Centres was to require centres to establish arms-length, high-calibre, scientific review panels that would meet at regular intervals, namely International Scientific Advisory Boards (ISABs). The early stages of the program had numerous short-comings in the effective use of ISABs and the 2009 report made explicit recommendations for improvement at the program level. Nonetheless there were eleven centres found to be deficient in their use of an ISAB. Recommendations included actions required such as: ISAB to hold annual face-to-face meetings; renew ISAB membership to establish arms-length members; establish terms of reference for ISAB procedures; and ISAB to submit an annual written report to the Board.

As many as twelve centres had recommendations to increase international scientific activity on subjects such as: collaborations, exchanges, profile, benchmarking, funding and publications (number and impact).

International recruitment was also recommended for program improvement in 2009. While some centres have proactive and successful programs for recruiting international research personnel, five centres had recommendations to increase recruitment of international PhD students, Post-Docs and senior researchers.

Finances and Financial Reporting

Generally, centre finances were in good order with partners contributing appropriately. However in the case of five centres the evaluation team recommended that industry partners increase their cash support noting that, while in kind contributions are important and essential for successful university-industry partnerships, cash is critical to universities.

In kind reporting requires greater attention in the case of nine centres. Several centres appeared to be very casual about reporting in kind, for example, indicating during the interview that the actual was much larger than reported but since the threshold of required contribution had been reached there was no point in adding more in kind. There is, however, great value to all, evaluators included, to have accurate reporting of in kind contributions so that the true magnitude of the joint enterprise can be properly understood. Two problems associated with valuation of non-personnel in kind were identified: 1) unless there is a market basis for valuation of a good or service transferred, an independent valuation is required; and 2) some goods and services were transferred from industry to centres without being accounted for, thus lessening the industry partner's reported contribution and lessening the reported magnitude of the centre enterprise.

Gender Issues

Recommendations were made to nine centres to increase the proportion of women among one or more of the following: students, researchers, senior researchers, the ISAB and the Board.

Partners in the Centre

Recommendations were made to eleven centres concerning opportunities to improve the partner group. Recommendations called for action on several issues: increase number of companies; increase number of SMEs; and increase targeted value-adding partners.

In summary, the recommendations categorized and listed above show a pattern. There are widespread opportunities for strengthening the centres. In particular it is noted that at least half the centres received numerous detailed recommendations on the following subjects:

- Vision Strategy and Organization
- Internationalization
- Finances and Financial Reporting
- Gender Issues
- Partners in the Centre

1.2 Considerations for Future Evaluations

Centre Operational Plans and Key Performance Indicators

When centres attracted criticism, it could often be traced back to poor connections between strategic plans and operational plans and indeed many centre reports to the evaluation team failed to refer back to their approved Stage 2 Operational Plans. This was often associated with, and may have been caused by, poor definition of Key Performance Indicators (KPIs) and KPI targets in the Operational Plan. Progress during Stage 2 would be much easier to measure and evaluate if KPIs were rigorously used as the basis for both operation and reporting.

The use of standard formats for Operational Plans is to be commended but there should be increased scrutiny of plans submitted for approval at the start of each stage.

The role of VINNOVA contact staff for each centre could be greatly enhanced, and the centres given better continuous feedback if these staff could readily refer to clear KPIs and meaningful budgets.

VINNOVA Success Criteria

The success criteria (see Appendix) for the Berzelii Centres and the VINN Excellence Centres are essentially the same. This is not a desirable state of affairs as the implicit emphases of the two types of centres are different. The presence of VR as a major sponsor of the Berzelii Centres ensures that the emphasis on the success criterion “*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*” is very strong while the prime success criterion for the VINN Excellence Centres is probably “*Promoting sustainable growth by ensuring that new knowledge and new technological developments generated lead to new products, processes and services.*”

As part of Stage 2 Evaluations, one evaluation team also evaluated SAFER at Chalmers University of Technology, Gothenburg. This Centre had not been funded as a VINNEX centre and neither was it working towards VINNEX success criteria. In the absence of clear guidelines, the Evaluation team found their task problematical.

Recommendation:

- That success criteria for Berzelii Centres, VINN Excellence Centres, and any other specifically funded Centres are clearly differentiated so that it is clear to all stakeholders what the long-term expectations are for each of these types of centres.

From an analysis of the recommendations of centre evaluators, it is clear (for all programs) that in many cases the centres underestimate the importance in the early years of attending to the mechanics of good governance, good management, partner complementarity and involvement, financial management and IP in order to establish effective machinery for achieving impacts that are more than the sum of the parts long-term.

In conclusion

The centre evaluations confirm that by international standards, the program continues to rank highly, with some centres rated excellent and most making steady progress. This is to the credit of talent, commitment and leadership of the academic and partner participants and to the management of the program by VINNOVA staff. As expected there is still some scope for improvement, and examination of the centre evaluation reports makes it clear that there are numerous common issues that must be the focus of attention to ensure greater success in the future.

Recommendations:

- That VINNOVA institute a mechanism and establish personnel for auditing centre response to recommendations and adherence to guidelines on at least an annual basis, in particular with respect to:
 - Responses to recommendations

- Financial reporting
- In kind reporting
- ISAB reporting
- Significant deviations from the operating plan
- Key Performance Indicators including metrics for influence on national productivity
- International exposure and interaction with non-Swedish parties
- That VINNOVA requires each centre to have a plan for being self-sustaining after 10 years as a success criterion for Stage 3 evaluations.
- That before the start of a next evaluation round, that there be a round of consultation and discussion between VINNOVA and the generalists regarding VINNOVA vision and strategy regarding the continuing success of the centres and the roll of the evaluation process.

Generalist Evaluators:

Doug Reeve (Chair)

Anne Anderson

Heidi Dreyer

Robert E. Johnston

Alison McKay

Mary O’Kane

Anja Skrivervik

Per Stenius

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2 Assessment of the Individual Centres

2.1 Evaluation of BiMaC Innovation

VINN Excellence Centre at The Royal Institute of Technology – KTH, Stockholm

Introduction

On 26-27 September 2012, the Chair of the Centre Board, Göran Bengtsson, the Centre Director, Tom Lindström, colleagues of the BiMaC Innovation VINN Excellence Centre, PhD students, external partners, and university representatives, had meetings with the international evaluation team at Royal Institute of Technology (KTH) to evaluate the Centre's performance in Stage 2. The scientific experts of the evaluation team, Art Ragauskas and Ulrike Wegst, addressed matters concerning research strategy, projects, and progress. The generalist evaluators, Mary O'Kane (Chair), Alison McKay, and Anja Skrivervik, together with the experts in a subsequent meeting, addressed matters such as organisation and management, finance, interaction between industry partners and the university, and educational activities. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation. We especially appreciate the way in which the Centre Director with colleagues addressed the recommendations from previous reviews. The Centre's handling of this issue could be picked up by VINNOVA as a model for other centres.

2.1.1 Long-term Vision, Mission and Strategy

The research team is encouraged to maintain an integrated vision, mission and strategy.

2.1.2 Scientific Quality and Productivity

The scientific output of BiMaC falls into the categories of journal and conference papers, PhD, licentiate, MS and BS theses, reports, patents, international seminars as well as seminar at KTH, international visits as well as visits to KTH, and BiMaC days.

ACTIVITIES	JOURNAL PAPERS	CONFERENCE PAPERS	PHD THESIS	LICENTiate THESIS	MS THESIS	BS THESIS	REPORTS
2012	13	14					
2011	7	21	1	1	2		6
2010	6	9	2	1	7		3
2009	8	8			1	1	
2008	4	1			2		
2007	1						

ACTIVITIES	PATENTS	SEMINARS AT KTH	INTERNATIONAL SEMINARS	VISITS TO KTH	INTERNATIONAL VISITS	BIMAC DAYS
2012	2	1		1	4	
2011	3	1	1		2	1
2010			2	2	2	1

Journal Papers

The publication rate is balanced for DLP5 and DLP6. The publication rate has been increasing steadily. Joint industry-KTH BiMaC publications are encouraged. The quality of the papers and the journals in which they were published ranged from good to excellent.

Conference Papers/Presentations

The quality and quantity of conference papers and presentations were high.

Patents

The five patents originate from DLP6. The industrial value of these patents seems to be high as a first patent has been licensed and a second is in the process of being assumed by industry partners.

Theses

Three PhD and two licentiate theses have been successfully defended at KTH. These frequently take the form of a literature review as well as an executive summary of published journal papers and the journal papers themselves. Master theses are frequently completed in collaboration with the industrial partners. Some of the Masters students have been retained in academia, continuing their PhD research at KTH. Many have been recruited and have found employment with the industrial partners.

Reports

Nine reports have been published. The Centre is encouraged to consider whether these reports could be published as journal papers to reach a broader audience at a later date.

Software

DLP5 should explore whether their unique expertise and software development related to their modelling effort could be protected and made available to a broader audience, both in academia and industry, to set the industry standard.

Recommendation:

- 1 That the Centre accelerates the publication of accomplishments both in terms of number and quality of publications.

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

Research Area

Success Criterion: Research programmes are set up and carried out in collaboration between the various participants in order to solve key issues

Timely and highly relevant focussed research topics are being pursued and supported by industry partners. The driving forces for innovation are partly the quest for a competitive advantage and partly to satisfy consumer demands as well as being driven by legislation.

Competence Profile

Multiple disciplines, ranging from chemistry to mechanical engineering, participate in the Centre. This is a particularly important strength and attraction for industry. Research projects and publications are indicative of a truly *multidisciplinary* program. The industrial partners represent a range of paper, board and packaging companies of small, medium and large size.

People

The nationally and internationally recognised experts involved in BiMaC are a great strength of the Centre. There is a good gender balance in the graduate students that are involved in BiMaC research. The international background and mobility of the graduate students were also noted.

Success Criterion: A gender perspective in the research programme

This criterion is met.

Facilities

Excellent laboratory facilities are provided in-kind by KTH, industry and, additionally, by international collaborators. Access to pilot-plant papermaking equipment at Innventia is a competitive advantage that seems to be well integrated into the research program.

Critical Size

The program management team has identified a series of technical leaders at KTH to pursue the Centre's research vision and this is now leveraged with an excellent group of graduate students.

International Comparators with other Centres and Collaborations

Success Criterion: 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

There is a convincing rationale for the choice of international collaborations and project partners now. The collaborative effort with TU Dresden is highly complementary; KTH provides materials, TU Dresden the processing expertise. A notable accomplishment of this collaboration is the value the Centre's students see in these collaborations. Students participate in exchanges and have helped coordinate conferences as part of their graduate education. The collaborative effort with the Centre's Japanese partners promotes the scientific exchange between DLP6 scientists and their Japanese counterparts.

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

Critiques of Research Programs and Projects

It is desirable that the Centre collates the information and knowledge gained by all partners in a central, standardised and easily accessible format. Currently no such data repository exists.

Science

The quality of the presented science was excellent and cutting edge.

Methodology

New techniques, both experimental and numerical, have been developed for materials characterisation and modelling.

Technological Outcomes

One patent has been licensed, one is in the process of being licensed and a further three are in transfer from the lab to industry. Unfortunately, documentation of this transfer and its value to industry could not be deduced from the written report or the oral presentations but was reviewed in the panel/program management discussions.

Recommendations:

- 2 That the Centre develops a comprehensive knowledge management policy including rules for data access.
- 3 That in implementing the knowledge management policy, the Centre creates a data repository where all Centre data are deposited.
- 4 That the Centre develops its own set of quantifiable success criteria (a refinement of the VINNOVA ones) and indicators to measure performance.

Success Criterion: Ensuring that new science based knowledge generated leads to new products, processes and services.

Several examples of this were highlighted in the evaluation meetings.

Processes for Idea Generation

The process for idea generation is strong; an example is Forest Beyond. The Centre's management team has developed a good idea generation methodology and assessment tools; students reflect a very promising acceptance of new ideas and opportunities to pursue them. The industrial advisory panel is very supportive of these efforts and seems to champion them.

Summary and Overall Conclusion - Scientific Quality and Productivity

The quality of the Centre's research is high and the number of publications and patents is growing. Graduate students appear to progress well through their graduate programs. There seems to be an excellent balance between fundamental research, education and innovation. The technology transfer to industry is ongoing and first successes could be reported.

2.1.3 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

The Centre has a good complement of highly-committed industrial partners.

Success Criterion: 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).

The co-evolution of projects and Demonstrator Line Projects between academic and industrial members provided evidence that this criterion is very well satisfied by the Centre.

Processes for Needs Identification and Articulation

The Centre has well-developed and effective processes for needs identification and articulation.

Partner Participation in Innovation and Technology Translation

Discussions surrounding the translation of Centre results to industry lacked clarity and were described through a metaphor of an iceberg where the submerged portion represented industry take-up. This lack of clarity was also reflected in the low in-kind contributions of some industrialist staff (1% and 2% in some cases). However, in discussions, several industrial partners provided examples of technology-transfer projects within their companies that build on BiMaC research. The industrial partners explained further that these projects have substantial company resources allocated to them and were expected to deliver significant business benefits.

Success Criterion: Promoting sustainable growth by ensuring that new knowledge and new technological developments generated lead to new products, processes and services

This criterion is met.

Commercialisation Successes and Benefits to Society

Three patents have resulted from the Centre and two patent applications are in process.

Comments from the industrial partners indicate that commercialisation successes and societal benefits are very likely to result from Stage 3.

Recommendations:

- 5 That the Centre works with industry partners to estimate, on a regular basis, more realistic in-kind contributions from industry related to the translation of research results into their organisations.
- 6 That the success criteria (see earlier recommendation) include indicators that can be used to quantify the scale of industrial take-up of the research results.

2.1.4 Organisation and Management of the Centre

The Board's Role

The Centre has an active and involved Board led by a very effective Chairman. One issue that the evaluation team believes needs further work by both the Board and senior management is succession planning. This is a risk mitigation issue aimed at ensuring that the Centre retains its high level of functioning over the next 5 years of its operation as a VINN Excellence Centre.

Recommendation:

- 7 That the Centre strengthens its succession planning processes to ensure sustainability of the current high quality of research and innovation.

Success Criterion: 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

The Centre meets this criterion.

Success Criterion: Did the Board ensure that the Centre implemented recommendations of previous evaluations prior to secure long-term effects and international excellence?

The Board and management have addressed the recommendations of the previous evaluations particularly well.

Management Team Structure, Processes and Performance

The management team is operating well and has sensible management processes in place.

The International Scientific Advisory Board (ISAB)

The ISAB is well constituted and meets annually. The report of its last meeting was constructive and supportive.

Relationship to the University and to University Units

Success Criterion: The majority of work is conducted at a university to achieve a critical size and interaction between research, postgraduate education and graduate education.

The Centre is located at a world-class university.

The University clearly supports this Centre.

The evaluation team applauds the Centre's intention to consider involving a wider range of academic disciplines in the next Stage.

Communication and Promotion

The work being carried out in the Centre is inspiring. Industry could use material from the Centre to mount an aggressive outreach programme to attract young people into the pulp and paper industry.

Financial Management

The reporting of finances was of an excellent standard.

Success Criterion: 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.

This criterion is met.

2.1.5 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The evaluation team commends the Centre on its recruitment policy. In setting up and actively using a transdisciplinary Recruitment Advisory Team, it has been able to recruit very diverse and qualified students and junior scientists. This practice has also had a beneficial effect on gender issues at the junior level. The PhD students are very aware of the advantages of being part of the Centre. They especially value having direct access to transdisciplinary knowledge, industry and opportunities for innovation activities and international mobility. In order to build further on these assets, the evaluation team feels that the PhD students, as well as all partners of the Centre, would greatly benefit from having a common room at KTH dedicated to informal gatherings and discussions.

Recommendation:

- 8 That the University provides a room of its own to the Centre for informal gatherings, discussions and exchanges.

Mobility of Personnel between University and Industry

The University researchers are well integrated with their industrial partners through the research projects. The PhD students receive considerable feedback from industry on the quality and usefulness of their results, and are well exposed to the problems linked to industrial innovation.

An interesting scheme of Master Thesis works supervised by the Centre's PhD students but actually taking place at the industrial partners' premises is currently being set up. The evaluation team commends this initiative, as it facilitates the active collaboration between partners and gives the PhD students an opportunity to learn management skills.

Contributions to University Education

The evaluation team commends the Centre on its strategy for educating its PhD students. The approach taken allows the PhD students to learn about innovation processes in a hands-on manner through working with the industrial partners of the Centre while at the same time being exposed to more formal courses on innovation through KTH's Doctoral Schools.

Gender Perspectives and training for senior roles in research

Success Criterion: Equality aspects and active promotion for an equal balance of gender

The Centre has a proactive policy on gender perspectives. It has set up a Recruitment Advisory Team which considers this issue in recruitment exercises, and has a general awareness of gender issues. The evaluation team suggests that the Centre should also take this issue into account when considering and implementing its succession policy.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Centre accelerates the publication accomplishments both in terms of number and quality of publications.

- 2 That the Centre develops a comprehensive knowledge management policy including rules for data access.
- 3 That in implementing the knowledge management policy, the Centre creates a data repository where all Centre data are deposited.
- 4 That the Centre develops its own set of quantifiable success criteria (a refinement of the VINNOVA ones) and indicators to measure performance.
- 5 That the Centre works with industry partners to estimate, on a regular basis, more realistic in-kind contributions from industry related to the translation of research results into their organisations.
- 6 That the success criteria (see earlier recommendation) include indicators that can be used to quantify the scale of industrial take-up of the research results.
- 7 That the Centre strengthens its succession planning processes to ensure sustainability of the current high quality of research and innovation.
- 8 That the University provides a room of its own to the Centre for informal gatherings, discussions and exchanges.

Recommendations to VINNOVA

The Centre was an exemplar in terms of meeting the reporting guidelines. We hope other centres will be advised to report on the recommendations of previous evaluations as well as this Centre did.

Recommendations:

- That VINNOVA requires VINN Excellence Centres to submit a formal audited statement of accounts for the last financial year before an evaluation.
- That VINNOVA, in its end-of-Stage reporting instructions, requires centres explicitly to report against recommendations from the previous Stage evaluation
- That VINNOVA considers developing well-calibrated metrics to quantify performance of centres in terms of impact on national productivity.
- That VINNOVA requires each centre to have a plan for being self-sustaining after 10 years as a success criterion for Stage 3 evaluations.
- That VINNOVA establishes a high-profile PhD Innovation Prize open to all students in VINNOVA centre programs.

In conclusion

The evaluation team is of the opinion that the Centre is a very good example of a VINN Excellence Centre. Assuming the current good practices within the Centre are maintained and with the expectation that the above recommendations are addressed, the evaluation team recommends continued funding.

Mary O’Kane (Chair), Alison McKay, Art Ragauskas, Anja Skrivervik & Ulrike Wegst

2.2 Evaluation of BIOMATCELL

VINN Excellence Centre at University of Gothenburg

Introduction

On October 3-4, 2011, the Centre Director, Peter Thomsen, colleagues of the BIOMATCELL Centre, PhD students, industry partners, and university representatives, had meetings with the international evaluation team at University of Gothenburg to evaluate the Centre's performance so far in Stage 2 (April 1, 2009 – March 31, 2012). The scientific experts of the evaluation team, Shohei Kasugai and Mário Barbosa, addressed matters concerning research strategy, projects, and progress. The generalist evaluators, Robert Johnston (Chair), Mary O'Kane and Heidi Dreyer together with the scientific experts, in a subsequent meeting, addressed matters such as organisation and management, finance, interaction between industry partners and the university, and educational activities. In addition, the whole evaluation team met with 6 PhD students, and 3 postdocs discussing their background, research topics and experiences in the BIOMATCELL Centre and their future plans. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.2.1 Long-term Vision, Mission and Strategy

In order to become a global leader in the research and development of innovative medical devices based on biomaterials and cell therapies, the BIOMATCELL Centre should identify its competitors and carry out a benchmarking exercise. Apart from excellence in research, technology transfer, advanced training and internationalisation should be taken into consideration. The time frame to achieve the Centre's very ambitious goal should also be clearly defined, with intermediate steps and, whenever possible, with the identification of verifiable key performance indicators. The Centre should be aware of the existence of very strong international players, well established and very well funded. Particularly in the field of regenerative therapies, the Centre should not ignore that it is behind other centres. However, it could take advantage of the unique combination of expertise it has of academic researchers, the clinical environment and the industrial partners.

The focus on musculoskeletal research makes a lot of sense, but the synergies with Cellartis seem to have not been adequately explored. Also, the five existing projects are in different processes of maturation and the involvement of industry in some (Bioactive, Osteochondral, Biomembrane and Nano, in particular) is sub-optimal. Noble seems to be the only project with a clear commitment from industry. The Centre should revise its strategy, by adopting a more integrative approach, i.e. improve communication between project teams, involvement of clinicians in the establishment of research priorities in the design of projects and in their execution, and by improving the support of the majority of the industrial partners.

The project structure of the Centre, with five individual projects operating in a relatively unconnected fashion should be assisting technology transfer, but this (lack of) structure weakens the Centre's claim to be a unified entity where the whole is greater than the sum of the parts.

Recommendations:

- 1 That the Centre revisit its strategic plan with the assistance of the ISAB, to obtain full potential of the excellent scientists in the Centre
- 2 In planning for Stage 3, that the Centre focus the science of the Centre's researchers, and match it to the partner needs, clinical needs and realistically potential commercial products

2.2.2 Scientific Quality and Productivity

The Centre is led by Professors Peter Thomsen (Director) and Jukka Lausmaa (Deputy Director) who are world-class scientists in the field of biomaterials and surface properties. Other scientists with excellent academic records are integral to the Centre, covering a complementary range of scientific areas that are essential for biomaterials development. Most publications have appeared in highly-ranked journals, such as *Biomaterials* and *Tissue Engineering*. A considerable number of papers are co-authored by members of the industrial partners, mainly from TATAA Biocenter AB, and Cellartis AB. It is somewhat surprising that no paper has been co-authored with persons affiliated to Sandvik AB, in spite of the high relevance given in the report to the development of a new alloy.

The BIOMATCELL researchers have not consistently used the affiliation to BIOMATCELL VINN Excellence Centre, thus reducing the visibility of their Centre. A literature search conducted on the Web of Knowledge indicates that since 2009, 14 publications have been credited to BIOMATCELL. However, the scientific productivity of the PIs of the Centre is much larger than this. The Centre should consider the positive influence that generalised adoption of BIOMATCELL identification would have on the recognition of a corporate image.

Three out of the 14 papers mentioned above have co-authors from other countries (Germany, UK, Denmark and Norway). If international collaborations increase, as recommended in this report, it is likely that the percentage of publications with partners from other countries will also increase, thus impacting on the internationalisation of the Centre.

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

The Centre has decided to focus on musculoskeletal applications, which is well justified by the prominent role that University of Gothenburg has been playing in this field. The senior researchers in the Centre have the ability to conduct the proposed research. However, neither the abilities nor the degree of involvement of the collaborating companies are clear.

The facilities and the size of the Centre are fine, providing a good environment for research and innovation.

During the site visit difficulties in establishing Tissue Engineering in Sweden were invoked by the Director as a major constraint to developing this area in the Centre. Part of the resources allocated to the Centre should be directed to this field, if the Centre really aims at playing a leading role in regenerative medicine, as hinted by members of the Board. A wise combination of biomaterials science and technology and cellular therapies, taking advantage of the presence of Cellartis in the same building, could be instrumental in this respect, particularly if accompanied by an active involvement of orthopaedic surgeons, in the design of novel

strategies and therapeutic applications. The area of so-called “combination products” holds great promise and has been very little developed in Europe.

Recommendation:

- 3 That the Centre explore further the potential of collaboration with Cellartis and other companies in the area of tissue engineering and regenerative medicine.

International Comparators with other Centres and Collaborations

The Centre has established contacts with centres in Europe, USA and China, but they have not yet reached a stage of really effective collaboration that would bring with it joint publications and mobility of staff and students. The relatively short-term visits (up to 3 months) are not adequate instruments to establish strategic partnerships. If the Centre is to build effective collaborations, a more consistent and formal strategy is needed. Within the available budget the Centre should consider extending the periods of training abroad with a concomitant reduction in the number of supported visits. This reduction can be counterbalanced by a more pro-active recruitment strategy of foreign students. The Research School BIOSUM can play an instrumental role in this strategy. It is suggested that some key international partners of BIOMATCELL be identified and invited to become formally involved in BIOSUM, thus creating a truly international research school led by two prestigious and complementary universities: Gothenburg and Chalmers.

Recommendation:

- 4 That the Centre develop a more consistent and formal strategy for building effective collaborations with major international centres in related research fields.

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

Bioactive project

This project is actually composed of five sub-projects: 1. Ion substituted HA prepared by biomimetic coatings; 2. Mesoporous titanium oxide; 3. Thin films produced by PVD; 4. Alloy element toxicity; 5. Alloy development. This is a very wide and rather unfocused project in areas which have been extensively explored by numerous groups. Active involvement of Sandvik in alloy development is quite positive, however the body of evidence provided on the advantages of the alloy under development (Ti-Zr-Ta-Nb) was meagre, as no comparison with existing alloys was given. Of concern also is the problem of translation of the biomimetic coatings being developed into a usable product. From the scientific point of view the work carries little novelty and unless a company is interested in developing the technology, the benefits of this sub-project will be marginal.

Osteochondral project

This is a very innovative project aiming at regenerating cartilage and bone, by exploring the role of inflammatory signal and signalling pathways. If the Centre wishes to implement novel strategies for osteochondral regeneration this is certainly a flagship project that should be taken up further, particularly taking advantage of the collaboration with Cellartis. This project requires

developing or identifying an ideal scaffold. Thus, stronger input from materials scientists is strongly recommended.

Nano Project

Examining cellular responses to different topographies prepared by nano-technologies might provide scientifically important information to develop a new material not only in bone field. The titanium surface prepared on the polystyrene balls is interesting, but clinical application of this technique seems to be difficult because the long-term outcome of using a surface containing polystyrene is not clear. BIOMATCELL is focusing this project on promotion of osseointegration of implants; however application of this new technology to seal soft-tissue around implants is also interesting and worthwhile. The lack of involvement of an interested company and minimal contact with clinicians is of concern, particularly because the project is rather unfocused. It could clearly benefit from inputs from both the industry and clinicians, particularly in the dental field.

Membrane project

The originality of the project is questionable, since it is using a modified collagen membrane provided by a company (Key-stone Dental Inc.) Membranes for guided-tissue regeneration (GTR) or guided-bone regeneration (GBR) in next generation should possess the ability to deliver signalling molecules to stimulate bone and soft tissue healing. This particular membrane, however, seems to be inappropriate for delivering signalling molecules to stimulate regeneration, despite its surface promoting cell attachment. Collaboration with organic material scientists is strongly recommended to develop a different GTR or GBR membrane. Incorporation of titanium dioxide particles has been suggested, but their role remains to be tested.

Processes for Idea Generation

It appears that the several projects run separately and independently. Good communications among project groups of BIOMATCELL and among researchers of BIOMATCELL and clinicians (dentists and orthopaedic surgeons) are strongly recommended. Obviously, it is very important to reconfirm clinical problems in dental and orthopaedic fields and then to decide the direction of each project in the next stage.

In order to promote an environment more favourable to emerging new ideas, the annual meeting, though important, is not enough. There are a number of tools currently used in other research centres, such as weekly scientific meetings and monthly workshops attended by all researchers that could prove highly beneficial particularly for students. Also, as part of the process of development of stronger and coherent interfaces with companies, training of students in an industrial environment should be strongly encouraged. This does not necessarily imply research work at the company, but they should learn good industrial practices, quality procedures and IP issues, for example.

Apart from contact with industrial environments, exposure to other research laboratories, namely through periods of training abroad, would be greatly beneficial for generating new ideas. Periods of 6 to 12 months, rather than the present maximum of 3 months, should be strongly encouraged.

Overall Conclusion - Scientific Quality and Productivity

Some of the researchers of the Centre have clearly reached international recognition for their contribution to biomaterials science. Their productivity is very good and they have published in top journals in the field. The use of BIOMATCELL affiliation in all publications would considerably increase the visible output of the Centre.

There are several scientifically-relevant new findings, such as the communication of pro-osteogenic signals of human monocytes to hMSCs.

2.2.3 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

At the end of Stage 2 the Centre has 8 industry and public sector partners: Arcam AB, Bactiguard AB, Cellartis AB, Integrum AB, Keystone Dental Inc., Sandvik AB, Tataa AB, and Region VästraGötaland. Research partners are SP Technical Research Institute of Sweden and University of Gothenburg (which separately contracts Uppsala University and Chalmers University of Technology).

Centre partners appear to be cooperating well with obvious added value arising from this cooperation. The evaluation team would have welcomed a larger representation from industry partners at the generalist interview on the second day, where there were only two company partners represented. On the other hand it was particularly pleasing to see that the potentially problematical sub-contract arrangements had been working smoothly.

Consideration is being given to increasing the range of industry partners for Stage 3 and it was pleasing to see that the Board was taking a lead in that regard. The evaluation team were concerned that the Director implied that the consortium agreement had and could in the future constrain changes in membership. This should not be the case as the agreement should include, in addition to good IPR agreements, clear and encouraging guidelines for changes in membership.

Processes for Needs Identification and Articulation

This aspect of the Centre appears to be satisfactorily inline with VINNOVA guidelines. The evaluation team noted that an upcoming workshop with all parties, to identify needs, was a critical part of the planning for Stage 3.

Partner Participation in Innovation and Technology Translation

Although there are only a few industrially-useful results so far, the processes for technology translation appear to function. There are several patents that can be clearly attributed to Centre inventions so prima facie the processes work. Non-patent facets of the IPR agreement also appear to be satisfactory as company representatives spoke highly of the benefits they get from being in the Centre, including specific research results that increase the potential of profitability.

Translation should be expected to speed up in the near future

Commercialisation Successes and Benefits to Society

It is too early for proven commercialisation successes and benefits for society, however there is clear potential and Stage 3 plans should focus on achieving, measuring and, articulating these. This will be important in attracting new partners.

2.2.4 Organisation and Management of the Centre

The Board's Role

The Board is well constituted. It has appropriately accepted responsibility for strategy as well as for monitoring of management performance and progress against plans. However financial oversight could be improved to avoid accumulation of unspent funds between stages.

The Centre included several pages of fact tables as an appendix to the evaluation report, however no key performance indicator (KPI) matrix was provided summarising performance against the most critical and strategic indicators of Centre success. Such a KPI matrix could be very helpful in maintaining strategic focus.

Recommendation:

- 5 That the Board and management work together to develop a KPI matrix to ensure that the chosen key performance indicators truly provide information on progress on the Centre's short and long-term goals and delivery on the Centre Mission.

Management Team Structure, Processes and Performance

The Centre has an energetic and committed director who is ably assisted by his deputy and a management team including a financial controller. The management team appears to understand what is needed for the Centre to be 'more than the sum of the parts' but more attention could be profitably be paid to communication (see below) and to directing the excellent science in the Centre to clinical and partner needs (see above).

International Scientific Advisory Board's Role

The Centre has world-renowned scientists on its International Scientific Advisory Board (ISAB). The evaluation team heard that the ISAB meets formally once a year and has been helpful in reinforcing the Centre's determination to build on its strengths, and in giving feedback on projects, especially to PhD students. However the evaluation team was disappointed that no formal report from the ISAB was made available to it; nor did such a report seem to exist, rather a summary of the ISAB comments to the Board is included in the Board record of meeting. A more formal report would allow for the ISAB's candid comments, criticism, and suggestions to be noted in an arm's-length manner. Such a report could then be circulated and acted on by the Board and other bodies such as industry partners that the Board might choose to share it with.

Recommendation:

- 6 That the International Scientific Advisory Board prepare a formal report after each of its meetings.

Communication

Several communication aspects of the Centre could be improved including:

- communication between Centre projects with a view to increasing cross fertilisation between them
- revising and improving the processes for ensuring that new researchers in the Centre understand fundamental issues such as confidentiality and intellectual property processes and associated responsibilities
- increasing the awareness of the BIOMATCELL brand especially through relatively simple devices such as making it a formal requirement that all Centre researchers include BIOMATCELL as their nominated affiliation on publications.

Recommendation:

- 7 That the Centre make improved internal and external communication and branding a major priority in Stage 3.

On a positive note, the evaluation team commends the Centre on its website and notes the relatively recent appointment (on a 0.2 basis) of an enthusiastic communication manager.

Relationship to the University and to University Units

The Centre is well supported by its university partners especially the host university, Gothenburg University, and its commercial arm, GU Holding AB. This support also extends to the university units involved and, increasingly, to related clinical units in the university hospital. Also pleasing is the strong support from Region VästraGötaland for the Centre.

A highlight of the support from the University is the excellent new facilities for the BIOMATCELL activities at Gothenburg University with several related biomedical companies housed in the same building.

The Report to the Evaluation Team

The report to the evaluation team was well presented with appropriate commentary on challenging issues.

Financial Management

The quality of the detail in the Tables 8-11 of the Centre report was generally very good.

One issue that was not highlighted in the report was the degree of surplus cash (input over expenditure). Accepting that the predictions for Year 5 will be achieved, the Centre will have spent approximately 9.8, 14.0, and 20.0 M SEK in years 3,4 and 5 respectively, against cash incomes of 16.3, 11.6, and 14.9 M SEK. This in turn would suggest cash at hand of 6.5, 8.9, and 2.9 M SEK at the ends of years 3, 4 and 5. This does not look like tight management control and hints at late expenditure to balance the books. We were told at interview that imminent initiatives would partly solve the problem. It is surprising however that the board did not take earlier action.

Recommendation:

- 8 That the Board be more pro-active in ensuring that the finances of the Centre follow the operational plans approved by VINNOVA

2.2.5 Training Personnel of High Competence

The Centre has a solid and impressive group of people consisting of Masters students, PhD students (14), lab assistants (5), post docs (3), senior scientists (15), managers and administrative staff. In the meeting with the PhD students and post docs, they gave an enthusiastic impression of their work and research contribution. They indicated great motivation for their scientific work and the projects they were involved in. However some of the students seemed to have a rather vague and naive understanding of their connection to the Centre compared to their connection to the department and the University. This could be attributed to the fact that the majority of the research personnel spend a significant time working with projects outside the Centre. The Centre management should put more effort into establishing a BIOMATCELL environment and milieu, especially since the new Centre facilities really allow them to keep the majority of the personnel in a central location.

Recommendation:

- 9 That the Centre management develops a clear strategy to stimulate formation of an integrated research group and culture particularly among the young scholars

Recruiting and Developing People of International Competence and Experience

The model for recruitment in the Centre seems to be the one whereby mainly domestic Masters students (Gothenburg University and Chalmers) continue as PhD students, with a small number only specifically recruited into the Centre. The vast majority of personnel in the Centre have a good blend of academic and industrial experience, but when it comes to nationality they are mainly Swedish. There are some examples of personnel who have been recruited based on their international competence through a dedicated recruitment process based on announcements on onnaturejobs.com. On average they get 30 applicants per position.

Recommendation:

- 10 That the Centre, together with its partners and BIOSUM, develop an international recruitment strategy that includes an international “6-month internship” model

Mobility of Personnel between University and Industry

The contact and mobility level between the Centre and the industrial partners is excellent regarding research and outcomes. The level of co-publication is very good. Likewise, the level of patent and innovations is very good. The way these results are created, and the mobility model in the Centre, are traditional ones in the sense that Centre personnel seem to mainly meet in workshops, seminars and meetings and not in their laboratories and offices either at the University or in the company.

Gender Perspectives and training for senior roles in research

The report documented and the evaluation meetings demonstrated that the Centre has an excellent research training process, especially for the young scholars. Also the leadership and management model from VINNOVA has been implemented in the Centre. However some of the industrial partners indicated that the PhDs and postdocs could increase their professional knowledge if they were coached and given advice from the industrial partners and senior personnel. The coaching could address issues such as IP, project management, leadership and management, etc.

The gender balance in the Centre is good especially when it comes to the PhD students and post docs. For the PhD students there are 40 % female students and 75% female post docs. At more senior levels in the Centre, the ratio of females is lower; in the Board the percentage has fallen to 25%, while the level of females in the management team is 40%. The Centre could act proactively to motivate early career researchers, particularly women, to take more senior positions in the Centre.

Recommendation:

- 11 The Centre management should put in place a trainee program to develop early career researchers for senior research roles

Contributions to University Education

Together with the SuMo Centre, the Centre has established the valuable BIOSUM PhD school. As well scientists in BIOMATCELL contribute to education at Chalmers University and University of Gothenburg, both in teaching activities and in the planning of future courses and programs. It would seem that contribution of industrial and international partners to the education activities of the Centre could be stronger.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Centre revisit its strategic plan with the assistance of the ISAB, to obtain full potential of the excellent scientists in the Centre
- 2 In planning for Stage 3, that the Centre focus the science of the Centre's researchers, and match it to the partner needs, clinical needs and realistically potential commercial products
- 3 That the Centre explore further the potential of collaboration with Cellartis and other companies in the area of tissue engineering and regenerative medicine.
- 4 That the Centre develop a more consistent and formal strategy for building effective collaborations with major international centres in related research fields.
- 5 That the Board and management work together to develop a KPI matrix to ensure that the chosen key performance indicators truly provide information on progress on the Centre's short and long-term goals and delivery on the Centre Mission
- 6 That the ISAB prepare a formal report after each of its meetings.
- 7 That the Centre make improved internal and external communication and branding a major priority in Stage 3.
- 8 That the Board be more pro-active in ensuring that the finances of the Centre follow the operational plans approved by VINNOVA.

- 9 That the Centre management develops a clear strategy to stimulate formation of an integrated research group and culture particularly among the young scholars
- 10 That the Centre, together with its partners and BIOSUM, develop an international recruitment strategy that includes an international “6-month internship” model
- 11 The Centre management should put in place a trainee program to develop early career researchers for senior research roles

Recommendations to VINNOVA

- Strengthen instructions to Centres on reporting, particularly against operational plan and budget
- Develop a checklist for VINNOVA contact staff to more tightly choreograph the administration of Centre evaluations

In conclusion

The evaluation team is of the opinion that the Centre has developed a novel cooperative Centre that meets VINN Excellence Centre guidelines. With the expectation that the above recommendations are addressed, the evaluation team recommends continued funding.

Robert Johnston (Chair)

Mário Barbosa

Heidi Dreyer

Shohei Kasugai

Mary O’Kane

2.3 Evaluation of Centre of Excellence for Sustainable Communications - CESC

VINN Excellence Centre at The Royal Institute of Technology, Stockholm

Introduction

On May 9-10, 2012, the Centre Director, Mattias Höjer, colleagues of the VINNOVA Centre of Excellence for Sustainable Communications (CESC), PhD students, representatives of the ISAB, the Board, industry and public partners, and university representatives had meetings with the international evaluation team to evaluate the Centre's performance in Stage 2 (July 1, 2009 – June 30, 2012). The scientific experts of the evaluation team, Roland Clift and Kim Davis, addressed matters concerning research strategy, projects and progress. The generalist evaluators, Doug Reeve (Chair), and Sybrand van der Zwaag together with the scientific experts in a subsequent meeting, addressed matters such as organisation and management, finance, interaction between partners and the university, and educational activities. In addition, the whole evaluation team met with PhD students, discussing their background and future plans, and their research and other experiences in the Centre. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.3.1 Long-term Vision, Mission and Strategy

At the previous review in 2009 it was recommended that the management team and Board revisit the title, vision, mission, and strategy statement of the Centre and that “the whole Centre scientific team ... establish common intellectual ground among the projects and use that to develop common frameworks”. Although this recommendation had evidently been discussed, the panel saw little evidence that the discussions had led to more coherence. The work of the Centre has continued to be disparate and fragmented, a point which was also noted by the International Scientific Advisory Board (ISAB) in the 2011 minutes of the annual ISAB review meeting. This is the principal shortcoming of the Centre and if not fixed there is a risk that the Centre will continue to drift and become even more disparate. There is more potential for synergy among the projects than is currently achieved.

Recommendations:

- 1 That the Centre define its generic scientific challenges and intellectual agenda before defining any further specific projects.
- 2 That the Centre revise its vision statement to be coherent and focused.
- 3 That the Centre change its name to reflect the focus on IT for sustainability.

2.3.2 Scientific Quality and Productivity

The scientific output is essentially incremental with no major insights or conceptual leaps. Furthermore the quantity of published work is not proportionate to the resources which have already been expended. The journals in which the Centre's work is published are those which would be expected for incremental research. There has been no success in attracting funding from internationally competitive sources. Funding comes from Swedish government

programmes. These factors combined demonstrate to us that the Centre is not functioning or testing its performance at a level of international excellence.

Recommendations:

- 4 That the Centre pay more attention to increasing the number of high impact publications in both scientific and popular media.
- 5 That the Centre seek internationally competitive funding both to enhance its financial position and to justify claims of international status.

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

The Centre has been established in a field of growing political and academic interest and practical importance. This field requires a multidisciplinary approach and the Centre appears to have established the necessary ethos and foundation. It has also built up a level of enthusiasm and momentum most clearly visible amongst the PhD students associated with the Centre. We recognize that the Centre has an impact locally but the lack of a clear vision continues to hinder its development in the wider political and scientific community.

Following the earlier assessment it was expected that senior management of KTH would take a close interest in this Centre. Given KTH's professed ambition to achieve recognition for work in sustainability and the Centre's lack of international level performance, it appears that KTH senior management needs to take closer interest in the further development of the Centre.

Recommendation:

- 6 That KTH closely monitor the further development of the Centre.

International Comparators with other Centres and Collaborations

Claims of an internationally leading position are not supported by firm evidence. While individual researchers have contacts with other research centres, these appear to be informal and ad hoc. The Centre as a whole does not appear to be involved in any international research consortia and therefore its international standing has not been established.

Recommendations:

- 7 That the Centre assess its own performance by benchmarking itself against international leaders.
- 8 That the Centre actively establish formal linkages with selected leading centres and become active in international consortia.

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

The current projects represent a fragmented portfolio with little evidence of a coherent intellectual or methodological core. This is one of the principal reasons why the full potential of the Centre has not yet been reached.

Recommendation:

- 9 That the Centre develop common intellectual frameworks and apply common methodologies across projects.

Processes for Idea Generation

The current portfolio of work appears to have developed in an ad-hoc fashion with insufficient attention to the possible ramifications of and relationships between projects. A specific example is the “hackathon”: it was an excellent idea as an event promoting public engagement, but no attention seems to have been paid to using it as a vehicle for any targeted purpose or action research. Greater clarity and coherence on the Centre’s unique selling points and focus is essential if a more coherent and sustainable project portfolio is to be realised.

Recommendation:

- 10 That the Centre engage its Stage 3 industrial and public partners in the development of new projects as components of a programme within the framework of the guiding Centre vision.

Overall Conclusion - Scientific Quality and Productivity

The output from the Centre is unremarkable and has not reached the level of international excellence which it potentially could achieve.

2.3.3 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

The 13 Centre partners in Stage 2 come from industry (mainly ICT and media companies), public sector (City of Stockholm, Stockholm County Council, and others) and civil organisations. Eight of the partners make cash contributions to the Centre. Two principal partners (Ericsson and City of Stockholm) indicated that the fact that the Centre is located in Stockholm had positively influenced their original decision to join the Centre.

The 4 partners from the media industry will all leave the centre at the end of Stage 2. In the partner survey and during the meeting with the evaluation team, they indicated a sufficient degree of satisfaction with the functioning of the Centre. However the comments made and the analysis of the time devoted by the representatives of these companies suggest that there has been a mismatch between the output of the Centre and the type of information the companies were looking for. One of the companies previously participating at corporate level stated their intention to leave the Centre but indicated that some subsidiary companies within the group, with more direct interest in the Centre’s work, are likely to continue some engagement but not necessarily as full partners.

Interesting new partners have been identified and two of the potential new partners (Coop and Interactive Institute) even attended the meeting with the evaluation team and expressed a clear interest in joining the Centre. Hammarby Sjöstad was represented at the meeting. Also the City of Stockholm, Ericsson, the Stockholm County Council and TeliaSonera made strong statements in continuing support of the Centre.

The feedback of the partners on the value of the Centre has been recorded in an exemplary manner in the Centre report.

Processes for Needs Identification and Articulation

The processes used to articulate the needs of the partners and translate them into a coherent research programme are obscure. The redefinition of the programme into a smaller number of larger projects represents an opportunity to rectify this.

Recommendation:

- 11 That the Centre develop a transparent project generation and selection process, to ensure that recognized and emergent industry and public partners' needs are addressed.

Partner Participation in Innovation and Technology Translation

On average there seem to have been sufficient, albeit loose and insufficiently structured, interaction between the partners and the Centre. The fact that some of the Centre PhD students held or still hold a job with one of the partners will have positively affected the flow of information between the Centre and its partners. A larger number of industrially based PhD students would be beneficial for this kind of Centre, but to bring that about would require action on the part of VINNOVA.

Commercialisation Successes and Benefits to Society

Several examples of successful Centre-partner collaborations, such as the Green Books for Bonnier, the work for a new travel planner for Stockholm and the widely publicised Green Hackathon initiative, were reported. In the case of the Green Hackathon initiative no proper follow-up to capitalise in an economic sense from the exposure generated has taken place. The evaluation team regards this as an error of judgement by the Centre; it was noted above as part of the rationale for Recommendation 10.

2.3.4 Organisation and Management of the Centre

The Board's Role

The Board is well constituted with 13 members representing public and industry partners and KTH, an external consultant (who is a former Centre Director) and a professor with expertise in the field from another university. The Board seems to function reasonably well with respect to operation of the Centre. However, it has not taken action to support the Centre to overcome the shortcomings in performance enumerated elsewhere in this report and so shares responsibility.

Management Team Structure, Processes and Performance

The Management Team (MT) has a well-articulated structure and sets of processes for management of the Centre and is to be complimented for ably facilitating the operation of the Centre, for instance developing and maintaining partner relations, fostering rigorous student selection procedures, and convening appropriate meetings. We also thought that the democratic style of the Centre was very effective. However, as with the Board, the MT shares responsibility for the shortcomings of the Centre.

The International Scientific Advisory Board (ISAB)

The ISAB is well constituted and met in 2009, 2010 and 2011. Its last report was insightful and useful. The Centre is to be congratulated on commendable operation of the ISAB. Regrettably, the Centre did not respond sufficiently to key suggestions from the ISAB that the evaluation team cites here as being part of the picture of poor performance.

The Report to the Evaluation Team

The report to the evaluation team was well written, informative, precise and consistent in presentation of data, and well executed. The section on partner impact was excellent; it drew on the extensive interview process that the Centre undertook to discover and articulate partner benefits. However, in some respects the report was strong on assertion but weak on evidence.

Communication and Promotion

Activities for promotion and communication appear to be routine and minimal. Given that this is a Centre devoted to communication and aspires to be “international” a more imaginative and effective communication programme would be expected.

Financial Management

The financial data were presented in a clear, consistent, thorough and meticulous manner.

2.3.5 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

During the site visit the evaluation team met with a group of 10 highly committed PhD students. In comparison to similar groups of students met at other Centres the students at the CECS Centre had a much wider range of backgrounds and were generally more mature, with many students having significant work experience prior to joining the Centre as a PhD student. The long-term job ambitions of the students covered both senior academic positions, positions in industry and positions in public organisations. The selection process of the students seems in good order; with sometimes very large (>100) numbers of applicants per position. The gender balance in the student population was in order. While the majority of students were Swedish nationals, a sufficient number of students from abroad have been hired.

Students met on a regular basis. Some of these student interactions had even resulted in joint publications. The Centre is to be complemented for creating such an open, lively and interactive atmosphere.

Regretfully, no policy seemed to be in place to make an internship of sufficient length with research institutes outside the Scandinavian region a regular part of the PhD student educational program. The work-related contacts of the PhD students with the international community in the field were deemed insufficient. This observation is part of the background to Recommendation 8 on establishing international linkages.

Mobility of Personnel between University and Industry

In general there seemed to be adequate interaction between the Centre personnel and the partners from industry and the public sector. The fact that some of the PhD students had held or still held part-time positions with the partners was seen as beneficial to the knowledge exchange. One of the students had effectively an industrial PhD position working at the company.

Gender Perspectives and training for senior roles in research

The Centre seems to conduct an effective gender policy. While gender equality has not been achieved at all levels, the overall Centre gender balance seems fine.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Centre define its generic scientific challenges and intellectual agenda before defining any further specific projects.
- 2 That the Centre revise its vision statement to be coherent and focused.
- 3 That the Centre change its name to reflect the focus on IT for sustainability.
- 4 That the Centre pay more attention to increasing the number of high impact publications in both scientific and popular media.
- 5 That the Centre seek internationally competitive funding both to enhance its financial position and to justify claims of international status.
- 6 That KTH closely monitor the further development of the Centre.
- 7 That the Centre assess its own performance by benchmarking itself against international leaders.
- 8 That the Centre actively establish formal linkages with selected leading centres and become active in international consortia.
- 9 That the Centre develop common frameworks and apply common methodologies across projects.
- 10 That the Centre engage its Stage 3 industrial and public partners in the development of new projects as components of a programme within the framework of the guiding Centre vision.
- 11 That the Centre develop a transparent project generation and selection process, to ensure that recognized and emergent industry and public partners' needs are addressed.

Recommendation to VINNOVA

In conclusion

The evaluation team is of the opinion that the Centre does not perform at the level of international excellence but does have enough added value and local importance to justify continuation of VINN Excellence Centre funding.

Doug Reeve (Chair), Roland Clift, Kim Davis & Sybrand van der Zwaag

2.4 Evaluation of Chase

VINN Excellence Centre at Chalmers University of Technology, Gothenburg

Introduction

On October 4-5, 2011, the Centre Board Chairman, Anders Karlström, the Centre Director, Staffan Sjödin, colleagues of the Chase Centre, PhD students, industry partners, and university representatives had meetings with the international evaluation team at Chalmers University of Technology to evaluate the Centre's performance so far in Stage 2 (January 1, 2009 – December 31, 2011). The scientific experts of the evaluation team, Anja Skrivervik and Martin Haardt, addressed matters concerning research strategy, projects, and progress. The generalist evaluators, Robert Johnston (Chair), Mary O'Kane and Heidi Dreyer together with the scientific experts, in a subsequent meeting, addressed matters such as organisation and management, finance, interaction between industry partners and the university, and educational activities. In addition, the whole evaluation team met with 11 PhD students, discussing their background, research topics and experiences in the Chase Centre. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.4.1 Long-term Vision, Mission and Strategy

The long-term vision covers two main time periods, the first within the lifetime of Chase and the other after the end of Chase. The members of the Centre have a clear idea of what they want to do in Stage 3 with a well-defined selection procedure for new projects. This procedure started one year ago, and included feedback from the International Scientific Advisory Board; it is now in its final stage. In some cases, pre-studies have been performed to evaluate the relevance of new directions, a process applauded by the evaluators. In later stages (i.e. Stage 4) of Chase, the Centre plans to prepare the continuation of the successful Chase platform by focussing on antennas as sensors to prepare the creation of a new research platform on wireless sensor systems. The evaluators agree that this is a promising strategy to foster research on relevant new topics while keeping the momentum as well as the collaboration between academic and industrial partners generated by Chase. During the evaluation process, the team was delighted to note the commitment of both industrial and university partners to find ways of making the Chase networking platform sustainable. The latter is perceived as a significant added value by all partners. The Chase Centre could extend this model further and consider undertaking pre-studies and/or projects to facilitate a seamless transition to post-VINNOVA-funded Chase research.

The main mission of Chase is bridging the gap between research and products by inducing collaborative projects between academic and industrial partners. This aim is very ambitious, but the Centre has been able to approach it in several projects. One reason for this success is the balance between academic research groups, industrial partners, and SMEs.

Most of the research topics addressed are of high relevance for the economy as well as the society within the frame of competence of the Centre. Strong scientific leadership is provided by the academic faculty, while the industrial partners and SMEs contribute strongly in kind to

the projects through their experience, equipment, and requirements. The larger companies could, however, increase their cash contributions.

Recommendation:

- 1 That the Board formulate a strategy to sustain the benefits generated by Chase beyond the end of VINNOVA-funded Chase research.

2.4.2 Scientific Quality and Productivity

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

In general, the scientific competence and the research output in Chase are excellent. However, some discrepancies exist between the different projects.

The results of some of the projects are on a world-class level, as demonstrated, for example, by awards, strong publication records, and keynote presentations at well-known international conferences. Other projects have not reached this international recognition yet. Only one project (Antenna Systems Simulator) was clearly below the level of the others, both in scope and results. But apparently this project is scheduled to end in December 2011.

The Centre comprises well-established and internationally-acknowledged researchers and also very promising young researchers. This mixture fosters scientific creativity and stimulates the interaction with the industrial partners. It is important to note that some of the industrial researchers involved have graduated from Chalmers and thereby greatly contribute to the knowledge transfer between academia and industry.

The Centre has been able to attract both dynamic young SMEs and large international players in the field of wireless communications. It has so far not been able to involve and maintain for the long-term, a major partner in the biomedical field, but it should be stressed that the biomedical projects are relatively new to the Centre. (St Jude Medical, a large medtech company, has been a member of Chase during Stage 2, participating in one of the biomedical projects: “Antenna Systems for Biomedical Applications”, but it will leave the Centre at the end of Stage 2).

Most of the projects have reached the critical size to achieve a significant performance. The exceptions are the two biomedical projects that have just started recently and have not reached their critical size yet.

Recommendation:

- 2 That Chase management provide the means by which the two biomedical projects can reach their critical size and if this is not possible, consider the merger of these projects. In addition, the Centre should actively search for cooperation with large biomedical companies.

International Comparators with other Centres and Collaborations

Some Chase projects (OTA, MIMO Systems, and Gap Waveguide Frontend Demonstrator) have clear international visibility. Others like the biomedical projects have started to receive international recognition, but have not reached the same level yet. The “MIMO Terminals 2”

project is overshadowed by the OTA project and has no well-defined visibility on its own. However, both projects have a significant impact in standardisation by proposing alternative test and certification procedures for the antenna systems of future wireless terminals. This is seen as a very important impact of the Centre's output.

Through two of its projects, the Centre has been able to attract high-calibre international visitors, which increases the visibility of Chase. This is also an advantage for the PhD students who benefit through their collaboration with them.

Recommendation:

- 3 That the Chase management should strongly encourage all research teams to strive for the same international excellence by promoting international interactions and international visibility as well high-class publications.

Critiques of Research Programs and Projects – Science, Methodology and Technological Outcomes

Chase has succeeded in realising the VINNOVA vision of contributing to the sustainable growth of the Swedish economy. All the projects tackle problems that have a high economic and societal relevance. For instance, the OTA project has contributed to the development of a successful product and the reverberation chamber that has been sold to several major international wireless stakeholders. The vision of the MIMO systems project has led to results that have a considerable impact on the future of wireless communications (increase of the throughput and the spectral efficiency). Furthermore, the problems tackled by the two biomedical projects have potentially a large societal impact.

The methodologies in the different projects are adequate as the quality of the results shows. They are based on state of the art engineering practice and result in efficient management structures. The project duration of three years allows an efficient use of temporal and financial resources without requiring an excessive management overhead. The fact that finishing projects have to compete with new projects for renewal ensures a high quality of the projects overall. Projects in the Centre are continuously self-evaluated. This has led to an appropriate solution for the MIMO systems project, which suffered from changing leaders until a new dynamic leader was found who has been able to foster vision, enthusiasm, and results within a period of one year.

One of the next steps of the OTA project is the demonstration of realistic MIMO multiplexing gains. To achieve this result, it is of paramount importance to get access to the raw data at the antenna outputs before an appropriate receive processing can be performed.

Recommendations:

- 4 That the Centre periodically re-assess the links between projects and consider merging or splitting projects in order to foster critical size and/or cross-fertilisation. Furthermore, the procedure for the continuous self-evaluation of the projects should be formalised.
- 5 That the Centre obtains access to the raw data at the antenna outputs for the OTA project, either through an agreement with the terminal manufacturers or by building appropriate receivers.

Processes for Idea Generation

The ideas for new projects are generated by a bottom-up approach. This has the advantage of enabling the efficient and fast definition of new projects. Thereby, the Centre can react quickly and support potentially promising ideas. However, this brings the risk of fragmentation of the research interests of the Centre. Good communication between projects is of paramount importance to allow cross-fertilisation between projects. Up to now, the Centre has handled this well as frequent interactions between projects are visible. The Centre should take care to ensure good and regular communication between all the projects of the Centre, highlighting common interests and visions.

Overall Conclusion – Scientific Quality and Productivity

The added value of the Centre is a dynamic networking platform, which enables academic and industrial partners to collaborate in an alternative way to more classical bilateral university-industry projects. The size of the Centre provides a critical momentum to all the research projects. The funding from VINNOVA gives more freedom to the academic partners, while the principle of in-kind contributions of the industrial partners allows for a multilateral knowledge transfer between all the partners.

The high productivity of the Centre is demonstrated by the quality and the number of the publications. However, the scientific output of the Centre is not limited to the publications, but it is also demonstrated through innovative products and test procedures.

There is a continuous self-evaluation of the projects. This has led to satisfactory resolution of a problem in one project and the termination of other projects.

2.4.3 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

At the end of Stage 2 the Centre has 15 industry partners: Arkivator AB, Ascom AB, Bluetest AB, Ericsson AB, Gapwaves AB, Medfield Diagnostics AB, Micropos Medical AB, Perlos AB, Powerwave Technologies Sweden AB, Qamcom Technology AB, Rockwell Collins Sweden AB, RUAG Space AB, Saab AB - Electronic Defence Systems, Sony Ericsson AB, and St Jude Medical AB. The last partner mentioned has indicated that it will leave the Centre at the end of Stage 2, but there are apparently discussions underway with a new potential partner from the biomedical field to fill a possible shortfall in this area. It was disappointing that there were only two attendees from industry at the general review on day 2 of the evaluation. Both spoke highly of the benefits of partnership in the Centre, but the evaluation team could not judge whether this satisfaction was uniformly repeated across all partners.

The Centre is hosted at Chalmers University of Technology, the partner which provides the bulk of the academic research input (with smaller amounts of research carried out by SP Technical Research Institute of Sweden, KTH, University of Uppsala and FOI Swedish Defence Research Agency). It would have been useful for the complete membership details of the general assembly to have been recorded in the report.

While the current industry partner profile has proven to be effective for Stage 2, the evaluation team understands the need for extra partners in Stage 3, particularly to boost cash contributions, but also to complement existing partners in newly identified projects being considered for Stage 3. It will also be necessary to identify research gaps that could be best filled by contributions from other Swedish universities under contracts with Chalmers. It appeared from discussions at the interview that little thought has been given to defining precise conditions on the admission of new partners. Regardless of whether or not the current centre agreement has a formal process defining admission of new partners, in writing a new Centre agreement for Stage 3, these conditions can be adjusted and defined to suit. The Centre is encouraged to formally write into the new agreement, specific steps and conditions for new partner entrants *during* the stage. In particular the Board is urged to confront the issue of major (foreign) companies which may wish to join despite being in direct competition with existing partners.

Processes for Needs Identification and Articulation

The Centre has well-thought-through processes for needs identification and uses its International Scientific Advisory Board well in this.

Partner Participation in Innovation and Technology Translation

From both the report and the well-articulated comments by various Centre participants at interview, it is clear that the process for commercialisation via patenting is not working well for any partners in the Centre. The model adopted in the Centre Agreement is one that is used by several universities around the world. Sometimes it works well; often it does not. The negotiations leading to Stage 3 give the Centre an opportunity to adopt a new or revised model. A recommendation on this matter is given below in the section on the Board's role.

In addition to the measurable "hard" technology transfer common to all university-industry partnerships, a great added value of the Centre is the non-measurable "soft" early exchange of ideas and concepts. The latter have led to new ideas, not necessarily linked to the projects of the Centre, ideas that have been pursued in industry and academia.

The mobility between academia and industry is strongly encouraged by the Centre. This leads to natural and easy relations between the partners of the Centre and fosters new ideas and directions of research.

Not all industrial partners have shown the same interest in this cooperation, but the partner with least interest will leave the Centre at the end of Stage 2.

Commercialisation Successes and Benefits to Society

Commercial value for companies stems not only from intellectual property, which in a mature field like antennas is sometimes difficult to protect. The participation in the definition of new standards is also of great relevance if the proposed testing procedures become a standard for successful products. The Centre has been active in this field, aiming at the valorisation of the knowledge gained in the OTA project. But its importance has not been sufficiently recognised and this was acknowledged at interview.

Recommendation:

- 6 That Chase management should encourage the participation in standardisation activities and acknowledge the successful contributions to a standard as a very relevant impact of Chase. In particular, the Centre and its industrial partners should be more committed to helping the outputs of the “OTA” and “MIMO Terminals 2” projects to become standards.

2.4.4 Organisation and Management of the Centre

The Board's Role

The Board is committed to the welfare of the Centre and has a good understanding of the issues facing it. However the Board indicated its role was to monitor and advise management and seemed to stop short of taking responsibility for strategic planning. The Board seemed to think it was constrained in addressing many of the strategic challenges facing the Centre by various factors including the Centre Agreement and the Chalmers University lack of funding allocation to its commercial arm for patent protection and development. The evaluation team suggests the Board needs to be more proactive in these matters. The negotiations for Stage 3 offer an opportunity for the Board, on behalf of the joint venture partners in the Centre, to devise modifications to the Centre Agreement so that the Agreement will enable rather than hinder developments in Stage 3 and beyond.

Similarly the Board needs to take the lead in ensuring robust, effective, and rapid processes are in place for dealing with IP generated in the Centre and that these processes are enabled by the (revised) Agreement. Re-negotiating the intellectual property arrangements could put the current Board Chair in a difficult position given his role as President of Chalmers Industriteknik and adjunct professor at the department of signals and systems. Given the imperative to fix this before Stage 3 commences, it is probably wise for the Centre to appoint a new Chair of the Board who is a senior figure, independent of any of the joint venturers, but who has a good understanding of the industries that draw on this Centre, and has a good appreciation for the role of industry-focused research. (Later advice to the evaluation team was that this process may well be in hand.)

Recommendation:

- 7 That the Centre Board be more proactive, taking responsibility for strategic planning and for ensuring factors hindering delivery on strategy, including the Centre Agreement and IP issues, are addressed as a matter of urgency. To do this the Board Chair should be independent of the joint venturers.

Management Team Structure, Processes and Performance

The management processes for the Centre are generally satisfactory. The Executive Board is very effective in driving high-quality research and education activities in the Centre; the (relatively new) Director is clearly working well with Centre participants both in industry and research organisations.

International Scientific Advisory Board's Role

The International Scientific Advisory Board (ISAB) is composed of internationally well-recognised experts. However, not all domains of the Centre are represented; there is no signal-processing expert at present; but the antenna and biomedical fields are well represented. Nor is the ISAB currently gender balanced. In a Centre which does not have many women in its management, attempting to gender balance structures where the composition is under Centre control can be an important signal of commitment to gender balance.

The interactions between the ISAB, the Board and the Executive Board are good, but as discussed at interview, more use could be made of the ISAB with its meetings taking place more often. That said, the Centre is to be congratulated on the manner in which it acted on the robust advice it received from the ISAB in planning projects for Stage 3.

Recommendation

- 8 That the Centre periodically reconsiders the composition of the International Scientific Advisory Board (ISAB) to ensure that all fields that are relevant to the Centre are represented and the ISAB is gender balanced.

Communication

Internal communication within the Centre seems to work well and is particularly enhanced by the co-location of many Centre partners. Communication to the international scientific community through publications is also very efficient. However, the Centre's website is well below what could be expected and is seriously outdated. For instance, the pdf-files of the published papers should be accessible from the website.

Recommendation:

- 9 That the centre redesign the Chase website completely and keep it updated regularly.

Relationship to the University and to University Units

Chalmers University is clearly pleased to host the Centre, assigning excellent staff and facilities to it along with a modest cash contribution. One area where Chalmers does need to re-examine the relationship with Chase is in the area of intellectual property processes – a matter referred to above.

The relationship between the Centre and the relevant university units (at Chalmers and at other partner universities) is excellent with the Centre being well integrated with the broader activities of these units while still maintaining its own distinct identity.

Financial Management

By and large the Centre has managed its finances quite well albeit with too little cash from industry partners. In-kind contributions overall were adequate even though one budgeted item (industry new projects) did not eventuate.

Several serious anomalies were detected in the tabular data of the evaluation report. Some of these were corrected by the Centre management shortly after the interview. However one major

discrepancy on financial matters is still of concern and that is the precise matching of available and expended cash in 2009.

Recommendation:

- 10 That the Centre management ensures careful auditing and editing of all financial and personnel reports.

The Report to the Evaluation Team

The report to the evaluation team was well presented with appropriate commentary on challenging issues. However the evaluators were disappointed that all pages of the report except the cover page, were headed “CHALMERS” with no matching mention of “Chase” and sees this as a serious misjudgement as well as a missed opportunity to confirm the importance that the partners place on the very existence of the Centre.

2.4.5 Training Personnel of High Competence

Chase consists of a vital and dedicated group of researchers. In the Centre there are PhD students (14), post docs (4), senior scientists (16), and management and administrative staff. The Centre has been very successful in including Masters students in the research which has resulted in several theses. During the meeting the evaluation team was pleased to hear that several of these students are recruited into positions by the industry partners.

We met an enthusiastic and youthful group of PhD students which impressed us with the number of publications produced, international background and experience, gender balance and reflections on future plans and careers. They indicated strong motivation for their scientific work and the projects they were involved in. The majority of these students expressed their wish to gain industrial experience as a foundation for building a future academic career. The good quality of the PhD research is really a significant resource in the Centre and related to the issue of building a strong and competitive international research group. However there should be a strategy and career plan for the students and planning for how to compensate for the generation gap.

Recommendation:

- 11 That the Centre management develop a recruitment strategy for post docs and senior scientists.

Recruiting and Developing People of International Competence and Experience

As mentioned, the group of PhD students has really a good blend of international background and experience. Also we were very pleased to see that this was the situation for the post docs and the senior researchers. The Centre has managed to recruit international researchers who fit very well into the Swedish research environment. Additionally the Centre has been the host to several international guest researchers.

Mobility of Personnel between University and Industry

The contact and mobility level between the Centre and the industrial partners is very good regarding research and outcomes. The level of co-publication is excellent and at least one

industrial researcher contributes on all the publications. Likewise, the level of innovations and disclosures is excellent. Researchers from the Centre are integrated in the research activity in the companies and personnel from the companies spend time in the Centre. One of the industrial employees has a part-time position in the Centre.

Gender Perspectives and training for senior roles in research

The gender balance in the Centre is excellent at the level of the PhD students and post docs. For the PhD students, five out of fourteen are female, while for the postdocs the figures are two out of three. This gender composition puts the Centre in a good position regarding the quality of work life and recruitment, which can be exploited and utilised to improve the gender balance in the management team, governing board and ISAB.

Contributions to University Education

No specific courses or Master programs have been developed in the framework of Chase. The PhD students follow the regular doctoral program linked to their department at Chalmers. The faculty members of Chase are, of course, active in those courses and teach also regular bachelor- and Masters-level classes. All of the Chase PhD students are involved in teaching activities. On the international level, Chase groups contribute to the European School of Antennas, which is a doctoral school program on antennas driven and recognised by the leading antenna institutions in Europe. The Chalmers antenna group (Professor Kildal) coordinates two modules of this program. Chase has sent several students to participate in the program.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Board formulate a strategy to sustain the benefits generated by Chase beyond the end of VINNOVA-funded Chase research.
- 2 That Chase management provide the means by which the two biomedical projects can reach their critical size and if this is not possible, consider the merger of these projects. In addition, the Centre should actively search for cooperation with large biomedical companies.
- 3 That the Chase management should strongly encourage all research teams to strive for the same international excellence by promoting international interactions and international visibility as well high-class publications.
- 4 That the Centre periodically re-assess the links between projects and consider merging or splitting projects in order to foster critical size and/or cross-fertilisation. Furthermore, the procedure for the continuous self-evaluation of the projects should be formalised.
- 5 That the Centre obtain access to the raw data at the antenna outputs for the OTA project, either through an agreement with the terminal manufacturers or by building appropriate receivers.
- 6 That Chase management should encourage the participation in standardisation activities and acknowledge the successful contributions to a standard as a very relevant impact of Chase. In particular, the Centre and its industrial partners should be more committed to helping the outputs of the “OTA” and “MIMO Terminals 2” projects to become standards.
- 7 That the Centre Board be more proactive, taking responsibility for strategic planning and for ensuring factors hindering delivery on strategy, including the Centre Agreement and IP

issues, are addressed as a matter of urgency. To do this the Board Chair should be independent of the joint venturers.

- 8 That the Centre periodically reconsider the composition of the International Scientific Advisory Board (ISAB) to ensure that all fields that are relevant to the Centre are represented and the ISAB is gender balanced.
- 9 That the centre redesign the Chase website completely and keep it updated regularly.
- 10 That the Centre management ensures careful auditing and editing of all financial and personnel reports.
- 11 That the Centre management develop a recruitment strategy for post docs and senior scientists.

Recommendations to VINNOVA

That VINNOVA

- strengthen instructions to Centres on reporting, particularly against operational plan and budget
- ensure that Centre Boards operate under well understood conflict of interest guidelines

In conclusion

- The evaluation team is of the opinion that the Centre continues to do excellent needs-driven antenna research and clearly meets VINN Excellence Centre guidelines. With the expectation that the above recommendations are addressed, the evaluation team recommends continued funding.

Robert Johnston (Chair)

Heidi Dreyer

Martin Haardt

Mary O’Kane

Anja Skrivervik

2.5 Evaluation of Centre for ECO² Vehicle Design

VINN Excellence Centre at The Royal Institute of Technology, Stockholm

Introduction

On October 28-29, 2010, the Centre Director, Peter Göransson, colleagues of the VINN Excellence Centre: ECO², industry partners, and university representatives, had meetings with the evaluation team at KTH. The scientific expert of the international evaluation team, Paul Sas, addressed matters concerning research strategy, projects, and progress. The generalist evaluators, Doug Reeve (Chair), Bob Johnston, and Anne Anderson, together with the expert, in a subsequent meeting, addressed matters such as organization and management, finance, interaction between industry partners and the university, and educational activities. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.5.1 Long-term Vision, Mission and Strategy

The long term vision of ECO² is to establish by 2016 a world-class research centre focusing on technical solutions in road and rail vehicle design to improve performance, reliability and safety, combined with limited costs and a reduced impact on the environment. In the report it states that a revised vision is being initiated, but it is not clear what this revised vision implies; this should be clarified.

Recommendation:

- 1 That the Centre clarifies its revised vision, so that the distinctive ‘ecological engineering’ approach of the Centre is distinguished from good engineering practice

2.5.2 Scientific Quality and Productivity Part 1

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

The ECO² Centre focuses on research in vehicle design to achieve more environmentally friendly and economically competitive vehicles, aiming at technical solutions leading to improved performance, reliability and safety. 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 therefore essential to the Centre’s strategy.

The ECO² centre is a strong and internationally competent partnership between university and industry researchers, with excellent expertise in vehicle engineering design. The industrial partners include major Swedish rail and road vehicle manufacturers. The research is organized around a number of projects which 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 excellent, but the competence in ecology related engineering aspects could be strengthened.

Recommendations:

- 2 That the Centre undertakes to increase its competence in “ecological aspects” of engineering by recruitment of faculty and/or senior researchers to KTH and/or by collaboration with others in KTH, in other universities, in the private sector or in the public sector.
- 3 That the Centre clarifies its relationship and possible synergies with other collaborative research projects in which KTH is involved such as CSC, CVER, FLOW, CICERO, SHC, TRENOP.

International Comparators with other Centres and Collaborations

The Centre’s multiple vehicle research concept is unique in terms of its consortium composition and research topics. Ecology-related vehicle research is being conducted in many research centres but the multi-vehicle concept with active participation of the respective industrial partners is unique.

International collaboration has commenced but could be strengthened, especially with respect to participation in EU projects and the international exchange of researchers.

Recommendation:

- 4 That the Centre increases its participation in EU research projects (such as FP7, Marie-Curie), and stimulates exchange of researchers with leading international academic and industrial partners (this should apply to PhD students as well as senior researchers)

2.5.3 Scientific Quality and Productivity Part 2

Critiques of Research Programs 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. The research outcomes in terms of publications are good, but the multidisciplinary aspects could be strengthened. Most of the research projects are conducted in close collaboration with industry and the technological outcomes are highly valued by the industrial partners.

The research project on ‘Virtual Vehicles’ is not well defined. It is impossible to judge its relevance from the documentation provided. According to the report one of the objectives is the development and implementation of the ECO² approach as a research methodology as well as the development of the ECO² evaluation tool, but neither the methodology nor the evaluation tool are adequately described. During the expert evaluation session this concern was raised, but a clear description of the four Virtual Vehicle sub-projects could not be given. The relevance was however confirmed by one of the industrial partners who is already using the ECO² methodology to evaluate the eco-impact of internal research projects.

The research project ‘Crosswind stability and unsteady aerodynamics’, is one of the three major research projects within the centre and involves the work of three PhD students. This research is of a high scientific level and has a clear eco-impact and multiple-vehicle aspect. In addition there is intense collaboration with the industrial partners in experimental and numerical work.

The publication record is good, with several publications recently submitted. This line of research has sufficient potential to be further deepened.

The research project 'Multifunctional body panels' is the second of the three major research projects within the centre and involves the work of three PhD students. This research is also of high scientific level and has a pronounced eco-potential and multi-vehicle aspect. One of the interesting results of this research line was the demonstration of an innovative multi panel subsystem in a Saab 9-3 wagon. This demonstration was the result of intense collaboration with the industrial partner and clearly illustrated the potential of lightweight panels in car body design. The publication record here is also good and there is a clear potential for future research.

The research project 'ECO² Suspension design' is the third of the major research projects within the centre and involves the work of three PhD students. The research here is also multi-vehicle oriented and of high scientific level. Two of the sub-projects deal with safety and comfort of off-road vehicles. Although those topics are on the boundary of the 'classic' ecology field their relevance for the driver's health and for road safety is high, and as such can be included under a broader definition of ecology. Collaboration with the industrial partners to achieve relevant results has been realized here also. The publication rate of this line of research is satisfactory and there is ample room for future research.

Recommendations:

- 5 That the Centre articulates and justifies the current ECO² methodology, the current ECO² evaluation tool and the Virtual Vehicle concept
- 6 That the Centre defines and realizes a demonstrator

Processes for Idea Generation

The procedures set up by the Centre to generate new ideas and define projects guarantees a maximal involvement of all partners and has certainly facilitated the communication between partners. This has resulted in well-defined projects and sub-projects but is a time- and resource-consuming activity. The evaluation team hopes that the new 'Blue Sky' concept that will lead to the project demonstrator will achieve the same benefits more efficiently.

Overall Conclusion - Scientific Quality and Productivity

Within ECO² there is clearly excellent PhD research work of good scientific quality and output, as well as intense and productive collaboration with industrial partners, but the ecology aspect of the approach needs to be strengthened.

2.5.4 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

The non-academic partners forming the core of the Centre include representatives of most of the major Swedish vehicle manufacturing companies, a representative of a national transport authority, a government research institute and a small consulting company with a link to vehicle design. Among the manufacturers there is one car manufacturer, one train manufacturer, one heavy vehicle manufacturer, one truck manufacturer, and one bus and truck manufacturer. All of

the present partners in the consortium have been involved since the formulation of the initial proposal.

The profile of partners appears appropriate for a centre that has the responsibility of supporting a strong Swedish presence in this important economic sector. The evidence is that the partners work together well with no apparent conflicts. The only danger that is foreseen by the evaluation team is that this very “Swedish” partnership, that in many ways is essential in the national interest, may make it difficult to establish an international reputation. For the academic partners and particularly for the future careers of the younger researchers there is an urgent need to expose their achievements on an international stage.

The Centre has indicated that no major changes to partnership are foreseen at this point in time (apart from a minor change due to recent staffing changes at A2Zound). The evaluation team is not convinced that this is appropriate for a number of reasons. Firstly, the relatively small number of partners means that a reduction in involvement from even one of the partners can place the Centre in financial difficulty, and this has already been an issue during the recent financial crisis when uncertainty of continued participation was very apparent. Secondly, the Centre needs to develop increased international industrial contacts if they are to achieve their ambition to become a centre of international importance. Finally, despite earlier recommendations regarding increased partnership with SMEs this has not proceeded well. This evaluation team believes there is a need for the involvement of smaller, agile partners so as to capture the benefits and results over the wider economy, but particularly to increase the possibility of commercializing new design tools arising from the Centre research. The increasing prototype and demonstrator activities that are foreseen for later stages could open the possibility for partnerships with sub-contractors and sub-suppliers to the current industrial partners.

It is therefore felt that the Board should incorporate extra partners. If full partnerships prove to be difficult to manage, increased partners could be achieved for example by establishing a secondary level of membership in the Centre, maybe with limited access to information and limited participation in projects, giving particular attention to clear IP provisions

Although there are partners from the government transport sector, the team were pleased that the Centre has apparently considered the possibility of attracting a governmental partner with focus on environmental and societal matters.

Recommendations:

- 7 That the Board undertakes to widen its international contacts/partners in the vehicle design sector, through existing partners with international activities, and/or through new international partners.
- 8 That the Board continues to strive for increased partnership with SMEs

A serious potential problem identified by the evaluation team are the new the TrenOP project and the broader KTH transportation platform. Involvement with this broader overarching activity brings with it the danger of losing control of the special relationship that the Centre has developed with its partners. Both academic and non-academic partnerships could spin out of

control due to the massive increase in size and complexity of the new platform. It will be essential for the Board to maintain a very close watch on the impact of this new KTH endeavour. The Centre must, look after its own interests, “protect its patch,” while at the same time obtaining maximum benefit from new opportunities.

Recommendation:

- 9 That the Board urgently establish a strategy to maintain and increase the Centre’s strong industrial and academic partnership, and associated contributions, specifically in relationship to the development of TrenOP and the wider KTH transport platform

Processes for Needs Identification and Articulation

As indicated earlier, the procedures set up by the Centre to generate new ideas and define projects guarantee maximal involvement of all partners and have certainly facilitated the communication between partners. The evaluation team was impressed by the reported involvement of Trafikverket within the Centre as a public authority that can report on public trends and directions discussed in Sweden and Europe and thereby stimulate needs driven research within the Centre. It was disappointing that a representative could not have been present at the generalist’s interview.

Partner Participation in Innovation and Technology Translation

There have apparently been active discussions among all Centre partners focusing on new and innovative project ideas. The report indicates that during these discussions, special attention was given to areas in vehicle design where conflict, particularly between “ecological” and economical issues, existed. The evaluation team was impressed by the emphasis placed on this process of identifying innovative ideas.

Translation of results to practice seems to be well managed. The integration of the results by the non-academic partners is encouraged by both the Centre Coordination Group (CCG) and the project steering groups. The commercial “separation” of industry partners makes it relatively simple to manage the translation without undue IP issues arising. The team was informed at interview of negotiations that were taking place with one partner over the ownership rights of a particular design developed by the Centre.

Several technology transfers have already taken place, mainly on a project level involving PhD students and researchers in the Centre. Examples are: the multi-functional Saab 9-3 roof from Multi-functional Body Panels project; the active suspension tested on the Regina train in the Suspension Design project; the cross-wind stability criteria and associated driver handling results from the Cross-wind Stability project; and the environmental evaluation work from the Virtual Vehicles projects.

Commercialization Successes and Benefits to Society

There is a clear understanding that results from the research projects should contribute to the growth of industrial partners. Project results highlighted in the interviews were exciting, and from evidence given by partners, also commercially significant. However there was no mention of the word commercialization throughout the Centre report. At interview we eventually heard of many successful research projects with great potential benefit, but these were not well

presented in the report. The Centre needs to improve its presentation of major successes, focusing on, but distinguishing between, immediate application successes and those more theoretical developments that provide a step change in design capability.

Recommendation:

- 10 That the Centre establish a professional public relations approach to publication of results and successes for sustained public and corporate engagement, in addition to traditional academic publications

2.5.5 Organization and Management of the Centre

The Board's Role

The Board meets regularly and we were told that Board members from partners were well engaged. However, attendance of partner Board member representatives at the evaluation was rather light (at the expert evaluation only Henrik Tengstrand of Bombardier (Chairperson) was present and at the generalist evaluation only Board member representatives of Scania and Volvo AB were present). It was noted that several other Board member representatives (of Saab, the Rail Administration, the Road Administration and A2Zound) were absent on both occasions and sent no message to the evaluators.

The evaluators expressed several concerns about Centre performance that might be remedied by intervention by the Board. 1) The evaluation report failed to persuasively articulate the highlights and to make a compelling case for the Centre; perhaps industry partners on the Board could identify expertise, e. g. from public relations or marketing, that would support the Centre in making their case. 2) As will be discussed in more detail in the section on finances, it will be important to the success of the Centre that more cash is raised from industry partners. It is recognized that there is stiff competition for such resources within companies but the Board should undertake to make the case on behalf of the Centre within their own companies and with other companies. 3) There has recently been a proliferation of centres, programs and platforms in the field of transportation at KTH and there is a danger that the interests of the Centre will be overlooked; the Board can assist the Centre with making the case for the Centre within KTH.

Recommendation:

- 11 That the Board undertake to raise the cash contribution from the industry partners

The academic representation on the Board should be altered to ensure that the voices of the University and Centre researchers are heard without problems of apparent conflict of interest.

Recommendations:

- 12 That academics who receive funding from the Centre (directly or for projects they are associated with) should not be on the Board.
- 13 That the University be represented on the Board by a senior, experienced person.

Management Team Structure, Processes and Performance

The Centre is to be complimented on the unique and effective organization of the management team, the so-called AMG (Assistant Management Group). As an aside, it is suggested that this be renamed the Management Group.

It will be essential to the future success of the Centre that the AMG improve their administrative infrastructure.

Recommendation:

- 14 That the Centre acquire sufficient personnel to provide effective administrative assistance to the AMG and the Director

The evaluators were concerned that the Director, although he is obviously very much engaged with the organization and research of the Centre, is perhaps too busy, while he continues to serve as Department Chair, to give as much attention to the Centre as it deserves. Similarly the former Director is now dedicated to a larger agenda in transportation research across KTH. The evaluators note that this provides the other, (relatively junior) faculty in the Centre with perhaps too little support, particularly as the Centre grows and must increasingly compete with other transportation agendas at KTH.

International Scientific Advisory Board's Role

The evaluation team were pleased that the Centre had eventually acted on the 2007 recommendation to set up an International Scientific Advisory Board (ISAB). It was interesting to read the SWOT analysis prepared by this body at its first meeting held earlier this month.

The membership of the ISAB is appropriate to advise on the engineering aspects of projects of the Centre. However the evaluation team were surprised, given the emphasis in the professed philosophy of the Centre regarding the importance of “ecological” matters, that there was no one on the ISAB with an international reputation in this field.

It is also important that this board meets frequently if the value of the international benchmarking is to be maximised.

Recommendations:

- 15 That the ISAB membership be expanded to include a third member with expertise related to ‘ecological’ aspects of engineering
- 16 That the ISAB meet at least annually

Relationship to the University and to University Units

Currently the Centre receives considerable support from senior levels within the university, if not a lot of cash. The Centre has a relatively clear position within the University.

There was indication in the report, and it became even clearer during the generalists’ interview that the University milieu for the Centre was changing rapidly, and particularly in the “transportation space”. Until recently the entire Centre activity has been carried out in five groups within a single department, Aeronautical and Vehicle Engineering, plus one other group

in a different department, Environmental Strategies Research (fms). With the advent of the KTH “transportation platform” and TrenOP program, the environment will become much more complex as was made abundantly clear by the organisation charts shown at interview.

This change in environment may offer tremendous advantages, particularly in increased resources, e.g. we learned of new buildings and improved co-location of many other groups working in the area of transportation research. On the other hand it may bring with it disadvantages such as increased complexity of interrelationships, increased competition, higher management overheads etc. This evaluation report already includes three recommendations that address in part this issue – one in the section on research differentiation, one in the partnership development section and one in the section on the Board. The Board of the Centre, and VINNOVA itself should be in no doubt about the seriousness of the concern of the evaluation team regarding this matter.

Financial Management

In the part of Stage 2 for which there is financial reporting (just under 2.5 years), the Centre received SEK 16.5 million cash from VINNOVA, SEK 6.5 million cash from the University and SEK 3.1 million cash from partners. The partners also provided an estimated SEK 14 million in kind contribution and the University provided approximately SEK 12 million in kind. The reported total funding is therefore SEK 52 million.

In Table 12, Related Research Grants, there was some confusion about the data that was provided and, as we learned at the generalists’ interview, missing information. In particular, several EU projects that provide cash to the Centre and several EU applications (unfortunately not successful) were not mentioned. Similarly the data in Table 6 on publications and 7 on international activity was not as thorough as it could have been.

Recommendation:

17 That the Centre continue to seek research funding in international competitions

2.5.6 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The evaluation team was very pleased to have the opportunity to meet with six of the PhD students in the Centre. The students were an impressive group who had provided high quality posters about their research and the ECO² perspective. They also played an important part in the scientific evaluation session.

The group came from a wide variety of national backgrounds: Canada; India; Germany; France as well as Sweden. The students gave clear accounts of their reasons for studying at ECO² and the benefits they derived from being part of the Centre. Some of the international recruitment had arisen from the department’s participation in EU Erasmus exchange programmes, and this is to be recommended as one way of maintaining a diverse flow of high quality future students. These included the strong ties with industry and the ecological perspective they had developed during their projects, notably through their participation in the special Centre course: “ECOlogy Vehicle Design from a Societal and Environmental Perspective”.

Although this distinctive ecological perspective was valued by the PhD students and the course had been much appreciated, it was less clear that there was ongoing input to their research from ecological experts. None of the students we met seemed to have supervisory input from ecology experts nor was there evidence from the evaluation meeting of ongoing collaborative research between the engineering and ecological academics. The evaluators learned that the Centre hopes to have a joint engineering and fms PhD 'soon'. There was only one relatively junior member of staff from fms present at the second evaluation meeting and she seemed to be the only academic from fms actively involved in the Centre's organizational structures. Multidisciplinary collaboration between engineering and ecology seems a real opportunity that should be developed more strongly in line with the Centre's mission but this may need additional academic input.

Recommendation:

- 18 That the University make every effort to recruit additional faculty with 'ecological' expertise that can be active in the research of the Centre.

Mobility of Personnel between University and Industry

There are clearly strong ties between the Centre and its industry partners. This is reflected in a number of ways, including the practice of joint supervision between academics and industry partners for each PhD student. This was an aspect of their experience which the doctoral students commended to the evaluators. The students also appreciated a number of other aspects of their interactions with partners such as the time they spent at partner sites, data exchange and the regular meetings with companies not only those with whom they were collaborating on projects. Many of the students anticipated future careers in industrial R&D.

Despite the economic challenges for the automotive sector in the last couple of years it is encouraging that four of the ten students are industrial PhDs and more are planned for the future.

Gender Perspective

The Centre is to be congratulated on the good gender balance it has maintained among its academic staff. Although the Director is now male, the AMG has four women and three men. There is still progress to be made however, as the Board is predominantly male with only two women out of twelve, both members of the ISAB are male and sadly, of the current cohort of PhD students, only one is female.

Recommendation:

- 19 That the Centre proactively pursues well qualified female PhD candidates to improve the gender balance in the PhD student cohort.

Contributions to University Education

The academics involved in the Centre all contribute to undergraduate and postgraduate education. In addition the evaluation team was pleased to learn of the influence that the Centre was having on university education, from inspiring BSc projects to the very significant impact of the ECO² graduate program on ecology for doctoral students. This was discussed by the PhD

students that the team met as having a quite profound impact on their thinking about their research.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Centre clarifies its revised vision, so that the distinctive ‘ecological engineering’ approach of the Centre is distinguished from good engineering practice
- 2 That the Centre undertakes to increase its competence in “ecological aspects” of engineering by recruitment of faculty and/or senior researchers to KTH and/or by collaboration with others in KTH, in other universities, in the private sector or in the public sector.
- 3 That the Centre clarifies its relationship and possible synergies with other collaborative research projects in which KTH is involved such as CSC, CVER, FLOW, SHC, TRENOP.
- 4 That the Centre increases its participation in EU research projects (such as FP7, Marie-Curie), and stimulates exchange of researchers with leading international academic and industrial partners (this should apply to PhD students as well as senior researchers)
- 5 That the Centre articulates and justifies the current ECO² methodology, the current ECO² evaluation tool and the Virtual Vehicle concept
- 6 That the Centre defines and realizes a demonstrator
- 7 That the Board undertakes to widen its international contacts/partners in the vehicle design sector, through existing partners with international activities, and/or through new international partners.
- 8 That the Board continues to strive for increased partnership with SMEs
- 9 That the Board urgently establish a strategy to maintain and increase the Centre’s strong industrial and academic partnership, and associated contributions, specifically in relationship to the development of TrenOP and the wider KTH transport platform
- 10 That the Centre establish a professional public relations approach to publication of results and successes for sustained public and corporate engagement, in addition to traditional academic publications
- 11 That the Board undertake to raise the cash contribution from the industry partners
- 12 That academics who receive funding from the Centre (directly or for projects they are associated with) should not be on the Board.
- 13 That the University be represented on the Board by a senior, experienced person.
- 14 That the Centre acquire sufficient personnel to provide effective administrative assistance to the AMG and the Director
- 15 That the ISAB membership be expanded to include a third member with expertise related to ‘ecological’ aspects of engineering
- 16 That the ISAB meet at least annually
- 17 That the Centre continue to seek research funding in international competitions
- 18 That the University make every effort to recruit additional faculty with ‘ecological’ expertise that can be active in the research of the Centre.
- 19 That the Centre proactively pursues well qualified female PhD candidates to improve the gender balance in the PhD student cohort.

Recommendation to VINNOVA

In conclusion:

- The evaluation team is of the opinion that the Centre is making progress in their development of a distinctive university-industry Centre focused on ‘ecological’ and traditional elements for vehicle design. With the expectation that the recommendations made in the report above are addressed, the evaluation team recommends continued VINNOVA support.

Doug Reeve (Chair)

Anne Anderson

Bob Johnston

Paul Sas

2.6 Evaluation of Faste Laboratory

VINN Excellence Centre for Functional Product Innovation at Luleå University of Technology

Introduction

On August 29-30, 2011, the new Centre Director, Magnus Karlberg, colleagues of the Faste Laboratory, PhD students, industry partners, and university representatives, had meetings with the international evaluation team at Luleå University of Technology (LTU). The scientific experts of the evaluation team, Luciënne Blessing and David Barton, addressed matters concerning research strategy, projects, and progress. The generalist evaluators, Doug Reeve (Chair), Robert Johnston, and Mary O’Kane, together with the scientific experts, in a subsequent meeting, addressed matters such as organization and management, finance, interaction between industry partners and the university, and educational activities. In addition, the whole evaluation team met with eight PhD students, discussing their background, research topics and experiences in the Faste Laboratory. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.6.1 Long-term Vision, Mission and Strategy

In its report of Stage 1, the evaluation team recommended that: “the vision and mission of the Centre be reviewed in order to establish a coherent and compelling statement that is distinctive and motivating”. The changes to the vision and mission, however, have been minimal. An explicit reference to the Centre and a time scale are missing from the vision. Overall, the concept of Functional Product Innovation is more clearly embedded in most of the research projects than previously. The integration of the various strands, however, still needs considerable attention.

Recommendation:

- 1 That the Centre revises the vision statement to express, in a more compelling way, the envisaged future role and planned impact of the Centre through the uptake of the concepts, methods and tools within industry to form a more compelling statement, and to make the time-scale explicit.

2.6.2 Scientific Quality and Productivity Part 1

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

The research area is important from a scientific and practical point of view, and will remain so for the foreseeable future. The practical importance has been consistently emphasized by the company representatives. The team has a good competency, in particular on the engineering side. The earlier recommendation to increase the breadth of disciplines has been put into action to some extent, but this effort is not as yet as strong and visible as it should be.

The evaluation team is pleased with the commitment and enthusiasm shown by the new Director of the Centre, who has clearly taken ownership of the topic, and whose task it will be to refine the direction of the Centre in Stage 3 and beyond.

The facilities are state-of-the-art.

With the additional project funding that has been attracted, the total activity directed to the Centre's field of research has increased and the total resources taken together are certainly appropriate for making a substantive contribution to the field, especially given the considerable involvement of the companies.

Recommendations:

- 2 That the Centre continues to broaden and integrate a range of disciplines that are relevant to the main work of the Centre particularly with respect to service engineering, business models and social science.
- 3 That the Centre improves the visibility and effectiveness of the interdisciplinary approach.

International Comparators with other Centres and Collaborations

International collaboration has received some attention: the International Scientific Advisory Board (ISAB) has become more international, and some new links have been established. However collaborations with and benchmarks against other international centres are not clearly visible.

The rate of publication should have increased by now. This was acknowledged by the Centre as reflecting poorly on their scientific success and relevance. The University's new policy to provide financial incentives for international journal publications should be a further motivating factor.

Recommendations:

- 4 That the Centre increases its profile in the international research community, in particular by an increased rate of publication in refereed international journals.
- 5 That the Centre targets increased international collaboration and establishes measurable and reportable benchmarks, such as increased publication with international co-authors, and substantial international research visits or stays
- 6 That the Centre benchmarks itself against other international research groups focusing on functional product development and related topics, in order to highlight the Centre's unique features and contribution.

2.6.3 Scientific Quality and Productivity Part 2

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

The individual research projects in WP2 and WP3 seem to be well managed and to produce useful results for industry partners. The assessment of the projects is carried out every quarter in a systematic and consistent manner, leading to good awareness of the contributions of each project to the overall objectives and the interactions between the projects. WP1, however, seems to be managed in a less structured way and not treated as a research project in its own right, even though it is central to the overall vision, as it is intended to aggregate and integrate the results of WP2 and WP3.

The report provided little insight into the actual methodologies and outcomes of the research projects. Visualizations would have helped, such as those used in the presentations. The methodologies used in the projects seemed appropriate for the tasks and the industrial representatives confirmed that several deliverables have already been transferred to their companies.

The research work was solid with respect to its practical contribution, but did not produce many scientific highlights. The evaluation team is of the opinion that a step change is possible, but that this requires the aggregation and generalization of the individual project results; there was some industry agreement with this during the evaluation interviews. This will also contribute to the necessary identification of the true features and challenges of Functional Products and Functional Product Development, and demonstration of the uniqueness of the proposed approach.

The results have been linked to the 14 high-level objectives defined before the start of the Centre. The intention to reflect on the continuing appropriateness of these objectives has been expressed by the Centre. The evaluation team wishes to encourage this reflection.

Recommendations:

- 7 That the Centre crystallizes the concept of Functional Products and Functional Product Development (FPD) in order to (i) “improve the theoretical foundation of the research area”, as recommended by the International Scientific Advisory Board (ISAB) in October 2010, and (ii) to demonstrate the uniqueness and the practical impact of the work done with partner companies.
- 8 That the Centre undertakes, urgently, systematic refinement of the overarching research plan to ensure aggregation and generalisation of the individual project results, for instance by managing and structuring WPI in a similar manner to the other working packages.

Processes for Idea Generation

Regular meetings are held at the Centre with the various partners and seem to contribute to the generation of research ideas, solutions and directions. ISAB meetings have not been well utilized in terms of driving the direction of the Centre. There is no evidence of how the advice of this board has been acted upon.

Recommendation:

- 9 That the ISAB be consulted more frequently, at least annually, and by using the state-of-the-art virtual communication tools available in the Centre.

Overall Conclusion - Scientific Quality and Productivity

Concrete results have been achieved in 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 developed methods and tools, and that they realize that “looking at service life agreements” is important for them in order to remain competitive in the long-term. The Centre was considered to “act as a catalyst” and provide “a meeting place to discuss issues with other companies”. However, scientific quality and productivity should be improved along with the aggregation and generalization of the individual project results.

2.6.4 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

At the end of Stage two the Centre has eight industry partners: Sandvik Coromant; BAE Systems Hagglands; Gestamp HardTech; Hagglands Drives; LKAB; Volvo Aero; Volvo Car and Volvo Construction Equipment. As part of its mission statement the Centre aims to “collaborate nationally and internationally with leading companies and academic partners in order to secure strong research”. The evaluation team was impressed by the range of industrial partners already involved in the Centre and is of the opinion that increasing the number might risk a fragmentation of the impressive teamwork displayed by these partners. It could be argued that the involvement of new members, particularly SMEs, might be considered worthwhile, however the team suggests that this would be best achieved by simple third party agreements between new companies and existing members.

On the other hand, certain academic disciplines necessary to fully develop the tools of FPD do not appear to exist within the Centre to a sufficient degree, and this has been outlined above in the section on *Research Area, Competence Profile, People, Facilities, Critical Size*. The evaluation team is not in a position to suggest whether these extra capabilities may be found within LTU, or whether it may be necessary to seek new university partners. This need for such new research capacity, as the Centre enters the next phase, was endorsed by industrial representatives at the evaluation interview, and in the report of the ISAB. (see Recommendation 2)

Processes for Needs Identification and Articulation

Needs identification was one of the first tasks for the Centre and it was initially carried out even before obtaining VINN Excellence Centre status. Key issues have been regularly refined through ongoing and structured work with partner companies, e.g. through interviews, discussions, workshops and ideas spun out of early research results. For instance, the “five senses of interaction” tool that has been developed within the Centre is an interesting innovation.

To ensure that the Centre is heading in the right direction, the industrial partners are frequently required to review their needs. The Tiger Team approach where academics and industry come together in Radical Innovation Workshops, has been used to identify projects which are both “do-able” and have industry value.

Overall the evaluation team was very impressed by the measures taken to identify and articulate the research problems of industrial partners. This view was confirmed by the industry representatives at the interview.

Partner Participation in Innovation and Technology Translation

The evaluation team was impressed by the obvious close interaction between the partners, involving considerable resources of the partners, and how this has resulted in the many examples of innovation and technology translation noted in the Stage 2 report. Company partners were unanimous in their recognition of the part played by the Centre in designing and implementing significant and profitable changes in their organisations.

Commercialization Successes and Benefits to Society

Many of the new methods and tools developed by the Centre have shown remarkably quick take-up by the industrial partners. However, the benefits so far have not been disseminated to a wider industrial community in any marketable or even “open access” fashion. The evaluation team believes that the Centre is remiss in not investigating these opportunities. Particularly as it approaches a final phase of VINNOVA funding, it will be essential that the contributions of the Centre can make is disseminated as widely as possible.

Recommendation:

- 10 That the Centre takes steps to increase dissemination of the methods and tools they develop, such as the Radical Innovation Workshop, to a wider group of companies for the benefit of the Swedish industry and to raise the profile of the Faste Laboratory brand.

2.6.5 Organization and Management of the Centre

The Board's Role

The Board consists of representatives of six of the eight company partners and one representative of LTU. The Board meets six times per year. It is evident that the Board is very much engaged with the work of the Centre. The evaluation team was concerned that the Chair of the Board was not from one of the companies, but from LTU, and that this would detract from one of the central missions of the Board, that is, to drive the research based on industry needs. The Board members reported that this issue had been discussed and that – although there was strong appreciation for the contribution of the present Chair in the first two stages – a new Chair who was industry-based would be appointed for Stage 3.

The Board has a role in supporting the Centre Director and this is particularly important with the appointment on August 1 of the relatively young, Research Coordinator to the position of Director.

Recommendations:

- 11 That the Centre follows through with its plan to select a new, industry-based Chair
- 12 That the Board provides strong support for the new Centre Director in refining the strategic direction of the Centre for Stage 3 and beyond

Management Team Structure, Processes and Performance

The Management Team has consisted of the Centre Director and two other professors, one of whom is the Research Coordinator, who work in close collaboration with the Work Package Coordinators. This executive team is to be commended on their close monitoring of research projects, such as through quarterly evaluation of the Objective Readiness Levels of each project. The outgoing Centre Director is to be commended for his leadership of the Centre through conception, Stage 1 and Stage 2, and for his great success in creating productive partnerships with industry. The evaluation team was impressed by the vigour and enthusiasm of the incoming Director and his evident readiness to assume responsibility for the Centre leadership.

Communication

As discussed above, the report failed to capture the successes achieved by the Centre. The evaluation team urges the Centre to seek out professional guidance and assistance in formulating key strategic messages and disseminating those messages to Swedish industry, Swedish society, the University and local community. It is also critical to the next level of success that the Centre acquires this capacity. As a minor matter the next evaluation report would be well served by such a development.

Recommendation:

- 13 That the Centre makes strategic communication a priority in Stage 3

International Scientific Advisory Board's Role

The evaluation team noted the soundness of the observations and recommendations made by the ISAB at their meeting in October 2010. However, it is lamentable that the Centre has apparently not paid heed to many of these recommendations, most especially as some of those recommendations were also made by the VINNOVA evaluation team in 2008. The ISAB met only once in the three years of Stage 2, which seems insufficient (see Recommendation 9).

Relationship to the University and to University Units

The Centre reaches across Departments and Divisions within LTU and has the support of the senior management of LTU, as was visible in their attendance at the evaluation meetings. It should be noted that there is need for greater connectivity with other units within LTU, as discussed above in connection with the broader range of disciplines that could usefully be exploited in development of functional product design.

Financial Management

As per the financial plan for the three years of Stage 2, the Centre received 7 MSEK cash per year from VINNOVA, and 7 MSEK cash per year from LTU, totalling 21 MSEK each. Industry partners contributed cash and in kind totalling 23 MSEK for the three years of Stage 2. Industry cash contribution increased from 2.9 to 3.4 MSEK in the last year of Stage 2 with the addition of Volvo Construction Equipment to the Centre. Industry in kind contribution ranged from 0.4 to 2.3 MSEK per company per year. It was noted during the generalist interview that the reporting of industry in kind contribution was not consistent or thorough.

The duties of the Director are substantial and will have effect on the Director's commitments at the University and as leader of Research Project 3.5.

Recommendations:

- 14 That the industry partners report in kind contributions more consistently and thoroughly so as to recognize the significant contributions of the company partners
- 15 That the percentage of full time of the new Director committed to the Centre be increased to recognize his new, expanded duties as Director

The Report to the Evaluation Team

The report was repetitive and not very clear as to the methodologies, the progress made and the future plans. Summarizing tables and explanatory figures would have been useful. Related information was spread around the document. Furthermore, lists of items would have been easier to use if they had been better ordered or grouped. The Operational Plan for Stage 2, written in 2009, was considerably easier to follow and also the presentations at the evaluation interviews concisely provided the necessary insight into the research projects. Access to the main publications, e.g. through the FASTE portal, would have been helpful to better evaluate the scientific contribution.

2.6.6 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The VINN Excellence Program has a goal to have all its centres operate at the highest level of science measured in international terms. This means that all positions (for researchers and students) in a centre should be filled by top candidates from the international pool. In the Faste Laboratory, however, very few of the researchers and graduate students come from outside Sweden (only two of the twelve PhD students have first degrees from outside Sweden). Indeed, a high proportion has their qualifications from LTU itself. If the Faste Laboratory brand is to achieve lasting impact, this needs to change.

Recommendation:

- 16 That the Centre targets a significantly higher proportion of international PhD students and junior researchers so as to approach the proportion in the University generally (50% for PhD students).

Mobility of Personnel between University and Industry

The Centre and its industrial partners are to be commended for their continuing effective interactions. The formal and informal mobility between industry and academia has been effective to date and should be continued as a distinctive feature of the Centre.

Gender Perspective

The Centre acknowledges the importance of understanding the impact of gender and diversity issues related to the work environment. It has acted on the recommendation in the Stage 1 Review that Professor Ewa Gunnarsson be included as a collaborator in the Centre to focus on relevant gender-focussed research. This has raised awareness of the issues involved and led to concrete outcomes such as substantive changes in company practice at Sandvik Coromant leading to a major gender prize being awarded to the company and to a gender-sensitive re-design of publicity materials.

As the Centre progresses to Stage 3 there is the opportunity to formulate and solve specific research questions on exactly how gender and diversity issues impact development and maintenance of functional products.

Recommendation:

- 17 That in Stage 3 the Centre addresses specific research questions on exactly how gender and diversity issues impact development and maintenance of functional products

As is common in this research area, the Centre has struggled to attract women researchers especially at senior levels. It is commendable that at least two of the twelve PhD students are female but this should not be a cause for complacency. Women need to be recruited to all levels of the Centre's operations; it is noted that of those named on pages 39 and 40 of the report at the senior levels of the Centre (ISAB, WP coordinators, Management Team, Board, and Centre Partner Key Contacts) 26 are men and only 3 are women.

Recommendation:

- 18 That the Centre increases the proportion of women among PhD students, postdoctoral fellows, the ISAB, WP coordinators, Management Team, Board, and Centre Partner Key Contacts

Contributions to University Education

Through related funding, researchers and industry partners from the Centre have collaborated in the Sirius Program for some years. This is an MSc final-year course in Mechanical Engineering Design, popular with students and useful to industry both as a source of new product ideas and future employees. This is a course that can be usefully copied by other universities in the spirit of open innovation.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Centre revises the vision statement to better express the envisaged future role and planned impact of the Centre through the uptake of the concepts, methods and tools within industry to form a more compelling statement, and to make the time-scale explicit.
- 2 That the Centre continues to broaden and integrate a range of disciplines that are relevant to the main work of the Centre particularly with respect to service engineering, business models and social science.
- 3 That the Centre improves the visibility and effectiveness of the interdisciplinary approach.
- 4 That the Centre increases its profile in the international research community, in particular by an increased rate of publication in refereed international journals.
- 5 That the Centre targets increased international collaboration and establishes measurable and reportable benchmarks, such as increased publication with international co-authors, and substantial international research visits or stays.
- 6 That the Centre benchmarks itself against other international research groups focusing on functional product development and related topics, in order to highlight the Centre's unique features and contribution.
- 7 That the Centre crystallizes the concept of Functional Products and Functional Product Development (FPD) in order to (i) "improve the theoretical foundation of the research area", as recommended by the International Scientific Advisory Board (ISAB) in October 2010, and (ii) to demonstrate the uniqueness and the practical impact of the work done with partner companies.

- 8 That the Centre undertakes, urgently, systematic refinement of the overarching research plan to ensure aggregation and generalisation of the individual project results, for instance by managing and structuring WP1 in a similar manner to the other working packages.
- 9 That the ISAB be consulted more frequently, at least annually, and by using the state-of-the-art virtual communication tools available in the Centre.
- 10 That the Centre takes steps to increase dissemination of the methods and tools they develop, such as the Radical Innovation Workshop, to a wider group of companies for the benefit of the Swedish industry and to raise the profile of the Faste Laboratory brand.
- 11 That the Centre follows through with its plan to select a new, industry-based Chair
- 12 That the Board provides strong support for the new Centre Director in refining the strategic direction of the Centre for Stage 3 and beyond
- 13 That the Centre makes strategic communication a priority in Stage 3
- 14 That the industry partners report in kind contributions more consistently and thoroughly so as to recognize the significant contributions of the company partners
- 15 That the percentage of full time of the new Director committed to the Centre be increased to recognize his new, expanded duties as Director
- 16 That the Centre targets a significantly higher proportion of international PhD students and junior researchers so as to approach the proportion in the University generally (50% for PhD students).
- 17 That in Stage 3 the Centre addresses specific research questions on exactly how gender and diversity issues impact development and maintenance of functional products
- 18 That the Centre increases the proportion of women among PhD students, postdoctoral fellows, the ISAB, WP coordinators, Management Team, Board, and Centre Partner Key Contacts

Recommendations to VINNOVA

- That VINNOVA takes a wider view of Centre funding and encourage Centres to place emphasis on, and communicate the broader impact of, a Centre in increasing the financing of wider academic enterprises attracted by the VINN Excellence Centre

In conclusion

The evaluation team is of the opinion that the Centre has developed a distinctive university-industry collaboration focused on the introduction of the concept of functional products and the implementation of functional product development in Swedish industry. With the expectation that the recommendations made in the report above are addressed, the evaluation team recommends continued VINNOVA support.

Doug Reeve (Chair)

David Barton

Luciënne Blessing

Robert Johnston

Mary O’Kane

2.7 Evaluation of FunMat

VINN Excellence Centre at Linköping University

Introduction

On November 8-9, 2011, the Chair of the Centre Board, Lennart Karlsson, the Centre Director, Lars Hultman, colleagues of the FunMat Centre, PhD students, industry partners and university representatives had meetings with the international evaluation team at Linköping University (LiU) for an evaluation of the Centre's performance so far in Stage 2 (January 1, 2009 – December 31, 2011). The scientific experts of the evaluation team, Marie-Paule Delplancke-Ogletree and Pasqualina Sarro, addressed matters concerning research strategy, projects and progress. The generalist evaluators, Doug Reeve (Chair), Mary O'Kane and Alison McKay together with the scientific experts, in a subsequent meeting, addressed matters such as organisation and management, finance, interaction between industry partners and the university, and educational activities. In addition, the evaluation team met with PhD students, discussing their background and future plans, and their research and other experiences in the Centre. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.7.1 Long-term Vision, Mission and Strategy

The scientists of the Centre have a long-term vision and a strategy of development that they are updating regularly in view of international developments in the field. In addition, they are taking into account, when possible, the shifts in interest of the industrial partners. They are also actively prospecting for new developments and looking to expand their industrial partnership in a controlled way.

2.7.2 Scientific Quality and Productivity

On the basis of the presentations given on the first day, and following discussions with the scientists of the Centre (university and industry), the evaluators consider that the scientific quality and productivity are very high. This Centre is very competitive at the international level, is putting Swedish industry in an excellent position and giving it a head start.

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

The Centre has cleverly defined its niche "market" based on the fundamental competences it developed prior to the formation of the Centre. This continues to feed the Centre research through fundamental research funded by other agencies in the framework of the University. They have reached a critical mass by integrating methodology and technology platform activities with industrially driven projects. They channel their competences towards the industrial partners in an efficient way. They have assembled synthesis and characterisation equipment that is state-of-the-art and essential for the development of the research projects. The industrial partners consider the Centre facilities to be very attractive. The senior scientists are internationally recognised as leaders in their respective fields and thus attract young scientists from abroad.

International Comparators with other Centres and Collaborations

They have established national and international collaborations when they need additional competences: for example with UU, KTH, CTH, RWTH (D), Saarland University (D), and University of Illinois (USA). They have a large network of collaborations. In the developed themes, they are certainly international key players in a very competitive field.

Critiques of Research Programs and Projects: Science, Methodology and Technological Outcomes

In general, there is a good balance between the development of fundamental methodology and the application of these findings within an industrial environment and in a relatively short time. The active participation of the industrial partners in the Centre is considered as extremely positive and significantly facilitates technology transfer.

For each theme, the objectives for the next phase should be clearly but concisely presented.

It would be useful if the medium and long-term objectives were also specified and for the report to refer to these objectives. In this way, progress will be easier to assess and the operational plan fine-tuned if necessary.

Processes for Idea Generation

The main generation process takes place inside individual themes. The infrastructure and staff required to execute new ideas are evaluated and the industrial relevance is assessed at this level. If the assessment is positive a search for industrial partnership is initiated. If a conflict of interest develops then the management team decides on whether the idea is taken forward. This is a continuous process encouraged by all involved.

Overall Conclusion: Scientific Quality and Productivity

The evaluators were impressed by the quality and quantity of the results achieved and by the dynamic and constructive interaction between academic and industrial partners. This Centre is fulfilling the criteria of an Excellence Centre according to VINNOVA: scientific and industrial outputs, long-term vision and perspectives, growing recognition nationally and internationally.

2.7.3 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

The Centre currently has 11 partners: LiU plus 10 industry partners. The partner mix appears to have been chosen with care so that partners can work together within the Centre theme structure in a way that allows excellent research to proceed, focussed on a mutually agreed range of challenging problems which have direct bearing on industry partner needs. Many of the industry partners have prior experience of working with the University researchers in bilateral projects that predated the Centre's establishment. This prior experience of working together along with well-designed arrangements for interaction has allowed the Centre to be quite productive in enabling commercial benefit to the industry partners during Stages 1 and 2 of the Centre's existence.

LiU has been a good anchor partner, providing excellent facilities (partly through the excellent wider environment in materials science at LiU including the large Linneas Grant, ERC grants and Strategic Research Funds) and an appropriate cash contribution.

The evaluation team was disappointed that only one industry partner was present for the generalist interview (by virtue of their representative being Chair of the Board). This made assessing the full effectiveness of the industry-academic interaction difficult.

The proposed industry partner complement for Stage 3 seems appropriate with most of the current 10 partners likely to remain and negotiations currently proceeding to secure at least one new partner.

Processes for Needs Identification and Articulation

Identifying and articulating appropriate problems to be tackled are managed well through a process of regular formal meetings within and across themes backed up by frequent informal discussions at both industry and university premises. The Centre has promoted a harmonious internal culture through a dedicated board, through encouraging close interaction of graduate students with industry colleagues, and through the process of checking that the academics enjoy working with industry.

Partner Participation in Innovation and Technology Translation

All participants in the Centre are encouraged to declare significant innovations early so that industry partners can decide whether or not there is potential to translate the innovation to their particular circumstances while work on the innovation including preparation of draft publications can proceed in parallel. This process seems both expeditious and effective in terms of maximising rapid uptake of Centre innovations by partners.

Commercialisation Successes and Benefits to Society

The Centre has provided several significant commercial success stories from Stage 2 including several examples of rapid commercialisation of results within established industry partners, four patent applications, and the new company, SenSiC.

In addition, many of the graduate students are in the process of completing their theses and, given their exceptional experience of working closely with industry, one of the most impressive commercial outputs of the Centre is this cohort of highly skilled personnel for the industries centred around materials science.

2.7.4 Organisation and Management of the Centre

The Board's Role

The Board is made up of five people, two from partner companies, two representing the University and one senior member of the European science community. The Board Chair, Lennart Karlsson, and one of the University representatives were present during the two days of the evaluation.

The University should have a senior level administrator on the Board to represent the Rector. One Board member is a university investigator and therefore could benefit from Board decisions allocating funds. Such conflicts of interest are to be avoided.

Whereas the evaluation team generally had a favourable impression of the Board's dedication to the interests of the Centre, we suggest that the Board could be more proactive in the betterment of the Centre for instance by promoting the successes of the Centre and winning support from the companies for greater cash contributions.

Recommendations:

- 1 That a member of the senior administration of the University be appointed to the Board.
- 2 That no representative of the University on the Board should be in a position to benefit directly from a Board decision e. g. by the Board granting funding to a project on which the representative works.

Management Team Structure, Processes and Performance

The evaluation team was impressed by the efficiency and effectiveness of the management team in establishing a smoothly operating research program in a complex environment. However, we suggest that the Centre would benefit from acquiring greater competence in marketing, promoting and negotiating.

The International Scientific Advisory Board (ISAB)

At its last meeting, the ISAB provided a very thorough review. However, it has not met since May 2010. The evaluation team notes that the ISAB was the subject of a recommendation from the last evaluation report in 2008 and that the Centre has been only minimally responsive. Discussion during the generalist interview surfaced a number of difficulties in mounting an ISAB meeting. Nonetheless, the Centre is obliged to convene an arms-length ISAB, preferably on an annual basis.

Recommendation:

- 3 That the ISAB be reconstituted and meet within three months of the start of Stage Three

The Report to the Evaluation Team

The evaluation report was generally well organised, succinct and informative although more explicit information on scientific and technological progress would have been appreciated.

Communication and Promotion

The productivity of the Centre in terms of academic publications is good. It was noted that the Centre was not receiving as much recognition as it could and that improvement of this would benefit the Centre with respect recruitment of students and companies. The personnel lists on the web site link to email messages and, as such, do not allow easy linkage to pages containing personal information.

Financial Management

The Centre is receiving good financial support from the University, 2 MSEK per year in cash and substantial in kind, for a total that exceeds the required 21 MSEK matching over three years. Industry is also on target to contribute in excess of the required 21 MSEK matched funding, however the cash contribution is modest given the scale of some of the companies and the impact of the research. We note that the evaluation of 2008 also commented on the need for greater input of cash from the companies. We strongly suggest that the cash input from the companies be increased.

It was noted in the generalist interview that the reporting of in kind contributions from companies appeared to be rather imprecise estimates that conform to the minimum required. This practice fails to give credit to the companies who perform above the minimum and fails to give the evaluation team a clear picture of company engagement.

Recommendation:

- 4 That the companies be more accurate in reporting in kind contributions.

2.7.5 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The team met eight PhD students, two non-Swedish (from Indonesia and China) and four female. Of the Swedish students two had first degrees from LiU. The PhD students described a selective and demanding recruitment process; this was reflected in the quality of the students we met. The Centre is well recognised internationally and we were pleased to learn that four visiting professors from outside Sweden have been appointed.

Mobility of Personnel between University and Industry

The team was pleased to see measures taken to achieve mobility between the University and industry. The use of shared posts and adjunct professorships is an effective mechanism for achieving mobility of staff. The PhDs were very positive about their experience with industry mentors, in particular on the support they provided as “unofficial supervisors” who visit the University fortnightly. In addition, the students often work at industry premises. From the report and evaluation meetings the level of engagement between the University and industry is excellent.

Gender Perspectives and training for senior roles in research

There was strong evidence of effective measures being taken to promote equal opportunities for both genders. Approximately 40% of the senior researchers are female. This is a good performance with respect to the technical faculty norm of approximately 20% female at LiU. All four of the international visiting professors associated with the Centre are male.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That a member of the senior administration of the University be appointed to the Board.

- 2 That no representative of the University on the Board should be in a position to benefit directly from a Board decision e. g. by the Board granting funding to a project on which the representative works.
- 3 That the ISAB be reconstituted and meet within three months of the start of Stage Three
- 4 That the companies be more accurate in reporting in kind contributions.

Recommendations to VINNOVA

At interview the evaluation team queried the Centre leadership about how it ensures there is no conflict of interest or perceived conflict of interest in funds allocation to Centre spinoffs that are at least partially owned by senior researchers from the Centre. Such spinoffs are, of course, to be encouraged but the possibility of conflict of interest or lack of transparency in these matters could be ameliorated by the adoption of an ethics code of practice in this Centre and, more generally, in all VINN Excellence Centres.

Reccomendation:

- That VINNOVA require all VINN Excellence Centres to adopt an ethics code of practice to maximise transparency and minimise perceived conflicts of interest in Centre funds allocation.

In conclusion

The evaluation team is of the opinion that the Centre is doing excellent needs-driven research and clearly meets the standards of a VINN Excellence Centre. With the expectation that the above recommendations are addressed, the evaluation team recommends continued funding.

Doug Reeve (Chair)

Marie-Paule Delplancke-Ogletree

Alison McKay

Mary O'Kane

Pasqualina Sarro

2.8 Evaluation of GigaHertz

VINN Excellence Centre at Chalmers University of Technology, Gothenburg

Introduction

On September 29-30, 2011, the Chair of the Centre Board, Peter Olanders, the Centre Director, Jan Grahn, colleagues of the GigaHertz Centre, PhD students, industry partners, and university representatives, had meetings with the international evaluation team at Chalmers University of Technology to evaluate the Centre's performance so far in Stage 2 (January 1, 2009 – December 31, 2011). The scientific experts of the evaluation team, Dominique Schreurs and Iain Thayne, addressed matters concerning research strategy, projects, and progress. The generalist evaluators, Robert Johnston (Chair), Mary O'Kane and Heidi Dreyer together with the scientific experts, in a subsequent meeting, addressed matters such as organization and management, finance, interaction between industry partners and the university, and educational activities. In addition, the whole evaluation team met with 7 PhD students, discussing their background, research topics and experiences in the GigaHertz Centre, as well as their future plans. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.8.1 Long-term Vision, Mission and Strategy

The Centre has a vision of establishing a novel type of organisation that draws on its range of partners to strengthen and lead companies in the shaping of tomorrow's wireless world. This concept is consistent with the aims of the VINN Excellence Centre Program.

The GHz Centre mission is to bring scientific advances aimed for future wireless communication and sensor technologies faster to industrial prototyping and exploitation. This is a laudable mission and partner representatives believe they are achieving this mission, however firm evidence was not presented. The project structure of the Centre, with four individual projects operating in a relatively unconnected fashion, should be assisting the Centre mission, but this structure weakens the Centre's claim to be a unified entity where the whole is greater than the sum of the parts. The evaluation team comments on these projects individually below.

Recommendation:

- 1 That the Board and management develop mechanisms to detect if the Centre is indeed enabling speedier translation of scientific advances to its company partners.

2.8.2 Long-term Vision, Mission and Strategy for individual projects

DIGIPA

In this project objectives are closely defined in cooperation with current industry needs. This means that the future commercial and research benefits from this project depend on the evolution of the companies' interests. Two out of three company partners (both semiconductor manufacturers) are non-Swedish, and the value of their product developments to the Swedish economy, making use of expertise built up in the GHz Centre, has not been sufficiently demonstrated. A good model to explore would be one in which the chip manufacturers engage

with the GHz Centre to develop enabling technology solutions which the Swedish component, sub-systems and systems manufacturers can then directly exploit, again via the GHz Centre. This would be a more transparent win-win-win scenario, with clear potential compared to the current situation.

In terms of vision, the further integration of hardware and DSP is a logical continuation, and a path that other international research groups are pursuing also. The same applies to MIMO. Extensions such as expanding the transmitter activity with antenna research, for example in cooperation with the Centre CHASE, have apparently been difficult to achieve during Stage 2, but should be considered when framing Stage 3 proposals. This could have a positive effect on the academic productivity and ultimately, on the potential for timely commercial exploitation.

EXPO

In this project the strategy is rather short-term as it follows the progress of the on-going research activities. The extension of the measurement system to baseband will contribute to the modelling activities, but this will probably only just allow catching up with the state-of-art (several international research groups already have electrothermal modelling and baseband loadpull in place). Improving back-off efficiency in multi-/wideband operation is also a research area in which other international research groups are already active. On the other hand, the exploration of GaN technology for a wider range of circuits is a justified novel path, particularly as a new industrial partner active in GaN may be involved in Stage 3. Although the Mitsubishi partnership offering early access to novel technologies is well justified, the evaluation team could not yet see any direct return to Sweden of delivering device models to this partner. In terms of the characterization activities, there could be a stronger involvement from SP as regarding traceability of non-linear microwave measurements.

INTOSC

In this project the approach adopted has been to understand the origins of the source of phase noise in the widely accepted “technology of choice” for the realisation of high performance oscillators (InGaP-based HBT MMICs). This has been attacked by working in close collaboration with a commercial foundry supplier (Win Semiconductors) and then evaluating design methodologies to minimise the contribution to phase noise. This is a very sound strategy, and leverages an existing partnership between Chalmers and Win Semiconductor, thereby giving the GHz Centre excellent return on its resources (Chalmers are underwriting the MMIC fabrication and the Centre industrial partners are given free access to space on wafer runs for R&D purposes). As will be outlined below, the technical progress in this theme has been excellent in certain areas, often meeting and surpassing the performance targets set.

The future plan for Stage 3 appears to be to terminate the InGaP HBT-based MMIC theme, to be replaced by a GaN HEMT technology platform. Caution should be exercised in this regard as results so far are not entirely negative. The demonstration of a GaN HEMT oscillator with “acceptable” performance would open new opportunities in more highly integrated rugged transceiver front-end demonstrators, and link excellently to any continuation of the EXPO project described in more detail above (-100 dBc phase noise at 100 kHz has apparently been demonstrated).

Recommendation:

- 2 The Centre should carry out a commercial risk analysis before terminating the InGaP HBT-based MMIC theme

THz+

In this project the goals are to demonstrate compact, sensitive radiometer front-ends for future satellite-based instruments, using mHEMT MMICs for applications to 200 GHz and Schottky diodes for 200-600 GHz. The project is being undertaken in partnership with two SMEs and the SP Technical Research Institute. The sub-200 GHz MMICs were produced using the Fraunhofer IAF 100 nm GaAsmHEMT technology, funded by Omnisys. The > 200 GHz solutions were produced in the Chalmers cleanroom using Schottky diode technology. In principle, the approach of building sub-system demonstrators based on the best easily available enabling technology is sound. The future for this technology depends on accessing qualified production level quantities of both transistor-based MMICs and Schottky diodes. This may be challenging because of small volumes and costly, particularly if it is necessary to manufacture all components within the Chalmers cleanroom. The possibility of sourcing low noise InP HEMT and HBT technologies from Teledyne, as outlined in the presentation during the review, should be exhaustively explored, as this would reduce the technological risks in the supply chain. On the other hand success could be threatened by potential component availability problems due to ITAR exportation restrictions.

The commercial partners in the project are both SMEs, and therefore the value they extract by accessing the Chalmers expertise and environment is very significant (possibly enabling their survival). Currently the market for the THz+ theme is relatively modest, and therefore it is questionable whether, without governmental agency intervention, any business in this area is sustainable. On the other hand, there is undoubtedly a need to develop technology such as that which the THz+ project is exploring. The “upstream” nature of this research could have positive benefits in providing a “technological pipeline” important to longer term sustainability. The role of the SP Institute in this project is not entirely clear – it seems that their major participation is to access the mm-wave and THz capabilities of Chalmers and to learn from them.

2.8.3 Scientific Quality and Productivity Part 1

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

In general, the split of human resources across the four projects is influenced by the level of industry interest. For this reason DIGIPA and EXPO have about double the number of FTE researchers compared to the INTOSC and THz+ projects. Overall, there is a good mix between industrial and regular PhD students.

DIGIPA

The research in this project is related closely to short-term industrial needs and usage, although the industrial partners were vague about the actual implementation in their products. The project is served by a strong competence profile. One significant contribution is the close cooperation between the hardware group and the signal processing group. The balance between

the number of senior researchers and the number of PhD students is OK. There is a strong personnel input from industry. The facilities in terms of circuit fabrication and measurement infrastructure are excellent. The project has reached critical size. The project is in line with the overall strategy and vision.

EXPO

This project also covers a research area close to practical industrial use. It was recognized that for two of the three identified research aims set at the start of Stage 2 there is no progress recorded. At the interview it was explained that one of these research objectives lost industrial support, while the other target was clearly overambitious considering the state-of-art of the technology. This indicates that more care is required in designing projects and that targets must be well thought out when negotiating Stage 3. The competence profile of the team serving EXPO is high, particularly in device modelling, and measurement techniques. In terms of staff, the ratio of PhD students to senior researchers should be higher to ensure long-term availability of the expertise. There are a large number of industrial scientists and engineers involved in this project. The number of undergraduate students involved is adequate, but there is room for stronger undergraduate visibility. The project has adequate access to LDMOS devices through the industrial partners, and a GaN MMIC technology in-house. Measurement facilities are excellent and the extension to baseband (DC - 100 MHz) will enable catching up with the international state-of-art, and offer added value for research activities such as electrothermal modelling. The project has reached critical size.

INTOSC

The research undertaken in Stage 2 of this project is well aligned to the needs of the participating industrial partners. The approach of understanding the source of phase noise in GaInP HBTs, then minimizing this to produce high performance oscillators is a logical one, and builds upon pre-existing expertise within the GHz Centre and the wider Chalmers environment. Chalmers is underwriting the MMIC prototyping and partner companies have access to multi-project wafer runs for R&D. The project is being undertaken by 3 senior researchers in Chalmers, with contribution from 1 PhD student. 1 Masters level student is associated with the project, which has also engaged 5 BSc thesis students (3 of whom may translate to MSc level study). The project leader highlighted participation from 5 people at both Ericsson and Sivers IMA. The research environment at both Chalmers and the partner companies seems to be entirely suitable and appropriate for delivering the research programme. As will be described below, a number of world leading components have been demonstrated in this Stage, which demonstrates the quality of both the team and the environment.

THz+

The research area of this project is a logical one, building on the previous long track record and expertise in Chalmers. The addition of the THz and mm-wave lab to the Centre seems to have significantly accelerated activity in this project, and broadening it to include Schottky diode enabled solutions opens up higher frequencies than would be accessible with the GaAsmHEMT MMIC solutions previously investigated. The theme accesses the Chalmers cleanroom and the embedded expertise therein – the in-kind contribution of Chalmers to this project is perhaps somewhat over-valued given the total running costs of the facility and the number of users, but on balance, the value added to the project probably justifies the in-kind contribution identified.

The extent of the research team engaged on this project was not totally obvious from the report – clearly some senior researchers are active in the GHz Centre along with engineers in the SMEs. It appeared that one PhD student was aligned with the project, but the impression was that masters and bachelors level students were regarded as something of a distraction, because of the purported complexity of the research challenges. This view ignores the need to establish a “personnel pipeline” and a gender balance of the next generation of researchers who the industrial partners may ultimately wish to employ.

Recommendation:

- 3 The Centre should budget for an increased ratio of PhD to senior researchers

International Comparators with other Centres and Collaborations

DIGIPA

The researchers in this theme are well aware of the international academic competitors but explicit benchmarking at a technical level was lacking in the written and oral reporting. Nevertheless, the project group is among the leading groups on this topic worldwide, such as demonstrated by the best paper award at WAMICON 2011. The international collaborations are substantial and well justified. There has been no exchange of researchers with US or Canadian research groups due to visa issues.

EXPO

Researchers in this project have demonstrated a world leading position in GaN PA design. The project has collaborations with internationally recognized research groups in relevant areas, although the quantity of international collaborations is low.

INTOSC

The project has generated a number of quality, and in some cases, world leading outputs, spanning microwave to millimetre wave frequencies. International collaboration during the period was with the National Chiao Tung University (NCTU) in Taiwan, from where a PhD student spent 1.5 years in Chalmers. Researchers from Chalmers have visited NCTU and in addition, undertaken phase noise measurements in LAAS-CNRS Toulouse, a highly regarded laboratory with world leading domain expertise in the area of oscillator design, test and measurement.

THz+

The project has produced a number of mm-wave and THz frequency radiometric sub-systems, which should be commended because of their technical complexity. The 90-130 GHz module is claimed to be the most integrated such solution available. Similarly, the 160-200 GHz front-end, and low noise Schottky diode receivers operating beyond 200 GHz are excellent outcomes. During the review, the performance of the various new receivers was not clear compared with state of the art, either in Europe or globally. External international collaboration with JPL was mentioned; the Centre is to be complimented on this collaboration.

While the process of international exchanges at researcher level is well developed for each of the four projects, reaching out to MSc level, such as hosting exchange master students through the European Erasmus framework, would add to the Centre’s international visibility.

Recommendation:

- 4 That the Centre benchmark its research output at project level against the academic state of the art

2.8.4 Scientific Quality and Productivity Part 2

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

DIGIPA

In this activity, the methodology is adequate to pursue the set goals. The technological outcomes are very good. The publications are of high quality, but relatively low in number when compared to the overall human resources in this project. The low number of PhD students is probably a contributing factor to the low publication rate.

EXPO

While the technological outcomes of this project in terms of GaN PAs are excellent, other circuits such as the 2-18 GHz GaN MMIC receiver front-end do not yet meet the specifications expected from industry. While the active loadpull measurements are greatly improved in terms of time efficiency, the ignoring of device memory effects was not sufficiently clarified during the presentation.

INTOSC

The science, methodology and technological outcomes of this project are very solid. The GaInP HBT based MMICs are, in a number of cases, world leading. What is less clear is how this leading edge research has been or will be translated into commercial benefit for the commercial partners in the project.

THz+

A number of radiometers have been constructed and evaluated. An experiment was described where comparison with an existing diode based imager for ozone detection at 110 GHz indicated no apparent advantage for the active radiometer. To extend the frequency range beyond 200 GHz, the in-house Chalmers fabricated Schottky diode technology has been exploited. This additional source of technology to some degree de-risks the project, though for Omnisys to be able to offer competitive commercial products in the 100-200 GHz range will require access to a transistor based solution.

Processes for Idea Generation

Overall, the process for idea generation within individual projects is good, offering a balance of “risk and reward”. Industrial partners are involved from the on-set of new discussions on the next Stage activity plan. This strong industrial needs input means that there is limited place for novel fundamental academic research that is outside the interest area of these industrial partners. The role of the international advisory board in this matter should be stronger. The number of meetings during Stage 1 and 2 combined is too low.

The success of the GHz Centre will ultimately be measured in terms of knowledge transfer and commercial exploitation by the partner companies, and so it is important that the research seeds planted in earlier Stages of the Centre are not overlooked.

Overall Conclusion - Scientific Quality and Productivity

Scientific quality is very good, with outstanding, world leading demonstrations in each of the projects. There is a good balance of nearer-to-market and more “upstream” research, which gives the Centre some technology future proofing. The number of scientific publications is adequate considering the number of PhD students, but relatively low considering the total human resources *in the Centre*. The scientific productivity in terms of number of PhD graduations is low considering the size of the Centre, although there has been a substantial improvement in Stage 2 as compared to Stage 1.

The number of invention disclosures has been dropping due to issues with establishing patents. While this has not slowed down the research itself the output metric for the Centre as a whole is suffering and is below expectations.

The commercial exploitation plans for the technologies developed to date are not very clear in many cases. At this stage in the life of the Centre these should be more transparent. Whilst the GHz Centre should be constantly horizon scanning and being an early adopter of emerging technology opportunities, it is important to ensure that successful work undertaken to date is properly and fully exploited.

Recommendation:

- 5 That the Centre increases the total number of patents plus publications per FTE/Yr in Stage 3.

Intellectual Property management

The biggest single risk to approval for progression to Stage 3 is the IPR agreement. The current agreement in force for Stage 2 was based on an “experimental” IP concept. The Centre acknowledges that this agreement has been a failure because negotiations between Chalmers and industry partners directed towards a transfer to industry have broken down in each attempted transfer. In the words of the Director “2 good inventions have gone down the drain”. This is not the outcome that VINNOVA aims for in VINN Excellence Centres and continuation to Stage 3 under this current agreement/ arrangement is not an option.

The IPR model adopted in the Centre Agreement is one that is used by several universities around the world. Sometimes it works well; often it doesn't. The evaluation team was of the opinion that in the case of this Centre, the two largest partners – Chalmers and Ericsson – did not have a sufficiently good working relationship for this type of agreement to work. This relationship would be improved if the Chair of the board was independent of these two major partners. The negotiations leading to Stage 3 give the Centre an opportunity to make changes to the IPR agreement and/or the structure of the board

At the interview the Centre indicated that there has been discussion between Chalmers and a limited number of the industry partners in regards to a new agreement for Stage 3. Further

negotiations are planned for the near future. Presumably all industry partners, both small and large, will be scrutinising this development and will all want to carefully consider their options before deciding on continuing their membership of the Centre under any new agreement.

Recommendation:

- 6 That the Centre urgently establishes consensus on an IPR model and a matching Board structure that removes the apparent tension over intellectual property ownership and management

2.8.5 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

During Stage 2, the Centre partnership was extended. The THz and mm-wave lab of MC2 at Chalmers is now participating, along with the SP Technical Research Institute of Sweden. 9 industrial partners are now involved, namely Ericsson AB (90,000 employees), Saab Aktiebolag (Publ) (12,500 employees), ComHeat Microwave AB (3 employees), OmniSys Instruments AB (22 employees), NXP Semiconductors BV (28,000 employees), Infineon Technologies AG (27,000 employees), Mitsubishi Electric Corporation (110,000 employees), SiversIMA AB (20 employees) and WasaMillimeter Wave AB (2 employees). The partners are engaged in the various projects as follows:

- DIGIPA: Chalmers, Ericsson, NXP, Infineon
- EXPO: Chalmers, Ericsson, Saab, SP, NXP, ComHeat, Infineon, Mitsubishi
- INTOSC: Chalmers, Ericsson, SiversIMA
- THz+: Chalmers, SP, OmniSys Instruments, WasaMillimeter Wave

The broad spectrum of industry partners is commendable but because of the lack of a workable IPR agreement there appears to be some tension between large and small company partners in the Centre.

The academic partners in the Centre seem appropriate but as discussed elsewhere the makeup of the Chalmers contribution might be revisited in planning for Stage 3, as it would appear useful to consider mechanisms for including some antenna scientists (from the Chase VINN Excellence Centre)

Processes for Needs Identification and Articulation

The Centre Stage 2 report indicated that Needs Identification was working well in the Centre. Industry representatives seemed well pleased with incorporation of their objectives into the research targets of the Centre, and academics seemed happy to give precedence to industry needs over and above academic research needs.

Strangely the role of the Board in this process was not clear. From the interview the evaluation team understood that the Board was prepared to sit back and let industry and academic representatives design new projects for Stage 3 based on compromises between industry needs and academic competencies. The evaluation team sees this laissez faire approach as very limiting. The team suggests that there should be far more strategic and business planning to

decide first on the research projects that matter, and secondly on what research competencies are required.

Partner Participation in Innovation and Technology Translation

There has been close collaboration between industry and research partners in Stage 2, leading to improved innovation. A key Centre premise has been to improve the speed of technology translation. While there is no quantitative measure of improvement, industry representatives seem content. However the lack of a working IPR agreement, has meant that any translation occurring has been unprotected, from a patent point of view.

Commercialization Successes and Benefits to Society

The Centre has achieved some breakthroughs in certain technologies through leading edge research. What is less clear is how this leading edge research has been translated into commercial benefit for the commercial partners in the project, or what their plans and methodologies for exploitation are at this stage.

Recommendation:

- 7 That the Centre develop metrics that distinguish between and enable recording of commercialization and research successes

2.8.6 Organization and Management of the Centre

The Board's Role and Management Team Structure, Processes and Performance

In the report to the evaluation team, the Centre indicates that the most important role of the Board is “to approve and follow up the research programme and the budget” while “the Centre Director is responsible for strategic planning, leading, proposing, execution and reporting of the activities in the plan of the Centre”. With a view to the Centre delivering more effectively on its Vision and Mission, the evaluation team suggests that these roles and responsibilities be changed somewhat with the Board being responsible for strategy, goal setting, guidance to management, and monitoring of performance while the Centre Director, with the management team, leads, proposes, executes and reports on the activities against the Centre’s agreed strategic and operational plans.

At present there is clearly a problem with goal setting in the Centre. Some goals were distinctly overambitious (see comments on EXPO Project above) while other goals (e.g. only 5 PhD completions in Stage 2) are maybe too modest. The Centre has established a good International Scientific Advisory Board (ISAB). In establishing appropriate goals for the next Stages of the Centre, the Board and management could profitably draw heavily on the advice from the ISAB.

Recommendations:

- 8 That the Board take responsibility for strategic planning, goal setting, guidance to management, and monitoring of performance ensuring that the added value of having a Centre is maximised
- 9 That the Centre Director, working with his management team, leads, proposes, executes and reports on activities against the Centre’s agreed strategic and operational plans

- 10 That the Board and management improve goal setting (utilising the advice of the ISAB) to establish realistic goals for all aspects of Centre operations in Stages 3 and 4.
- 11 That the Board and management work together to improve and clarify the current KPI matrix scoreboard to ensure that the chosen key performance indicators truly provide information on progress on the Centre's short and long-term goals and delivery on the Centre Mission.

Communication

Communication within the Centre appears to be sub-optimal with the four Centre projects operating independently with limited cross-fertilisation. PhD students operate in project silos; the web pages contain limited information on Centre operations and achievements; the Centre and the University do not appear to be communicating well on major problems issues such as intellectual property management. These are only some of the examples of poor communication presented in the report to the evaluation team and in the Centre interview.

Recommendation:

- 12 That improved communication be a major feature of Stage 3 plan and progress on this be monitored closely by the Board.

Relationship to the University and to University Units

The Centre did not present a clear picture of how it operates within the context of the University. In particular and regrettably there was no evidence of synergies with other industry-focused research centres such as CHASE and the other VINN Excellence Centres at the University.

The Report to the Evaluation Team

The report to the evaluation team was well structured with clear commentary on important issues.

Financial Management

The quality of the detail in the Tables 8-11 of the Centre report was very good. The Centre clarified its assumptions in the reporting of both cash and in-kind resources making it easy to understand the way in which the report was constructed.

One issue that was not highlighted in the report was the degree of surplus cash (input over expenditure) in the first two years of Stage 2 - of the order of 11 million SEK. The only mention of this was a footnote indicating a "lag" in expenditure that would be remedied by the end of Stage 2. The evaluation team is concerned that the Centre budget could have been allowed to reach the stage where it would have to almost double its expenditure in Year 5 to achieve a balance. We were told at interview that imminent initiatives would partly solve the problem. It is surprising however that the board did not take earlier action to avoid what appear to be last minute expenditures.

Recommendation:

- 13 That the Board be more pro-active in ensuring that the finances of the Centre follow the operational plans approved by VINNOVA

2.8.7 Training Personnel of High Competence

The Centre has a staff of management/administrative and scientific personnel divided between undergraduate students, PhD students (12), post doc (3) and senior researchers (10). The level of MSc students is modest and 2 students have been involved in the Centre activity during Stage 2. At the interview with the PhD students we saw a vital group of young scholars, all with great enthusiasm and academically ambitious regarding their research and future careers. Several of the students highly appreciated the research collaboration with the industrial companies and considered them as potential employers; others appeared to be working in isolation with only minimal industry contact. Several of these students have international experience and have managed to develop fruitful international relationships and joint publications. The PhD students constitute an important value for the Centre, and the evaluation team detected a weakness regarding the capitalizing of this value since there were no signs of a formulated career planning and training program.

Recommendations:

- 14 That the Centre develop and implement individual career training programs for young research scientists
- 15 That the Centre should use its strong links to industry as a selling point to attract more undergraduate and PhD students to supply industry and academia with increased numbers of trained specialists

Gender

The gender issue is a critical element for the Centre which is acknowledged by the Centre as a challenge. The Centre has struggled to attract women researchers especially at senior levels and this could partly be explained by the nature of this scientific discipline. The Centre management sees the importance and the impact of gender balance related to the work environment.

Therefore in Stage 2 this has been a priority action. A project has been carried out in order to highlight the challenges and actions needed in order to attract more females into the field.

Equity is a separate point on every board meeting and the number of female researchers and students is a progress indicator for the Centre.

The outcome of this attention has been that the number of females has increased from 2 to 7 in Stage 2. Additionally two female masters students have conducted their theses in the Centre. However the number of female researchers and students is still too low and more women need to be recruited to all levels of the Centre's operations. As the Centre progresses to Stage 3 there is the opportunity to formulate and solve specific challenges on exactly how gender issues impact on the development of this research field and its outcome. Additionally the opportunity to develop specific training and career plans for the female staff should be considered.

Recommendation:

- 16 That the Centre increases the proportion of women among undergraduate students, PhD students, postdoctoral fellows, the ISAB, Project Leaders, Management Team, Board, and Centre Partner Key Contacts

One jarring point with regard to gender was the lack of attention to gender-neutral language in the report. Also annoying was the use of the number of female participants in the Centre as an ‘activity indicator’ which was summed with other totally unconnected activity indicators to produce a meaningless total.

Recommendation:

17 That the Centre uses gender-neutral language in all its documents and communication.

Mobility of Personnel between University and Industry

Several indicators point to good mobility between the university and the industrial partners. Co-authorship on publications, office and laboratory facilities at the disposal for research collaboration, industry financing the PhD training of own employees, and industrial positions at Chalmers all underline the level of mobility.

Contributions to University Education

The results and knowledge created in the Centre is brought back into the educational system at Chalmers by the Centre researchers and industrial partners. However this is mainly input to existing programs/courses and the development of new courses or programs as a result of the Centre has been very limited to date.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Board and management develop mechanisms to detect if the Centre is indeed enabling speedier translation of scientific advances to its company partners.
- 2 The Centre should carry out a commercial risk analysis before terminating the InGaP HBT-based MMIC theme
- 3 The Centre should budget for an increased ratio of PhD to senior researchers
- 4 That the Centre benchmark its research output at project level against the academic state of the art
- 5 That the Centre increases the total number of patents plus publications per FTE/Yr in Stage 3.
- 6 That the Centre urgently establishes consensus on an IPR model and a matching Board structure that removes the apparent tension over intellectual property ownership and management
- 7 That the Centre develop metrics that distinguish between and enable recording of commercialization and research successes
- 8 That the Board take responsibility for strategic planning, goal setting, guidance to management, and monitoring of performance ensuring that the added value of having a Centre is maximised
- 9 That the Centre Director, working with the management team, leads, proposes, executes and reports on activities against the Centre’s agreed strategic and operational plans
- 10 That the Board and management improve goal setting (utilising the advice of the ISAB) to establish realistic goals for all aspects of Centre operations in Stages 3 and 4.
- 11 That the Board and management work together to improve and clarify the current KPI matrix scoreboard to ensure that the chosen key performance indicators truly provide

information on progress on the Centre's short and long-term goals and delivery on the Centre Mission.

- 12 That improved communication be a major feature of Stage 3 plan and progress on this be monitored closely by the Board.
- 13 That the Board be more pro-active in ensuring that the finances of the Centre follow the operational plans approved by VINNOVA
- 14 That the Centre develop and implement individual career training programs for young research scientists
- 15 That the Centre should use its strong links to industry as a selling point to attract more undergraduate and PhD students to supply industry and academia with increased numbers of trained specialists
- 16 That the Centre increases the proportion of women among undergraduate students, PhD students, postdoctoral fellows, the ISAB, WP coordinators, Management Team, Board, and Centre Partner Key Contacts
- 17 That the Centre uses gender-neutral language in all its documents and communications.

Recommendations to VINNOVA

- strengthen instructions to Centres on reporting, particularly against operational plan and budget
- Demand KPI benchmarking on both academic and commercialization issues and include such a section in the suggested report template

In conclusion

- The evaluation team is of the opinion that the Centre has performed adequately against the VINNOVA criteria for VINN EXCELLENCE Centres in most respects and is producing quality industry driven research. However Stage 3 funding should not be approved until
 - the recommendations above are well addressed and
 - the Centre has established formal agreement on an IPR model and a matching Board structure that removes the existing tension over intellectual property ownership and management

Robert Johnston (Chair)

Heidi Dreyer

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Dominique Schreurs

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2.9 Evaluation of HELIX

VINN Excellence Centre at Linköping University

Introduction

On October 26-27, 2010, the Centre Director, Per-Erik Ellström, colleagues of the VINN Excellence Centre: HELIX, industry partners, and university representatives, had meetings with the evaluation team at Linköping University. The scientific experts of the international evaluation team, Pascale Carayon and Peter Totterdill, addressed matters concerning research strategy, projects, and progress. The generalist evaluators, Doug Reeve (Chair), Bob Johnston, and Anne Anderson, together with the experts, in a subsequent meeting, addressed matters such as organization and management, finance, interaction between industry partners and the university, and educational activities. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.9.1 Long-term Vision, Mission and Strategy

As an interdisciplinary centre with a focus on work organisation and working life, HELIX places major emphasis on an “interactive approach” to research grounded in collaboration with enterprises, public agencies and social partners. HELIX reflects a long-standing focus within the Swedish research community and embodies national perspectives and traditions established over several decades. Its current portfolio of projects and the associated income streams are impressive. The portfolio builds on traditional concerns with quality of working life but also engages with topical issues such as public service reorganisation, marketisation, and innovation.

The 2007 evaluation team expressed doubts about the utility of “mobility” as a unifying concept within HELIX’s portfolio of projects, and in 2010 these doubts are magnified rather than dispelled. Mobility is a broad notion and, despite its use by HELIX as a ‘boundary concept’, its meaning has been stretched to include any aspect of working life that is of interest to the researchers and their partners. Certainly the term no longer provides either a clear explanation of HELIX’s activities or supports its branding. Nor does it offer a clear direction for deciding which projects to pursue. Several other organising concepts such as “sustainability” also began to emerge from discussions with the evaluation team and warrant further exploration as potentially more coherent unifying concepts.

VINNOVA’s approach to financial support is both enlightened and rare in Europe as a whole: secure, long-term funding allows focused research objectives and outputs to be developed in partnership with stakeholders rather than identified in advance. This model gives HELIX an enormous advantage and the opportunity to build sustainability into its operating plan from the outset. Continuity post-2016 is identified as one of HELIX’s key goals. The early signs, particularly in terms of external income generation, are very encouraging. However, attention should be given to supporting the development and emergence of future centre leadership.

Recommendations:

- 1 That HELIX’s staff and partners take part in a structured, reflective exercise designed to generate a coherent conceptual framework.

- 2 That the Centre uses the unifying conceptual framework to organise, select and screen projects.

2.9.2 Scientific Quality and Productivity: Part 1

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

The HELIX team represents an impressive range of research talent and experience, including many staff with international records of achievement. HELIX researchers represent six disciplines: business administration, education, industrial ergonomics, innovation and entrepreneurship, sociology, and work and rehabilitation. These disciplines are relevant to the overall goal of developing sustainable change and innovation in working life. HELIX's critical mass of researchers from these varied disciplines has the potential to develop ground-breaking research in work life development. However the majority of HELIX senior researchers were initially trained at Linköping University, which may limit the pool of knowledge, expertise and experience available for achieving their research ambition.

In response to the 2007 evaluation's recommendation for improving the organisation of projects HELIX created seven clusters; these appear to offer opportunities for truly interdisciplinary approaches to the sharing and creation of knowledge. Each cluster is led by a group of senior researchers typically from diverse disciplines and is focused on multiple projects conducted in collaboration with the Centre's partners. Several examples of multidisciplinary scientific impact were cited, for instance outcomes from a specific project published in different journals representing different disciplinary perspectives. The multidisciplinary nature of cluster projects should be commended and further enhanced. However the evaluators question both the number of clusters and the process leading to their selection and organisation.

It is surprising that there appears to be little integration of the knowledge generated by the different projects in each cluster. For example HELIX states that it has ambitions to create a wider "European model" for sustainable change in organisations and working life. Thus the *Production and Organisational Development in Firms and Public Organisations* cluster contains a series of innovative projects likely to generate complementary insights and knowledge relating to a European model of lean production. Yet, as with the other clusters, there appears to be no strategy for managing and integrating knowledge from these different projects into an output greater than the sum of the parts. This will seriously undermine HELIX's ability to achieve a "European model" recognised in the rest of Europe.

Lack of a systemic approach to knowledge integration appears both within and between the seven clusters, and represents a serious weakness in HELIX's ability to achieve its strategic goals. During discussions with the evaluation team, the sharing of data collection methods (e.g., a questionnaire to measure innovation) was mentioned as an example of activity occurring across clusters, and this type of initiative is to be welcomed. Collaboration across clusters also occurs by means of seminars and a diverse range of opportunities for meeting with partners, though the scientific impact of this cross-cluster dialogue is unclear and unmeasured. HELIX should formulate and maintain a much clearer account of how multidisciplinary adds to the quality and relevance of its research. The process for capturing the added value of multidisciplinary research should be embedded in every project. This will enable

multidisciplinarity to be recognised as a core strength of HELIX, thereby contributing to the creation of a distinctive brand and international reputation.

Linköping University has made a clear commitment to the HELIX by providing a defined working space. This dedicated space allows researchers from different disciplines to interact formally and informally. Thus HELIX Ph.D. students enjoy increased opportunities for scientific exchange and exposure to different disciplines that enrich their Ph.D. research. Students have access to a large pool of senior researchers who can provide timely and useful advice.

Recommendations:

- 3 That the Research and Innovation Council and the Board review the number and organisation of clusters to reflect the need for a more focused rationale for HELIX as a whole, with the presumption that the outcome will be fewer but deeper clusters.
- 4 That the Research and Innovation Council ensure that multiple disciplines are actively involved in collaborative research in each cluster and all research projects involve more than one discipline.
- 5 That the Centre's leadership urgently develop a strategy for integration of knowledge across clusters and projects in relation to the overall research theme.

International Comparators with other Centres and Collaborations

HELIX has begun to address the criticism of limited international engagement made by the 2007 evaluation team, for example through the establishment of the International Scientific Advisory Board. HELIX researchers are also involved in a few European initiatives such as the Danish-led *Network for Research on Employee-Driven Innovation and Workplace Learning* and the *EU Evaluation Network* (see page 13 of the *Report*).

This limited (perhaps opportunistic rather than strategic) engagement remains surprising given the scale and scope of HELIX's portfolio and expertise as well as its stated intention to inform European thinking. Systemic engagement with Europe requires proactive engagement with Brussels and international partners. For example the recent EU 2020 Strategy consultation, consultations on the design of FP8 and policy debates on social innovation deal with topics close to the heart of the HELIX agenda. Yet the *Report* makes little mention of engagement in such policy dialogue with the European Commission, representing a wasted opportunity for HELIX to share its knowledge and experience in an important public sphere. HELIX should actively participate in EU policy dialogue and adopt a strategic approach to targeting key sources of Commission funds, including DG Employment, DG Enterprise, DG Region, DG Research and DG Sanco. Building a strong collaborative network of research and social partner organisations, including from new EU Member States, will be central to the success of this strategy. HELIX is also silent in the sustained dialogue that other European work life research centres have with the Commission on the need for more focused policy measures to stimulate new forms of work organisation. Nonetheless the engagement with European Structural Funds nationally and at EU level, including the proposed 2012 conference on "Knowledge Formation for Sustainable Work Life and Regional Development", represents a very promising starting point. However the opportunity exists for HELIX to reignite Sweden's thought leadership in

work organisation thereby realising its aspiration to create a new European model, but this will require a much more strategic approach.

Recommendation:

- 6 That the Centre's leadership drive a proactive and structured approach to ensure effective EU-level engagement, i.e. in policy deliberations, in social partner organisations and in collaborative research networks.

2.9.3 Scientific Quality and Productivity Part 2

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

The concept of “interactive research” is a useful umbrella term that embodies core values and can generate clear “win-win” benefits for researchers and partners. However the diversity of methodologies demonstrated across the current portfolio of HELIX projects suggests that the concept represents work-in-progress, and it will be important to ensure that processes are in place that lead to shared learning, reflection and the further development of interactive research methodologies.

Moreover the need (in the words of one of its partners) “to reinforce HELIX as a brand” remains pressing. HELIX provides rich opportunities for researchers to build international profiles. Yet there is a danger that HELIX itself will fail to create a sufficient national and international profile despite the reputational capital of its researchers, and this will not bode well for its sustainability after 2016. Annual “HELIX Days” represent a start in addressing this deficit but further profile-raising at national and international level is essential.

Section 4B of the *Report* differentiates the direct, conceptual and symbolic impact of HELIX activities. Under the heading of direct forms of knowledge use, five specific cases identified as examples of the influence that project outcomes can have on the centre's partners. There is no indication that such impact was systematically measured. The case examples describe the impact in terms such as “continuously interacted with the management team” and “active and interactive participation in meetings”. Given the enormous emphasis placed on interactive methodologies and the “utmost importance” of the partnership, it is really surprising that direct impact is not measured systematically and in detail by HELIX. While it is readily accepted that some of the impact may not be quantified, evidence of a consistent commitment to measuring qualitative impact in workplaces would be very welcome – not just for a sample of five projects but across the whole portfolio. This is important for at least three reasons: firstly to persuade partners and other stakeholders that worthwhile practical outcomes do result from HELIX's commitment to interactive research, thereby helping to ensure the Centre's long-term future; secondly because interactive research is not universally understood beyond Scandinavia and it would be helpful to gather impact data systematically to raise the international significance of HELIX's approach; thirdly because it would provide the HELIX team with a valuable resource for internal reflection and improvement. In addition, HELIX researchers need to work closely with partners at the outset of projects to identify target indicators, baseline data and appropriate evaluation methodologies.

The HELIX Academy and National Advisory Board represent potentially valuable initiatives to intensify impact and may help to ensure the Centre's sustainability after 2016. Both initiatives will need to be very adroit in demonstrating that they can address the real concerns of participants, add value to existing practices and contribute to the vision of HELIX.

Recommendation:

- 7 That the Centre undertakes to assess the qualitative impact and measure the quantitative impact of HELIX intervention in workplaces as appropriate.
- 8 That the Board and Director take steps to enhance HELIX's profile at both national and international levels.

Processes for Idea Generation and Project Management

Research projects are defined through a consultative process with the partners; this dialogue leads to the definition of needs-driven research projects that have potential impact on the partners, as well as scientific and policy impact. Section 3 of the *Report* lists six industrial partners, three public agencies and four labour market organisations (the absence of employers' organisations is notable and disappointing, but this reflects their apparent unwillingness to engage in research grounded in a social partnership context).

HELIX's commitment to "interactive" research leading to actionable knowledge (as well as to academic publication) appears to provide the glue that holds the partnership together, and this is reflected in the partner "voices" distributed through the *Report*. There is a commitment to creating "an attractive meeting place" through opportunities for dialogue, breaking down barriers by bringing actors together who might not otherwise meet to explore common concerns and convergent interests. Continuity of dialogue through diverse seminars and meetings appears to hold the key to relationship building.

The selection of research topics and projects appears to emerge from such dialogue, which provides a focal point for the "cross fertilisation" of theoretical debate and practical concerns. If the model actually works like this in practice it is a significant achievement for both the VINNOVA funding model and for the HELIX *modus operandi*. However as previous sections argue there is a need to ensure the creation of a body of cumulative knowledge through parallel and successive projects within and across clusters.

Overall Conclusion - Scientific Quality and Productivity

VINNOVA funding has provided HELIX with a rare opportunity to innovate, excel in its chosen field and create a sustainable future for itself. HELIX has attracted a very able research team (albeit with a somewhat limited geographical provenance) and its broad approach has the potential both to make local impact and to achieve international excellence.

Our concern is that while it has achieved much in five years, HELIX should adopt a strategic approach to securing both local and international prominence given its privileged access to resources and opportunities. Not to do so would represent a significant wasted opportunity for Linköping University, for Sweden and for Europe.

2.9.4 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

The evaluation team was impressed with the number of non-academic partners that are committed to the Centre and by their continued contributions, both cash and in-kind.

Despite the relatively large number of partners, it is apparent that the management of the relationships between academics and these partners is proceeding well. But the evaluation team believes that the current profile might well be a limiting factor in achieving longer term goals of the centre. In the report and in the interview it appeared as though relatively few partners had a significant national or international sphere of activity and influence. SMEs appeared to be under represented. Some examples of immediate candidates for partnership are ALMEGA, the Swedish Agency for Economic and Regional Growth, and the Swedish Association of Local Authorities and Regions (SKL).

The evaluators realise that expansion of the partnership could bring with it an increased management burden and could also dilute the focus of the Centre. There is therefore a need for a careful strategic approach.

Recommendation:

- 9 That the Centre develop a philosophy for partner profile development and a strategy for extending the membership of the partner group to deliver on their ambition to become a centre of national and international importance.

Processes for Needs Identification and Articulation

The evaluation team was impressed by the processes in place for partner needs identification. Partners can and do identify and articulate their individual needs through their own internal processes but their needs are also identified as a result of feedback from Centre research projects or through participation in project seminars and partnership meetings where there is a focus on a specific topic. There has apparently been a high degree of participation and engagement by the partnership in the initiation and planning of the research program and the projects. In the interview we learned that, despite equivocation in the written report, all projects without exception had been developed with input from partners. The frequency of joint seminars and partners meetings – 4 times a year - was thought to be appropriate.

Partner Participation in Innovation and Technology Translation

A slight concern of the evaluators in the written report was the statement that “implementation of research results will be high on the agenda for the coming Stages 3 and 4 of the HELIX programme” because this begs the question “has translation been satisfactory to date?” However results from research projects are regularly conveyed to the partner organisations through project meetings or seminars and partners apparently participate in preparing reports. The evaluation team finds this mode of translation to be satisfactory for the moment, but suggests that a process be put in place to raise awareness of the importance of early dissemination of potentially useful research results. The team learned at the interview that part of the rationale for

the planned National Advisory Board was to enhance the promotion of the Centre's achievements and results to a wider body of potential users.

Commercialisation Successes and Benefits to Society

All participants, academic and non-academic appeared to be convinced that the Centre is having a large and important impact and all spoke highly of the benefits of the partnership.

Nevertheless the measure of the impact was poorly recorded and reported, and the Centre staff had difficulty in articulating success. Simply enumerating the numbers of projects and project participants is not sufficient proof of success.

Convincing evidence of successful impact will be important for the Centre to become recognised, and rewarded, as a national and internationally important centre, and will be essential in maintaining sustained involvement of existing or new partners. The evaluation team considered that the appointment of a "Communication Officer", possibly a public relations staff member from one of the industry partners, might be appropriate to consistently capture, report and disseminate impact.

Recommendation:

- 10 That the Centre appoint a skilled communication officer to assemble evidence, and to articulate and publicise commercialisation, research and organisational successes as well as benefits to society arising from centre activities.

Overall Conclusion - Research Program Relevance, Utilisation and Commercialisation

In this area the Centre's performance is satisfactory but it needs to continuously re-assess its partnership makeup and structure, and be more proactive in demonstrating and disseminating its successes.

2.9.5 Organisation and Management of the Centre

The Partnership Group

The Partnership Group of the Centre is used as a forum for engaging partners, developing ideas for research and for disseminating results. It meets three to four times per year with thirty to forty people attending.

The Board's Role

The Board was represented by only a few of the partner members during the evaluation process (for the expert session from Rimaster, BT Products (Toyota), the Municipality of Linköping, TRR and the Swedish Metal Workers Union; for the generalist session from Siemens, Toyota and the Swedish Metal Workers Union). Academic members of the Board were present on both days. The evaluators commend the inclusion of a student on the Board. Board members were obviously well engaged with the Centre and spoke in a very positive and supportive way.

The academic representation on the Board should be altered to ensure that the voices of the University and Centre researchers are heard without problems of conflict of interest.

Recommendations:

- 11 That academics who receive funding from HELIX (directly or for projects) should not be on the Board.
- 12 That the University be represented on the Board by a senior, experienced person.

Management Team Structure, Processes and Performance

The Centre Director leads a Management Team of three academics and one administrative assistant with time commitments from each as follows: the Director, 50+%; the Deputy Director, 20%; the Director of Graduate Studies, 25% and the Coordinator, 100%. The organisational infrastructure we observed in the premises of the Centre and during the evaluations was a good indicator that the team provides effective support for the work of the Centre. It is vital that good administrative support continues to be provided to the Centre.

The Role of the International Scientific Advisory Board (ISAB)

ISAB has strong membership, meets annually and is used effectively by the Centre. It is noted that one of the listed members of the ISAB (G. Aronsson) is a Professor at Stockholm University and a collaborator and co-author with two senior Professors in the Centre; it is thus inappropriate for him to be on the ISAB.

Relationship to the University and University Units

HELIX has been granted a generous allocation of office and meeting space for its operations by the University. This is an important factor in creating a unique working culture; students and staff were uniformly enthusiastic about the atmosphere of the Centre.

HELIX has been very successful in forming a multi-disciplinary, extra-departmental environment. All Centre staff and students belong to a home department and many have office space in both places.

Financial Management

In Stage 2 the Centre will receive SEK 21 million cash from VINNOVA, SEK 21 million cash from Linköping University and SEK 9 million cash from partners. The partners will also provide an estimated SEK 13 million in kind contribution. The reported total funding is therefore SEK 64 million. There is an additional SEK 15 million in kind from the University reported in Table 10 that is not added to the total funding of the Centre in Table 8; it should be added to calculate the total resources available making a new total of SEK 79 million.

Recommendation:

- 13 That the Centre report in kind contributions from the University summed with other contributions as part of the total resources available

The Centre has done well in winning additional research funding as reported in Table 12, a total of SEK 81 million. This is laudable and a significant sum to stimulate the research and educational activities of the Centre. It matches projected Stage 3 funding.

However, for every grant listed in Table 12 the source of the funding is Swedish. One of the recommendations of the evaluation of 2007 was that the Centre seek funding from European research programs. During the evaluation it was noted that the Centre had made three applications for European funding during Stage 2 but that none was successful. It is important for the Centre to continue to seek funding from beyond Sweden to meet the challenges of competing internationally and to increase its stature and reputation in the world.

Recommendation:

- 14 That the Centre systematically expand its efforts to win international competitions for research funding.

2.9.6 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The evaluation team was pleased to have the opportunity to meet with seven Ph.D. students from HELIX. The students were at different stages of their doctoral studies but they were all extremely enthusiastic about the value that the Centre provides for them. They clearly have a strong sense of identity with HELIX and felt that the multi-disciplinarity which the Centre espouses is beneficial for their research.

The HELIX philosophy, the physical co-location of the researchers, the regular seminar programmes and the experience of shared training courses, all seem to have led to a real sense of shared identity among the students who report they benefit from an open and collaborative environment where they can draw on different disciplinary perspectives and help and support one another.

Although the Centre is performing well on aspects of ‘recruiting and developing people of international competence and experience’, there are some areas of concern. The Ph.D. group at the meeting were overwhelmingly Swedish with many graduates from Linköping University. Similarly the data on the whole Ph.D. cohort indicate a similar demographic with very little evidence of international recruitment. Despite the need to have Swedish speakers for some projects this should be addressed.

The evaluation team was a little surprised that few of the doctoral students expressed an interest in spending time at international Centres in their field. It was reported that there was funding and support available to do so and a couple of examples are mentioned in the report. This seemed to reflect a lack of appreciation of the international aspirations of the Centre and the competitiveness of the academic careers to which many of the students aspired.

The national or regional nature of the doctoral cohort, combined with the large number of senior academics having their degrees from Linköping, present challenges if HELIX is to achieve its goal to become a nationally and internationally leading centre for research and innovation. This will require developing a greater international perspective and ambition. As the Centre makes plans for the years ahead, including its future academic and leadership profile, these goals should be taken into account.

Recommendation:

- 15 That the Centre takes systematic steps to diversify and internationalise its research staff and students.

Mobility of Personnel between University and Industry

The Centre has attracted four organisational or industrial Ph.D. students to date, which is commendable. The Ph.D. students expressed enthusiasm for the collaborative way their research was undertaken with partner organisations, and they saw this as a major strength of the HELIX research environment. The amount of time students spend in partner organisations was reported to be worked out on a project by project basis and seems to be determined by the amount of data gathering, interviews etc which need to be undertaken. The Centre might consider more generic approaches to encouraging longer periods spent with partners not related to data collection.

Despite the value the partner organisations place on engagement with HELIX, the evaluation team was a little disappointed to learn that to date no partners had been able to spend time in HELIX - for example as adjunct or guest lecturers.

Recommendation:

- 16 That the Director and Board develop a plan to encourage sustained mobility of personnel between university and partner organisations.

Gender Perspective

Gender research is one of the key areas of expertise in HELIX and a substantive area of research in several projects. HELIX has also participated in the VINNOVA Tiger programme, and as a result has been further developing gender research projects with partners. The number of female Ph.D. students has grown from 50% of the first cohort to 100% of the latest admissions. This is encouraging but not unusual for the social science disciplines represented in HELIX. The policy of striving for equal representation of men and women on the Board is valuable.

The gender balance is less encouraging in terms of the management and academic staffing of the Centre. The Director and management team are male, only two of the six Professors are women, one of two Associate Professors is female but still little progress on these issues seems to have been made since the Centre began. The evaluation team was surprised that given the explicit focus on gender in the research programme and the disciplinary backgrounds within the Centre, the research leaders do not seem to have reflected on this or developed any strategy or plans to improve the position.

Recommendation:

- 17 That the Director and academics within the Centre develop and implement a strategy for promoting better gender balance at senior academic levels of HELIX.

Contributions to University Education

Members of HELIX have been involved in a number of courses for undergraduate and postgraduate students in their own departments. The HELIX Ph.D. students had also clearly benefitted from the training they had received.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That HELIX's staff and partners take part in a structured, reflective exercise designed to generate a coherent conceptual framework.
- 2 That the Centre uses the unifying conceptual framework to organise, select and screen projects.
- 3 That the Research and Innovation Council and the Board review the number and organisation of clusters to reflect the need for a more focused rationale for HELIX as a whole, with the presumption that the outcome will be fewer but deeper clusters.
- 4 That the Research and Innovation Council ensure that multiple disciplines are actively involved in collaborative research in each cluster and all research projects involve more than one discipline.
- 5 That the Centre's leadership urgently develop a strategy for integration of knowledge across clusters and projects in relation to the overall research theme.
- 6 That the Centre's leadership drive a proactive and structured approach to ensure effective EU-level engagement, i.e. in policy deliberations, in social partner organisations and in collaborative research networks.
- 7 That the Centre undertakes to assess the qualitative impact and measure the quantitative impact of HELIX intervention in workplaces as appropriate.
- 8 That the Board and Director take steps to enhance HELIX's profile at both national and international levels.
- 9 That the Centre develop a philosophy for partner profile development and a strategy for extending the membership of the partner group to deliver on their ambition to become a centre of national and international importance.
- 10 That the Centre appoint a skilled communication officer to assemble evidence, and to articulate and publicise commercialisation, research and organisational successes as well as benefits to society arising from centre activities.
- 11 That academics who receive funding from HELIX (directly or for projects) should not be on the Board.
- 12 That the University be represented on the Board by a senior, experienced person.
- 13 That the Centre report in kind contributions from the University summed with other contributions as part of the total resources available
- 14 That the Centre systematically expand its efforts to win international competitions for research funding.
- 15 That the Centre takes systematic steps to diversify and internationalise its research staff and students.
- 16 That the Director and Board develop a plan to encourage sustained mobility of personnel between university and partner organisations.
- 17 That the Director and academics within the Centre develop and implement a strategy for promoting better gender balance at senior academic levels of HELIX.

Recommendation to VINNOVA

In conclusion:

- The evaluation team is of the opinion that the Centre is regionally significant and has the potential to become nationally leading and internationally important. With the expectation that the recommendations made in the report above are addressed; the evaluation team recommends continued VINNOVA support.

Doug Reeve (Chair)

Anne Anderson

Pascale Carayon

Bob Johnston

Peter Totterdill

2.10 Evaluation of Hero-m

VINN Excellence Centre at The Royal Institute of Technology (KTH), Stockholm

Introduction

On November 15-16, 2011, the Chair of the Centre Board, Gunnar Brandt, the Head of Centre, John Ågren and Assistant Head of Centre, Annika Borgenstam, colleagues of the Hero-m Centre, PhD students, industry partners and university representatives had meetings with the international evaluation team at Royal Institute of Technology (KTH) for an evaluation of the Centre's performance so far in Stage 2 (May 1, 2009 – April 30, 2012). The scientific expert of the evaluation team, Greg Olson, assisted by generalist evaluator, Mary O'Kane, addressed matters concerning research strategy, projects and progress. (Sybrand van der Zwaag was to attend as an expert but at the last minute was unable to. He submitted written comments and joined the other evaluators by teleconference for a discussion of recommendations.) The generalist evaluators, Doug Reeve (Chair of the Evaluation Team), Mary O'Kane and Alison McKay, together with the scientific expert, addressed matters such as organisation and management, finance, interaction between industry partners and the university, and educational activities. In addition, the evaluation team met with PhD students, discussing their background and future plans, and their research and other experiences in the Centre. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.10.1 Long-term Vision, Mission and Strategy

The Centre is very clear about what it is doing. There are two parts to this:

- building of new science-based materials engineering tools;
- ultimately to support a methodology of materials design.

It is clear the Board embraces the full scope of this vision, and some industry partners have already begun their own application of the tools to true computational design of materials.

The Centre has been highly successful in developing new tools and transferring them to the industry partners. It is now crucial that it delivers on their proposed significant design demonstrator as a key focus of Stage 3. In strongly endorsing the Centre's plans to focus on a design demonstrator, the evaluation team is not recommending that the Centre stop pre-competitive tool development; indeed we expect that the demonstrator feeds back into this, creating a virtuous cycle.

In determining the best demonstrator to concentrate on, the Centre could profitably spend some time in the lead up to Stage 3 exploring multiple demonstrator possibilities with a view to choosing a class of materials that constitutes a significant challenge (including multiple objectives) and which suits the methodology need of the industry partners.

Recommendations:

- 1 That the Centre moves to emphasise and organise its design demonstrator as a key focus of Stage 3.

- 2 That the Centre chooses its demonstrator to emphasise the tools that the industry partners are most interested in while being non-competitive (as opposed to pre-competitive) to their own projects.

2.10.2 Scientific Quality and Productivity

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

The Centre is achieving excellent research results. Indeed it is in a world-leading position for development of the science-based engineering tools *and* their transition to industry. **No other group around the world has done this so well.**

Participants in the Centre clearly have the experience to work together very efficiently as a team. This mitigates potential concern over critical size issues and some participants only contributing a small percentage of their time.

Overall what they are doing is meeting their productivity goals, and showing good progress in broadening their toolset to include structure/property models. The organization of the Stage 3 demonstrator project provides a timely context to prioritize the properties to be modelled. These properties (and thus the associated demonstrator problem) are best chosen to meet the general interests of the industry partners.

Recommendation:

- 3 That the Centre supports the continued development of structure/property modelling using the demonstrator project to address highest priority properties.

An unusual but pleasing aspect of this Centre is the Harriet project. This worthy and effective project is addressing the attainment of gender equality in centres such as Hero-m. We note that both women and men from industry and the academic partner spoke to the effectiveness of the impact of the project. We believe that the methodologies explored through this work can be pushed even further as the project enters its design phase, building on the opportunity of creative teamwork experiences.

Recommendation:

- 4 Because design is becoming a central theme and as student teams are participating in design, the Centre should use the Harriet project to study and help enhance the role of diversity in team creativity and subsequent productivity. Design teamwork can be used as a programmed learning experience in diversity and the management of an inclusive environment.

International Comparators with other Centres and Collaborations

It is clear that the Centre benchmarks itself against other materials modelling centres (and compares favourably to all those it lists in the report) but now, as it moves to Stage 3, it would be appropriate to benchmark specifically against materials design activities as well.

The Centre has many useful international alliances but it could profitably seek further opportunities in international collaboration that would enhance its global visibility. The Materials Genome Initiative offers a splendid opportunity for this.

Recommendation:

- 5 That the Centre should look to opportunities for international collaboration under the banner of the Materials Genome Initiative.

The report states that the international exposure of the PhD students has improved substantially. At the interview the evaluation team heard that there is strong encouragement for PhD students to attend international conferences. We heard that a small number of students also have been able to spend time in other laboratories. This opportunity could be profitably offered to other students.

Recommendation:

- 6 That the Centre builds on its high international reputation by sending PhD students to key international centres, not only for student benefit but to enhance the visibility of the Centre.

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

The Centre could benefit from doing more intensive research on design methodology and how it impacts the nature of their tools. This will likely offer a higher level of utility of the tools themselves, as well as develop a process that extracts more value from their application.

Recommendation:

- 7 That in support of the development of their design demonstrator, the Centre explores the concept of structured hybrid modelling as a means to improve the adaptability of its modelling tools to support iterative materials design.

Processes for Idea Generation

With the move in Stage 3 to undertaking a major design demonstrator, the Centre will need to move more into the mode of design thinking. This could be expedited by using resources from within KTH such as faculty who specialise in CDIO teaching. Industry partners have expressed an appreciation for the value of students experiencing design application before coming to industry.

Recommendation:

- 8 That the Centre moves to design thinking and supporting contextual analysis in its ideas generation processes.

Overall Conclusion - Scientific Quality and Productivity

The quality of the Hero-m group remains at a very high level indeed. The high quality is the result of the personal qualities of the key scientists in the Centre as well as the strong and active and participative network it has built with the Swedish metal industry. Clearly the industry sets scientifically and technologically attractive goals and the Centre team shows itself highly competent in reaching them.

For the kind of things it is doing, the Centre is world leading, not just in science but also in the transition of its key findings to industry.

2.10.3 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

The Centre has twelve member partners from the metals fabrication industry plus KTH Holding. It is evident that the partners are very much engaged with the Centre on many fronts and fully supportive of the mission and vision of the Centre. It is a welcome finding that the companies can operate on a high technical level and so are readily able to absorb the research results of the Centre. The Centre has had discussions with prospective partners who might bring new knowledge to the Centre.

Processes for Needs Identification and Articulation

The Centre is world leading in computational materials science based engineering and is bringing leading edge tools to its industry partners. The partners in turn recognize the challenges of materials design as applied to their own ambitions for product development and are very much engaged with needs articulation. The Centre's planned design demonstrator is at the forefront of partner needs. The Centre organizes annual visits to each of the partners that facilitates recognition of industry needs.

Partner Participation in Innovation and Technology Translation

Partners are already using knowledge and tools developed by the Centre. Excellent mobility of students and personnel between the university and industry aids in this.

Commercialization Successes and Benefits to Society

Software developments in the Centre are taken on by Thermo-Calc Software and sustained as functional tools for industry. The Centre leads a related effort funded by VINNOVA, the Brinell Vinn program, that facilitates transfer of knowledge to companies to benefit commercial operations.

2.10.4 Organization and Management of the Centre

The Board's Role

The Evaluation Team was impressed by the way in which the Board influences the Centre's research. The Board makes a substantial contribution to the current and future industrial significance of the research. The composition of the Board is two thirds from industry and one third from KTH. From the discussion at the interview the team suggests that the Centre considers whether the KTH representation on the Board might be reduced from three to two: one member of KTH management with line management responsibility for the Centre and a second person to provide connections to other Materials research at KTH, for example, through senior representation from the KTH Materials Platform.

Concerns were previously raised with regard to potential appearance of conflict of interest in the role of TCSAB. An overly conservative approach to these issues can restrict the opportunity for TCSAB to provide a long-term future for the tools created in this program. Based on experience at other research universities, such issues can be productively managed by a committee with

business experience who can assess relative risk and value in these issues, providing clear answers to potential conflict questions.

Recommendation:

9 That the Centre Board creates a Conflict of Interest Committee.

Management Team Structure, Processes and Performance

The management of the Centre is both effective and efficient. The division of administrative tasks among senior staff and research students is sensible and gives benefits to all parties.

International Scientific Advisory Board's Role

The ISAB plays an integral role in the Centre. The recruitment of Professor Tresa Pollock to the ISAB during Stage 2 complements the other members by strengthening expertise in relationships between material structure and property, and in integrated computational materials engineering.

Relationship to the University and to University Units

The Centre is well integrated into KTH both vertically, through the Dean into the School of Industrial Engineering and Management, and horizontally, through personal relationships between key research leaders.

Financial Management

The University meets the VINNOVA matching requirements for cash and in-kind contributed to the Centre. The industry partners also meet the matching requirements.

The Centre reports that it has won 33 million SEK in additional funding (This figure was reported to be only those projects that were directly associated with the Centre subject matter.)

2.10.5 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The Centre has assembled an excellent team of experienced and junior researchers drawn from academia and industry. It also has established good mechanisms for drawing in specialist expertise as needed both from Swedish and international institutions.

The leadership team in the Centre clearly functions well as a unit; concentrating on top-level management and coordination while devolving many of the more mundane administrative tasks to the PhD students as part of their employment conditions. The students indicated that this, along with the teaching they also do, gives them valuable real-world experience that is likely to be useful in applying for jobs.

The PhD students, who were able to describe their research and their experience of being members of the Centre in a highly articulate manner, impressed the evaluation team which noted the quality of their research output both in the posters presented and in the publications they had achieved in top journals.

Despite the excellent cadre of current PhD students in the Centre, the evaluation team suggests that a more formal approach to student recruitment would be valuable for the future and would help attract excellent students from a wider range of institutions and countries to the Centre.

Mobility of Personnel between University and Industry

There is very good mobility between university and industry partners in this Centre with industry participants taking a leading role in various Centre projects and with good opportunities for students to work closely with industry.

Gender Perspective

The Centre has a good gender mix in its Board, ISAB and management team. Unfortunately there is only one female PhD student at present.

However as indicated above, this Centre takes gender and diversity issues very seriously and has effected cultural change on these matters through the Harriet Project.

Contributions to University Education

The Centre makes a significant contribution to university education with researchers from Centre leaders to PhD students all engaged in educational offerings.

The Centre has an opportunity to make its students even more employable by involving them closely in the materials design methodologies that will be used in the demonstrator project in Stage 3.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Centre moves to emphasise and organise its design demonstrator as a key focus of Stage 3.
- 2 That the Centre chooses its demonstrator to emphasise the tools that the industry partners are most interested in while being non-competitive (as opposed to pre-competitive) to their own projects.
- 3 That the Centre supports the continued development of structure/property modelling using the demonstrator project to address highest priority properties.
- 4 Because design is becoming a central theme and as student teams are participating in design, the Centre should use the Harriet project to study and help enhance the role of diversity in team creativity and subsequent productivity. Design teamwork can be used as a programmed learning experience in diversity and the management of an inclusive environment.
- 5 That the Centre should look to opportunities for international collaboration under the banner of the Materials Genome Initiative.
- 6 That the Centre builds on its high international reputation by sending PhD students to key international centres, not only for student benefit but to enhance the visibility of the Centre.
- 7 That in support of the development of their design demonstrator, the Centre explores the concept of structured hybrid modelling as a means to improve the adaptability of its modelling tools to support iterative materials design.

- 8 That the Centre moves to design thinking and supporting contextual analysis in its ideas generation processes.
- 9 That the Centre Board creates a Conflict of Interest Committee.

Recommendation to VINNOVA

VINNOVA should in future evaluations be more precise in its instructions to the centres about who should participate in the various parts of evaluation meetings.

In conclusion

The evaluation team is of the opinion that the Centre is doing excellent, industrially enabling, challenge-driven research and clearly meets the standards of a VINN Excellence Centre. With the expectation that the above recommendations are addressed, the evaluation team recommends continued funding.

Doug Reeve (Chair)

Alison McKay

Mary O’Kane

Greg Olson

2.11 Evaluation of iPACK

VINN Excellence Centre at The Royal Institute of Technology (KTH), Stockholm

Introduction

As part of the second round of evaluations of VINN Excellence Centres, an evaluation team met with iPACK on 17-18 November 2011. The scientific experts of the evaluation team, Berit Sundby Avset and Arved Huebler, addressed matters concerning research strategy, projects and progress. The generalist evaluators, Doug Reeve (Chair), Mary O’Kane and Alison McKay, together with the scientific experts, addressed matters such as organisation and management, finance, interaction between industry partners and the university, and educational activities.

The evaluation team reported to VINNOVA that iPACK did not meet the standards expected of a VINN Excellence Centre. In its Interim Report on the Centre, the evaluation team stated “there are fundamental scientific and organisational issues that need to be addressed if the Centre is to meet those standards and therefore be deserving of funding for the next stage”.

The evaluation team recommended:

- that the evaluation be suspended and that Stage 3 funding not be granted until a satisfactory evaluation had taken place
- that the issues articulated in the interim report be addressed and a new Stage 3 Operating Plan be prepared before the evaluation proceeds
- that a formal written report from the ISAB be submitted on scientific progress along with the Stage 3 Operating Plan before the evaluation proceeds
- that the evaluation may then proceed based on a new Stage 2 Report to the Evaluation Team

VINNOVA accepted most of these recommendations and the Centre addressed the issues raised in the Interim Report.

On 24-25 September 2012, the Chair of the Centre Board, Olle Steffner, the new Centre Director, Axel Jantsch, colleagues of the iPACK Centre, industry partners including potential partners and University representatives had meetings with a new international evaluation team at Royal Institute of Technology (KTH) for an evaluation of the Centre’s performance taking on board the changes made and the new material produced. The scientific experts of the evaluation team, Berit Sundby Avset, Arved Huebler and Ke Wu, again addressed matters concerning research strategy, projects and progress. And the generalist evaluators, Mary O’Kane (Chair), Alison McKay and Anja Skrivervik, with the scientific experts, addressed matters such as organisation and management, finance, interaction between industry partners and the university, and educational activities. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.11.1 Long-term Vision, Mission and Strategy

The Centre has started on a process to revise its vision, mission and strategy with the aim of sharpening and focussing them, as recommended by the interim evaluation. At the evaluation meeting the Centre was not able to deliver a final version of the vision because it is still in the

discussion phase with current partners and potential new partners. A revised focussed vision is important to the success of Stage 3.

Comment on Interim Recommendations

- That the Centre creates a revised vision that is cohesive and focussed, that is aligned with the identified needs of industry and society, and that reflects the aspirations of its academic members

The Centre showed commitment to addressing this and the matter had been extensively discussed but needs to be finalised as a matter of urgency.

- That the Centre develops a strategy to enable the realization of the vision

This issue is still open and depends on the vision and mission being finalised.

Recommendations:

- 1 That the Centre develops a pioneering vision to inspire and unify all partners in Stage 3
- 2 That the Centre develops a pragmatic mission and a detailed strategy to deliver the vision

2.11.2 Scientific Quality and Productivity

The Centre is very active and has provided output of good scientific quality in some fields. In order to enhance the scientific quality and quantity the Centre should ensure that overlapping research efforts are avoided with respect to common components among the projects. The Centre should define clearly the boundary between Centre activities and the responsibilities of the industry towards commercialisation.

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

Success Criterion: Research programmes are set up and carried out in collaboration between the various participants in order to solve key issues.

Success Criterion: 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.

The research programs are set up and carried out in collaboration between the various participants in order to solve key issues in a satisfactory manner. The Centre leads international research in different fields in collaboration between the private and public sectors, universities and colleges, research institutes and other organisations which conduct research. The Centre has developed a number of industry-oriented research projects through prototypes and demonstrators. In order to increase the international recognition of the Centre, the evaluation team recommends that the core competence on heterogeneous integration should be made more visible through magazine publications or other activities.

Comment on Interim Recommendations

- That the Centre reviews its projects in the light of the revised vision

This issue is still open because the vision remains to be finalised.

- That the Centre ensures all researchers funded by the Centre produce appropriate output including publications, and report their output

The Centre has a large number of publications but they are not equally spread among the researchers.

- That the Centre examines its competence profile and addresses any shortcomings in view of the revised vision through new collaborations

This has not yet been made possible as the vision remains to be finalised.

Recommendation:

- 3 That the Centre reviews the scope and the progress of its ongoing projects and its competence profile once the revised vision has been finalised and makes the appropriate adjustments

International Comparators with other Centres and Collaborations

The Stage 2 report refers in Section 2.5 to a comparison with some international groups. However, there are other groups within the same fields for instance in the US. Once the vision and mission of the Centre have been finalised the Centre may find it useful to readdress the comparison issue as a part of identifying the Centre strategy and its unique position.

Comment on Interim Recommendations:

- That the Centre actively engages in collaboration with other VINN Excellence Centres, such as Mobile Life, on related topics

The Centre has one joint PhD student with Mobile Life, and is exploring the possibility of a closer collaboration generally with SICS and Mobile Life.

- That the Centre undertakes a systematic analysis of its research work to identify shortcomings and specific strengths of the Centre compared to other centres world-wide

This issue has not been addressed adequately and should be performed in the light of the revised vision.

Recommendation:

- 4 That the Centre makes meaningful exchanges and collaborations with high profile international groups of similar interest

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

Success Criterion: Ensuring that new science based knowledge generated leads to new products, processes and services

The Centre presently addresses a wide spectrum of research topics. Excellent success has been observed for certain projects delivering good quality demonstrations and convincing results for technical peers and industrial partners. Some industrial partners have been actively involved. The validation of the research programs through demonstrators generally presents a good approach. However, more original research and/or more value-added techniques should be

highlighted in the programs, to make them unique and attractive. This could also present a good way of attracting high-quality students and academic exchanges with other well-known research groups, which will in turn enable further innovations and developments of the Centre.

Comment on Interim Recommendations:

- That the Centre, in its report, articulates the results of each of the projects in terms of publications, demonstrators, commercial proposals and patents

This was appropriately addressed in an appendix to the Stage 2 report.

Recommendation:

- 5 That the Centre in close collaboration with its industrial partners identifies integration factors, research drivers, R&D priorities and strategic orientations which are more likely to enable the successful commercialisation of the research

Processes for Idea Generation

The small project system is a good way of generating and exploring new ideas and it is laudable that the Centre is using resources on these projects. The Centre should ensure that the possibility of such projects is widely known among the industrial partners, and encourage industrial partners to propose projects.

Overall Conclusion – Scientific Quality and Productivity

The Centre has presented a number of interesting R&D achievements supported by technical publications and industrial interests. However, unique cutting edge technology should be more pronounced and a strategy should be formulated for improving university-industry collaboration.

2.11.3 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

The Centre has eighteen partners; eight have made cash contributions in Stage 2. At the interviews a good proportion of the industry partners were represented along with representatives of other companies that are anticipating becoming partners in Stage 3. All were positive regarding the potential benefits of being members of the Centre.

Success Criterion: 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).

The Centre's innovation environment couples an innovation funnel model with a prototype-based research methodology.

Comment on Interim Recommendations:

- That the Centre, in the light of the new vision, selects and develops partnerships with organisations that are (a) aligned strategically with the Centre's vision and (b) likely to add value to the Centre's work

From the Generalist meeting we are confident that, once the vision has been finalised, this recommendation will be acted upon.

- That the Centre through its Board ensure all partners provide cash contributions commensurate with their size and the potential benefits they might gain

At the Generalist meeting it was evident that this issue is being addressed by the Board.

Processes for Needs Identification and Articulation AND Partner Participation in Innovation and Technology Translation

An innovation process for Stage 3 was presented at the Generalist meeting. This gave confidence that the Centre's prototyping methodology will be effective in both the identification and refinement of industry needs and in engaging industry in innovation and technology translation.

Comment on Interim Recommendations:

- That the Centre ensures the industry needs for each project permeate the entire project, from initial definition, through the project team, to the delivery of outputs

The innovation process for Stage 3 addresses this issue and recognises different mechanisms for the initiation of commercialisation opportunities. One of the industrialists noted that the VINNOVA Centre agreement formed a good starting point for discussions in this area.

- That the Centre increases the engagement of industry personnel in Centre research for instance by having more industry scientists and engineers assigned as project leaders or specialists

From the evaluation report (Table 6), only one of the fourteen project leaders is from industry.

Success Criterion: Promoting sustainable growth by ensuring that new knowledge and new technological developments generated lead to new products, processes and services.

It was reported that a high proportion of the Centre's PhD students have taken positions in Swedish industry on graduation. The innovation process for Stage 3 promises to promote the development of new services built on a platform of integrated heterogeneous components.

Commercialisation Successes and Benefits to Society

A number of demonstrators show promise in this area.

Comment on Interim Recommendations:

- That the Centre, KTH Holding and KTH senior management put in place arrangements for the processing of IP that are effective, efficient, and deal with new IP in timeframes that are appropriate given the fast-moving nature of the landscape in which the IP is to be exploited

This recommendation has been addressed.

Recommendations:

- 6 That the Centre, in the light of the new vision, selects and develops partnerships with organisations that are (a) aligned strategically with the Centre's vision and (b) likely to add value to the Centre's work

- 7 That the Centre increases the engagement of industry personnel in Centre research for instance by having more industry-based scientists and engineers assigned as project leaders or specialists and more co-authored publications

2.11.4 Organisation and Management of the Centre

The Board's Role

Success Criterion: 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.

The Centre meets this criterion.

Success Criterion: Did the Board ensure that the Centre implemented recommendations of previous evaluations prior to secure long-term effects and international excellence

The Board has worked hard over the last few months to address the recommendations from the Interim Evaluation. The Centre acknowledges that it has yet to finalise its vision, mission and strategy for Stage 3. (See various comments in sections above.)

Management Team Structure, Processes and Performance

The evaluation team commends the Centre Board on the excellent choice of a new Director and the University for rearranging his duties and support structures to maximise the time he can devote to the Centre.

The evaluation team also commends the Centre on the well-functioning core management team (including the founder of the Centre as the Scientific Director) which has received careful and diligent guidance and support from the Board Chair.

The report to the evaluation team was a significant improvement on the report presented in November 2011 but it still had deficiencies. Significant sections had not been updated since November 2011 and some important information was not covered. In total the report portrayed the Centre in a less favourable light than was apparent in the meetings with the evaluation team. The evaluation team suggests that for future reports the Centre management writes less in total, but checks what is written more carefully for completeness, accuracy and consistency.

The International Scientific Advisory Board (ISAB)

The International Scientific Advisory Board (ISAB) has a reasonable complement of members although consideration could be given to expanding it for Stage 3, with any expansion hopefully addressing the current gender imbalance.

However the ISAB has not physically met, nor has it met virtually without the presence of Centre management, for some time. This is in contravention of the VINNOVA requirements and is an unacceptable situation especially when the Centre has had to face major challenges, a time when it most needs to draw on the wisdom of the ISAB, working collectively and not just as individuals providing advice.

Recommendation:

- 8 That the Centre arranges for the ISAB to meet face-to-face annually in Stage 3, and that it has a face-to-face meeting before the end of April 2013 from which it provides a written report to the Centre with comments and recommendations on its finalised vision, mission, strategy and Stage 3 plans

Relationship to the University and to University Units

Success Criterion: The majority of work is conducted at a university to achieve a critical size and interaction between research, postgraduate education and graduate education.

The Centre is located at a world-class university.

The Head of School of Information and Communication Technology, Professor Mikael Östling, assured the evaluation team of the University's continuing strong support, including cash support, for the Centre especially through his own School. This support includes the provision of excellent scientific infrastructure.

It is clear that the University has taken a strong role in helping the Centre Board and management address the recommendations of the Interim Evaluation.

Also it was reported at the Generalist meeting that the University has allocated hands-on support for the financial management of the Centre.

Communication and Promotion

The Centre is addressing communication issues well particularly through the national media. The evaluation team heard how media exposure has attracted new potential industry partners to the Centre.

Financial Management

The reporting of finances was of a good standard.

Success Criterion: 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.

This criterion is met.

Comment on Interim Recommendations:

- That the Centre prepares financial tables that are: 1) clear, 2) accurate, 3) consistent with the text, and 4) sufficiently detailed with footnotes so the reader can understand
- That the Centre confers with VINNOVA and KTH as to the applicable rate of overhead for Stage 2, set at 35% at the beginning of Stage 2
- That information is provided on the total remuneration of each student, including scholarship funds, in addition to the information on Centre funding to the student
- That Table 12 contain information on the total scholarship funding coming to the Centre through its students
- That data on in-kind contribution from companies be reported with more precision and less approximation

- That the nominal carry forward of StoraEnso funding from Stage 1 be resolved into cash and in-kind and reported in Stage 2
- That Board representation be deleted from in-kind contribution reporting
- That the funding for small projects be more clearly identified in income and expenditure summaries

The financial tables were presented in line with VINNOVA guidelines, consistent with the text and understandable. Although not directly evident from the tables, an overhead rate of 35% of direct costs had been applied. Information provided on the total remuneration of each student, including scholarship funds, was clear and the team was reassured in the Generalist meeting that the remuneration of each student was in line with the University rules. Data on in-kind contribution from companies was reported in a more convincing manner in that the in-kind outcomes were, in most cases, different to the budgets. Issues related to carry forward of StoraEnso funding from Stage 1 had been resolved and Board representation not included in in-kind contribution reporting. Funding for small projects was very clearly identified in income and expenditure summaries.

2.11.5 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The Centre has recruited a substantial number of PhD students, some directly and some through external scholarships. They form an international group with a high number of Chinese students. The relatively small number of Swedish PhD students does not concern the Centre seniors and the University, as the vibrant work environment of the Centre has enticed many of the PhD and Masters students finishing their degrees to stay in the Stockholm area. Industrial partners have commented on the usefulness of the Centre in enabling them to hire skilled engineers and scientists.

Moreover, the Centre's efforts to alert PhD and Masters students to innovation and industrialisation issues are highly commended.

Mobility of Personnel between University and Industry

Mobility between industry and University takes place through weekly seminars, workshops and in interactions between the different actors at project level. Two PhD students are currently doing industrial PhDs with partner companies.

The Centre has achieved international mobility by being very attractive to students coming with external scholarships, The Centre would however benefit from building partnerships with other high profile international Centres with a view to setting up student exchanges.

The structure of the Centre allows for guest researchers to participate in activities of the Centre through its small project scheme. So far, four scientists from KTH, one from Tampere University, and one from STMU have participated in the Centre via this scheme. The evaluation team feels that it would be fruitful to use this mechanism to invite more international guest scientists. This is likely to have the additional benefit of raising the visibility of the Centre internationally.

Contributions to University Education

The Centre contributes actively to education in KTH's School of Information and Communication Technology. It is a core partner in promoting a PhD + MBA program organised jointly by the Electronic Systems Department and the Turku Business School. The Centre has also participated in the organisation of a Masters curriculum on Embedded Systems with a strong emphasis on innovation and entrepreneurship (30 ECTS credits). Moreover, it offers courses on the innovation process to all its researchers.

Gender Perspectives and training for senior roles in research

Success Criterion: Equality aspects and active promotion for an equal balance of gender.

Success Criterion: A gender perspective in the research program.

The gender balance is good on the level of PhD students, as a third of the students are female. Matters are not as good at the senior level, with a strong gender imbalance in the Board, the ISAB, the management of the Centre and at the senior researcher level. The evaluation team acknowledges that this is largely due to gender imbalances in the main research fields of the Centre, and that the University is aiming to address this imbalance in its recruitment policies. However, the Centre could also take a more proactive role by, for example, keeping track of the career of promising junior female scientists in the field and identifying potentially interesting female candidates for upcoming positions to University nomination commissions.

International mobility could also be used to invite senior female scientists for short-, medium- or long-term stays in the Centre.

Recommendation:

- 9 That the Centre embraces a proactive attitude to mitigating the gender imbalance at senior level

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Centre develops a pioneering vision to inspire and unify all partners in Stage 3
- 2 That the Centre develops a pragmatic mission and a detailed strategy to deliver the vision
- 3 That the Centre reviews the scope and the progress of its ongoing projects and its competence profile once the revised vision has been finalised and makes the appropriate adjustments
- 4 That the Centre makes meaningful exchanges and collaborations with high profile international groups of similar interest
- 5 That the Centre in close collaboration with its industrial partners identifies integration factors, research drivers, R&D priorities and strategic orientations which are more likely to enable the successful commercialisation of the research
- 6 That the Centre, in the light of the new vision, selects and develops partnerships with organisations that are (a) aligned strategically with the Centre's vision and (b) likely to add value to the Centre's work

- 7 That the Centre increases the engagement of industry personnel in Centre research for instance by having more industry-based scientists and engineers assigned as project leaders or specialists and more co-authored publications
- 8 That the Centre arranges for the ISAB to meet face-to-face annually in Stage 3, and that it has a face-to-face meeting before the end of April 2013 from which it provides a written report to the Centre with comments and recommendations on its finalised vision, mission, strategy and Stage 3 plans
- 9 That the Centre embraces a proactive attitude in mitigating the gender balance at senior level

Recommendations to VINNOVA

- 1 That VINNOVA requires that VINN Excellence Centres submit a formal audited statement of accounts for the last financial year before an evaluation
- 2 That VINNOVA ensures it has an observer at all Centre Board meetings especially over the lead-in to Stage 3
- 3 That VINNOVA, in its end-of-Stage reporting instructions, requires centres to explicitly report against recommendations from the previous Stage evaluation

In conclusion

The evaluation team is of the opinion that the Centre is a promising example of a VINN Excellence Centre. With the expectation that the vision/mission/strategy are finalised and that the other recommendations listed above are addressed, the evaluation team recommends continued funding.

Mary O’Kane (Chair)

Berit Sundby Avset

Arved Huebler

Alison McKay

Anja Skrivervik

Ke Wu

2.12 Evaluation of Mobile Life

VINN Excellence Centre at Stockholm University

Introduction

On November 10-11, 2011, the Centre Director, Oskar Juhlin, colleagues of the Mobile Life Centre, PhD students, industry partners and university representatives, had meetings with the international evaluation team to evaluate the Centre's performance so far in Stage 2 (April 1, 2009 – March 31, 2012). The scientific experts of the evaluation team, Yvonne Rogers and James Hollan, addressed matters concerning research strategy, projects and progress. The generalist evaluators, Doug Reeve (Chair), Mary O'Kane and Alison McKay together with the scientific experts, in a subsequent meeting, addressed matters such as organisation and management, finance, interaction between industry partners and the university, and educational activities. In addition, the whole evaluation team met with senior researchers and PhD students, discussing their background and future plans, and their research and other experiences in the Centre. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.12.1 Long-term Vision, Mission and Strategy

At the core of the Centre's vision are the notions of enjoyment and happiness. The research agenda is concerned with providing pleasure and fun through technologies, primarily in the form of meaningful mobile services. There has been a focus on providing richer, more meaningful and more pleasurable experiences. Whilst laudable, this begs the question of what is the baseline and why the need to make life more enjoyable and playful. The rationale for wanting to improve the quality of life in these ways is not always clear. In order for the vision to be more generally understood over the next five years and to drive ambitious and adventurous research, it needs better motivation and explication. In particular, the vision of 'enjoyment through technology use' needs to articulate the specific scientific challenges being addressed and how life could be different if the challenges are met. This might be accomplished with 'what-if' scenarios. In addition, the negative consequences and tradeoffs involved in technology use, as well as how the challenges are manifest for different segments of society, should be discussed.

Recommendation:

- 1 That the Centre articulates a more explicit vision and accompanying specific research questions and link the vision and questions to the research agenda for the next five years.

2.12.2 Scientific Quality and Productivity

Productivity in terms of scientific publication and prototype construction is excellent. The Centre's output includes 54 peer reviewed papers (with 5 best paper nominations) and 11 journal articles in some of best venues of the field (e.g. CHI, CSCW, IEEE Multimedia). Two books, three doctoral dissertations, and 10 masters theses further document the work. The Centre is increasingly well known and is attracting international researchers visiting for extended periods. This has resulted in joint publications and continued collaborations.

Recommendation:

- 2 That the Centre steps back and reflects on current research contributions and systems with the goal of summarizing what has been learned and sharpening the specific research questions being addressed.

Research Area, Competence, People, Facilities, Critical Size

There is much interest in the core research areas that the Centre is investigating, i.e. mobile services, the internet of things, gaming and health, as evidenced by the comments of the industrial partners and board members. In addition, the Centre is able to explore a range of nascent areas in ICT and mobile technologies, which partners do not typically carry out in house. The directors, senior researchers and PhD students appear highly competent in addressing far-reaching and new areas, using a range of methods and interdisciplinary techniques. In particular, the Centre is to be commended for adopting and applying a range of innovative methods for advancing this area of research.

The size of the Centre is appropriate for its current stage of development. The facilities and lab space are exemplary.

International Comparators with other Centres and Collaborations

The Centre is unique in the resources and skill sets available. It has few international comparators. The funding level and support structure creates the space and continuity required to make significant contributions in this new research area. An impressive level of collaboration with industrial partners, academic institutions, and the public sector is already in place, with further opportunities and new partners being explored.

Recommendation:

- 3 That the Centre continues to diversify in the partnerships it develops, whilst maintaining strategic focus.

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

Adequate mechanisms are in place for enabling new projects to emerge and for a consensus to be reached to terminate research projects when considered necessary. There is a good set of coherent projects that have resulted in a number of technological outcomes and advances in knowledge. However, a concern was that many of the new projects may raise ethical issues that need additional methodological input.

Recommendation:

- 4 That the Centre debates, possibly through new partners and collaborators, ethical and philosophical issues that are raised by the research

Processes for Idea Generation

The iterative nature of the Centre's design methods (with representation from multiple disciplines, frequent close interaction with partners and other university Centres, and expanding international collaborations) provides a productive foundation for idea generation. The Centre is

to be commended particularly for its citizen dialogue projects and for providing a pre-competitive arena for cross-fertilization of ideas.

Overall Conclusion - Scientific Quality and Productivity

The Centre has, in a relatively short period of time, established itself as an international research lab with a ‘wow’ factor. It is to be commended for taking on board the recommendations from the last evaluation and building the foundation for a centre for excellence. It is to be congratulated on its interdisciplinary and innovative research ideas. The research environment appears to be excellent for nurturing and mentoring junior researchers and establishing senior researchers as international leaders.

2.12.3 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

The Centre currently has 12 partners: Stockholm University, SU Holdings, STING and Kista Science City representing public sector research and innovation; a local government partner, Stockholm City Municipality; and seven industry partners, two of which are SMEs recruited during Stage 2. This is an excellent and appropriate partner mix.

Partners, which were well represented at the interview, presented well-articulated views in support of the Centre and the benefits they derived from it.

The current partners are committed to continuing in the Centre for Stage 3. In addition, the Board and management are currently actively negotiating with potential new partners including strategic-use partners. This planned future partner complement is appropriate and appears to have been carefully thought through.

Processes for Needs Identification and Articulation

Partners are satisfied that the Centre’s mode of identifying which projects to work on has been appropriate while the Centre was being established during Stages 1 and 2. It is clear that the Centre has earned a reputation for openness in dealing with stakeholders, including partners.

The evaluation team was impressed by the Centre’s process of preparing a 5-year Operational Plan, engaging actively with its Board, International Scientific Advisory Board and other stakeholders in refining this Plan.

Partners indicated at the interview that the Centre might move towards more targeted needs identification as it transits to Stage 3 and later stages.

Partner Participation in Innovation and Technology Translation

Partners were clear that they valued the Centre as a place of open, leading-edge, pre-competitive experimentation which complemented the more specifically product and service innovation that takes place in companies.

From the beginning, the Centre has created opportunities for the partner staff to meet Centre personnel. This is currently managed through industry days every six months backed up by

extensive informal interaction, which is particularly enabled by the Centre's location within Kista.

Technology translation through researchers moving to industry has been a laudable feature of the Centre.

Commercialisation Successes and Benefits to Society

Direct commercialisation has not been a major feature of the Centre to date although activity in this area has increased recently, with explorations of the possibilities of commercialising Affective Health, Creator and Instant Broadcasting System underway.

The active participation of a highly engaged, public-sector partner such as Stockholm City Municipality has led to a focus on society benefits.

2.12.4 Organisation and Management of the Centre

The Board's Role

The Board has a good representation of partners and institutes. The Board has been active with management in developing the strategic plan for the next five years of the Centre. The evaluation team was impressed by the Board's level of engagement with the Centre.

Management Team Structure, Processes and Performance

The Management Team is to be complimented on the impressive development of the Mobile Life culture and research environment. They have gathered together a highly productive team of researchers, students and industry collaborators.

The Management Team consists of the Director, the Co-Director, the Past Director, the Senior Research Manager and the Coordinator. The four main PIs have had a policy of rotating the Directorship. The evaluation team is, in part, in agreement with the International Scientific Advisory Board, when they express their concern about the limitations of the rotating Directorship. The report was not entirely clear as to how the members of the Management Team divided up the work of operating the Centre. The Centre would be better prepared to meet the future, anticipating increasingly complex operations with more activities, partners and students, with more formal articulation of the roles and delegation of responsibilities among the team members.

Recommendations:

- 5 That the Centre, with the assistance of the Chair of the Board, reviews and articulates the roles and responsibilities of the members of the Management Team
- 6 That the Centre updates the organization chart

The International Scientific Advisory Board (ISAB)

The ISAB is, generally, very well constituted with five members, has met with admirable frequency and has been engaged with the Centre in a substantive way. They are to be complimented on the insightfulness of their most recent report. As is required by VINNOVA,

ISAB members must be arms length and so one member of the ISAB who has been a co-author with Centre researchers on a number of publications must step down.

The Report to the Evaluation Team

The evaluation report was not up to the expected standard. The main body was 53 pages long when the maximum specified was 37. The report suffered from being, at times, vague, repetitive, inconsistent and not well focussed on the requirements set by the guidelines.

Communication and Promotion

The web site was not very informative, particularly about the “fun” aspects of the research, nor was it easy to navigate. The Dean’s match-making between PIs in Mobile Life and with other researchers elsewhere in the University is to be commended. The Centre could do more to further promote its research internally.

Recommendations:

- 7 That the Centre improves the website to make it more informative, up-to-date and easy to navigate
- 8 That the Centre increases its visibility in Stockholm University, for instance by presenting its work to the senior leadership of the University

Financial Management

The Swedish Institute of Computer Science (SICS) and the Interactive Institute (II) are sub-contractors to Stockholm University. SICS, II and the University together meet the VINNOVA matching requirements for cash and in-kind contributed to the Centre. The industry and public sector partners also meet the matching requirements.

The Centre reports that it has won 26 million SEK in additional funding. The Centre is encouraged to increase its performance in winning related funding from other sources.

Recommendation:

- 9 That the Centre prioritizes its budget so as to increase the proportion of Centre’s funding that is devoted to PhD student salaries

2.12.5 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The team met nine PhD students with a range of educational backgrounds and countries (including Belgium, China, Pakistan and Portugal). The overall impression from the PhD students was very positive in that they seemed happy to be working in such a vibrant academic setting and encouraged by their supervisors to take responsibility for developing their own research areas. It was good that the Centre encourages externally funded students to work within the Centre. However, there was some inconsistency in the reporting of the number of PhDs supported by the Centre.

Given the inherent difficulty of interdisciplinary research, emphasis on research methodology (as opposed to methods) and the relationship of individual research activities to literature on

research methodology would strengthen the students in positioning their work, especially with respect to single disciplines and “harder” sciences.

Recommendation:

- 10 That the Centre arranges for students to receive education in commercialization and entrepreneurship as part of their course requirements.

Mobility of Personnel between University and Industry

It was encouraging to see many of the Centre’s students and staff being subsequently hired by industry. The PhD students were positive about their interactions with industry and the close proximity of the Centre to Ericsson offices was seen as beneficial.

Gender Perspectives and training for senior roles in research

Overall the Centre appears to have a good gender balance and gender was not seen as an issue by the senior researchers.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Centre articulates a more explicit vision and accompanying specific research questions and link the vision and questions to the research agenda for the next five years.
- 2 That the Centre steps back and reflects on current research contributions and systems with the goal of summarizing what has been learned and sharpening the specific research questions being addressed.
- 3 That the Centre continues to diversify in the partnerships it develops, whilst maintaining strategic focus.
- 4 That the Centre debates, possibly through new partners and collaborators, ethical and philosophical issues that are raised by the research
- 5 That the Centre, with the assistance of the Chair of the Board, reviews and articulates the roles and responsibilities of the members of the Management Team
- 6 That the Centre updates the organization chart
- 7 That the Centre improves the website to make it more informative, up-to-date and easy to navigate
- 8 That the Centre increases its visibility in Stockholm University, for instance by presenting its work to the senior leadership of the University
- 9 That the Centre prioritizes its budget so as to increase the proportion of Centre’s funding that is devoted to PhD student salaries
- 10 That the Centre arranges for students to receive education in commercialization and entrepreneurship as part of their course requirements.

Recommendations to VINNOVA

- That VINNOVA organize an annual innovation workshop for VINN Excellence Centre PhD students and junior researchers

In conclusion

The evaluation team is of the opinion that the Centre has made outstanding progress since the last review and has developed a distinctive multidisciplinary Centre meeting Vinn Excellence Centre guidelines. With the expectation that the above recommendations are addressed, the evaluation team recommends continued funding.

Doug Reeve (Chair)

James Hollan

Alison McKay

Mary O’Kane

Yvonne Rogers

2.13 Evaluation of ProNova

VINN Excellence Centre at The Royal Institute of Technology (KTH), Stockholm

Introduction

On November 14-15, 2011, the Centre Director, Amelie Eriksson-Karlström, colleagues of the ProNova Centre, PhD students, industry partners and university representatives, had meetings with the international evaluation team for an evaluation of the Centre's performance so far in Stage 2 (April 1, 2009 – March 31, 2012). The scientific experts of the evaluation team, Kristiina Takkinen and Markku Kulomaa, addressed matters concerning research strategy, projects and progress. The generalist evaluators, Doug Reeve (Chair) and Alison McKay, together with the scientific experts, in a subsequent meeting, addressed matters such as organisation and management, finance, interaction between industry partners and the university, and educational activities. In addition, the whole evaluation team met with a few selected PhD students, discussing their background and future plans, and their research and other experiences in the Centre. (We note that a third generalist who was planned to participate, Mary O'Kane, was unable, at the last minute, to attend the generalist interview but contributed to team discussions.) There were a number of issues about which the evaluation team was not satisfied. These issues with subsequent recommendations were summarized in an interim report to which ProNova Centre was asked to respond and so a further evaluation meeting when all evaluators, including Mary O'Kane, participated was held on March 7, 2012. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.13.1 Long-term Vision, Mission and Strategy

The progress of the subprojects is convincing with high level scientific results combined with potential IP. The unique position of the ProNova Centre having access to the HPA affinity reagents can be exploited in the development of improved or novel affinity tools and bio-analytical platforms and gives an excellent opportunity to widen industrial collaboration.

Recommendation:

- 1 That the Centre increases its focus on long-term strategies for enabling transfer of fundamental research results, including methodologies, tools and platforms, to innovations that are taken up by industry

2.13.2 Scientific Quality and Productivity

The research projects in the ProNova VINN Excellence Centre are organized into four Program Areas with fruitful interactions between projects as reported by the PIs and students. The scientific evaluators were pleased to see the excellent progress of the research and creation of improved and new bio-analytical platforms and tools. This was obvious from the Stage 2 Evaluation Report and especially from the oral presentations given by the PIs of the Program Areas and individual subprojects. The ProNova Centre is in a unique position in regard to the Human Protein Atlas (HPA) and to its affinity reagents (antibodies and antigens). This provides an exceptional opportunity for development of high throughput techniques to annotate the

human proteome for drug target identification and biomarker detection and diagnostics. A clear implementation plan for Stage 3 will be important to enhance the activities of the present industrial partners and to promote new ones. The evaluation team also encourages the Centre to widen its international perspective with a view to deepening international relationships, improving international recruitment and creating opportunities for sabbaticals of the ProNova scientists.

The affinity tool reagents for labelling or purification of antibodies generated in the Program Areas 1 and 2 are intended to be exploited as commercial reagents. It is therefore highly important that the binding affinity and stability of these developed affinity molecules is characterised in appropriate detail by using sophisticated techniques and approaches in addition to Biacore and CD spectroscopic interaction analyses.

Recommendation:

- 2 That the Centre accelerates the employment of a wider range of biochemical and biophysical techniques for quantitative characterization of antibodies and other affinity proteins, particularly interaction and stability analyses including development of relevant expertise in the Centre or via collaborations including with the existing KTH facilities

In addition to the activity within the Centre, the PIs and senior scientists of the Centre clearly have significant activity and workload elsewhere at KTH and also with international collaborators. This is obviously essential to the progress of the Centre. It would, however, be beneficial to understanding the scope and development of the Centre if activities related to ProNova were detailed in the evaluation report.

Recommendation:

- 3 That the Centre submits as part of the operational plan to the Board and VINNOVA, explicit strategies and actions for increasing the international profile and collaborations of the Centre and that the full, relevant, scientific publication record of the PIs and senior scientists be listed. The evaluation guidelines suggest a method of noting publications that are not funded by the Centre

The evaluation team recognizes the high calibre of the scientific leadership, staff, students, facilities and biological materials assembled by, and available to, the Centre. The evaluators were impressed by the high level of motivation and productivity of the staff and students of the Centre. From a scientific point of view, the evaluation team is confident that the Centre has in place the necessary resources for a successful Stage 3.

2.13.3 Centre Partners

The evaluation team looks for a number of indicators of engagement of industry partners: cash contribution, in kind contribution from time spent by personnel, testimony of industry actions, presence and participation in the evaluation interviews. In this case these indicators suggest that industry was not engaged at the level expected. As the Centre enters Stage 3 and looks beyond, it is essential to develop partnerships with industry that are strong and robust in order that the Centre can fulfil the expectations of a VINN Excellence Centre to translate research into economic growth.

The Centre may benefit from the addition of new private sector partners for Stage 3, particularly where the company has expertise or markets that would complement the existing partner group. Care must be taken, however, to integrate new partners in a way that recognizes the investments already made by the partners present in Stages 1 and 2.

Recommendations:

- 4 That the annual partner cash contribution be significantly increased in Stage 3, particularly for large companies
- 5 That the cash and in kind contributions of new companies, particularly foreign companies, joining in Stage 3 should reflect the earlier, substantial investments (in cash and in kind) by other partners, the University and VINNOVA during Stages 1 and 2
- 6 That the annual partner in kind contribution associated with personnel time be increased in Stage 3

We recognize that some partners are contributing significant in kind in biological materials. It is important that a proper valuation of these materials be made to express accurately the value of this part of the research enterprise of the Centre.

Recommendation:

- 7 That a method of establishing the value of in kind contributions associated with transfer of biological materials (from the Centre to the partners and vice versa) and with analytical services be developed by individuals who are arms-length to all associated with the Centre

It was apparent from some discussions with the Centre that there has been considerable activity within the companies arising from their Centre involvement that has not been captured in the evaluation report. The Centre is advised to make a greater effort to record this “informal engagement” and impact.

2.13.4 Organisation and Management of the Centre

The Board's Role

On the Board there are three nominees of companies (AstraZeneca, GE Healthcare, and BioInvent) that are among the twelve company partners listed in the report. Also on the Board are four individuals who, while knowledgeable about the subject matter of the Centre, are not associated with companies who have a stake in the Centre (including the representative of KTH Holding). One of the critical functions of the Board is to facilitate development of strong relationships with partner companies including commitment of cash contributions to the Centre. The Board has not performed well in this respect to date. For example, the cash contributions from partners in Stage 2 are less than 2.5 million SEK, half the amount commonly found at other centres. As there are numerous small companies among the partners, greater representation on the Board might serve the Centre well.

KTH Holding is represented on the Board. However it is vital that the Centre Board be connected to the senior academic leadership of KTH and so appropriate representation on the Board is recommended.

Recommendations:

- 8 That a representative of the senior management of KTH be a member of the Board
- 9 That members of the Board be predominately representative of the set of organizations that have a commitment of cash or in kind to the Centre
- 10 That a representative of the smaller privately held partner companies be a member of the Board

Management Team Structure, Processes and Performance

At the initial evaluation in November 2011, the Centre's management structure needed improvement and the Centre has responded with a new organization chart, and an enlarged and reconstituted Management Team including the four Programme Area Directors. However, especially given the demands of Stage 3, there is insufficient emphasis placed by the Management Team on the development and maintenance of relationships with industry and additional expertise is required.

Recommendation:

- 11 That a new Management Team position be created to focus on building and maintaining relationships with industry with a view to increasing partner cash and in kind contributions and possibly growing the partner complement

The International Scientific Advisory Board (ISAB)

The ISAB last met in 2008; this is not in line with the VINNOVA guideline that the ISAB meets annually. It is noted that the ProNova Operational Plan, approved by VINNOVA, said that the ISAB is to review the Centre status biannually, in which case there should have been a meeting in 2010. One member of the ISAB is a co-author on a 2009 publication from the Centre and therefore is not arms-length and so should step down from the ISAB.

Recommendations:

- 12 That the ISAB be reconstituted with arms-length people
- 13 That the ISAB meets annually during Stage 3

2.13.5 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The evaluation team met with five PhD students; one was not Swedish and all had completed Masters degrees at KTH. While the evaluation team recognises the high calibre of KTH graduates, it regards as insufficient the effort devoted to recruiting students from other sources.

Recommendation:

- 14 That the Centre implements a plan for the recruitment and selection of international students and researchers.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Centre increases its focus on long-term strategies for enabling transfer of fundamental research results, including methodologies, tools and platforms, to innovations that are taken up by industry
- 2 That the Centre accelerates the employment of a wider range of biochemical and biophysical techniques for quantitative characterization of antibodies and other affinity proteins, particularly interaction and stability analyses including development of relevant expertise in the Centre or via collaborations including with the existing KTH facilities
- 3 That the Centre submits as part of the operational plan to the Board and VINNOVA, explicit strategies and actions for increasing the international profile and collaborations of the Centre and that the full, relevant, scientific publication record of the PIs and senior scientists be listed. The evaluation guidelines suggest a method of noting publications that are not funded by the Centre
- 4 That the annual partner cash contribution be significantly increased in Stage 3, particularly for large companies
- 5 That the cash and in kind contributions of new companies, particularly foreign companies, joining in Stage 3 should reflect the earlier, substantial investments (in cash and in kind) by other partners, the University and VINNOVA during Stages 1 and 2
- 6 That the annual partner in kind contribution associated with personnel time be increased in Stage 3
- 7 That a method of establishing the value of in kind contributions associated with transfer of biological materials (from the Centre to the partners and vice versa) and with analytical services be developed by individuals who are arms-length to all associated with the Centre
- 8 That a representative of the senior management of KTH be a member of the Board
- 9 That members of the Board be predominately representative of the set of organizations that have a commitment of cash or in kind to the Centre
- 10 That a representative of the smaller privately held partner companies be a member of the Board
- 11 That a new Management Team position be created to focus on building and maintaining relationships with industry with a view to increasing partner cash and in kind contributions and possibly growing the partner complement
- 12 That the ISAB be reconstituted with arms-length people
- 13 That the ISAB meets annually during Stage 3
- 14 That the Centre implements a plan for the recruitment and selection of international students and researchers.

Recommendation to VINNOVA

In conclusion

The evaluation team is of the opinion that the Centre is doing excellent research and platform development. However, progress in industrial engagement, international perspectives and organizational development are not as expected. This is described in the text and recommendations above. VINNOVA should only approve Stage 3 funding after these recommendations have been addressed satisfactorily.

Doug Reeve (Chair), Markku Kulomaa, Alison McKay, Mary O'Kane & Kristiina Takkinen

2.14 Evaluation of SAMOT – Service and Market Oriented Transport Research Group

VINN R Excellence Centre at Karlstad University

Introduction

On November 22-23, 2010, the Centre Director, Margareta Friman, colleagues of the VINN Excellence Centre: SAMOT, industry and public sector partners, and university representatives, had meetings with the evaluation team at Karlstad University. The scientific experts of the international evaluation team, Peter White and Jon Sundbo, addressed matters concerning research strategy, projects, and progress. The generalist evaluators, Doug Reeve (Chair) and Per Stenius, together with the experts, in a subsequent meeting, addressed matters such as organization and management, finance, interaction between partners and the university, and educational activities. The evaluators also had a separate meeting with SAMOT PhD student We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.14.1 Long-term Vision, Mission and Strategy

Concerning the content of research, SAMOT's vision is public transport that succeeds in combining the individual's requirements 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 actively contribute toward the sector developing in accordance with this vision, by producing and disseminating scientifically-grounded knowledge of public transport and its conditions; knowledge which both stimulates continued development and inspires critical reflection as regards public transport's service and market orientation.

The mission mostly is carried out by emphasizing individuals' transport requirements seen within a service marketing perspective. This is the scientific core competence of the research group, which has grown out of CTF. This development has been described by SAMOT as a profound shift in industry logic, from a production paradigm to a service paradigm. SAMOT's mission is to actively contribute toward this shift. The sustainability, or environmental issue, is addressed, however, only in some of the projects and as a given aim of the transport companies. Environmental issues are not investigated as such, only how the service design and delivery can support sustainability.

SAMOT's mission is to conduct multidisciplinary, internationally recognized research in active collaboration with trade and industry, the public sector, and universities. The researchers' vision is to develop a SAMOT identity, as a leading player in a special, newly emerging, transport sub-discipline within service marketing.

SAMOT has succeeded in implementing its strategy although some mission still is to be fulfilled in the coming stage.

2.14.2 Scientific Quality and Productivity Part 1

The research area of this Centre is the service marketing, management or science approach to transport. The researchers have competence in this field and are performing well. The claim of – in connection with CTF – being one of the world’s leading research centres within service marketing and management, can be supported. The collaboration with industry is quite outstanding. Particularly when it comes to development of a new transport-sub-discipline within service marketing, SAMOT has the potential to be a world-leading pioneer thanks to the competencies and critical mass that the VINNOVA grant has made possible. This, however, requires that SAMOT emphasizes and develops this potential. The Centre should market itself as this pioneer.

The research of SAMOT has been organised within three themes:

- Theme 1. Perception of public transport. This theme is explained as travellers’ experiences of their journeys are not only influenced by the transport company’s current operation but also by factors lying beyond the implementation of the journey. These can be of a technical, psychological, and social nature. Understanding the service operation on the basis of “the person the service exists for” is something that constitutes the very essence of the service perspective, and is thus also a theme which explicitly or implicitly reoccurs in all the projects.
- Theme 2. Public transport and its customer offering. This theme focuses on the organizations providing public transport services. What do they offer their passengers and how can this offer be organized and produced in a way that ensures quality and efficiency? These two tightly integrated questions providing the common denominator for the projects within the theme reflect a basic insight from service research, namely the simultaneous production and consumption of services. They link the public transport experience of Theme 1 to areas such as management, leadership, product/service and organizational development, and the theoretical fields of service management and organizational theory.
- Theme 3. Regulation, institutional frameworks, and rules of play. Services are provided and created through interaction with the customers within the framework of a larger social, economic, and political context. The basic “rules of play” – in research often called institutions – have shown themselves to be of crucial importance as regards the efficiency of entire economies, as well as the design and quality of individual services. This theme also investigates how transport services can be organised to support environmental sustainability and corporate social responsibility (CSR) goals.

The general approach of SAMOT is, in accordance with service marketing theory, to take a customer or user perspective. They successfully attempt to combine deductive research where the researchers define the research questions with practice or needs driven approaches. This is a strength of the research, which fits well with the competencies and research tradition of the research group.

The centre has a critical mass, however, it could attract more international researchers. It has been quite successful in attracting PhD students including two industrial PhD students, which is extraordinary within the service field. The Centre should be encouraged to continue this development, however, also to attract more international PhD students. SAMOT has influenced undergraduate teaching in Karlstad University. The university has

established a business school and transport has become an education field within service management. Students are attracted even from other universities.

In many respects, SAMOT can be seen as undertaking an almost unique function. While service quality and marketing in public transport attracts much interest elsewhere, this is often as a subsidiary activity within other research. Likewise, whilst marketing is often covered in transport research or within business studies, it is rarely the focus of a separate research group. There is thus no single group that can be used as the basis for a direct comparison.

In their report, SAMOT have correctly identified a number of leading research groups in transport studies in general, including the universities of California and Newcastle. A degree of collaboration has been attained internationally, in part through the direct links described in SAMOT's documentation, and in presentations on 22 November (such as those with St Gallen, Singapore and Hamburg), and also through the role of the International Advisory Board (with membership from the USA, Norway and the Netherlands).

Another means of assessing international comparisons is through the range of published work and conference presentations. A wide range of outputs is evident from material submitted to the evaluation panel, including papers in international journals of appropriate repute (such as 'Transport Policy' and 'Transportation Research Part A'). Staff are also involved in acting as referees for papers in academic journals.

The plans of the Centre for the future stage 3 are the following:

- Promoting sustainable growth

SAMOT will continue its work as an action researcher, a catalyst, and a mentor for sustainable service- and market-oriented transport research, undergraduate studies and practice. This aim should emphasize environmental sustainability more than in Stage 2 if the vision of combining customer perspective with sustainability should be fulfilled.

- Leading international research

This has been touched above. SAMOT has further established an international advisory board, which should be used more in stage 3.

- Research programs

SAMOT wants to develop its research during stage 3 and be open to the discovery of new research questions and methods. The group has mentioned innovation and perception of troublesome travellers as examples.

- Geographical programs

The Centre will focus on transport in specific regions and will consider whether transport as a means in regional competition should be a dimension in the research.

- Long term implementation

SAMOT wants to influence the public debate in the society

- Long-term collaborative finance

SAMOT will look for further funding.

- Needs-driven research
- Innovative environments

The social and scientifically inspiring milieu of SAMOT should be further developed.

2.14.3 Scientific Quality and Productivity Part 2

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

It is evident that all three major themes identified in SAMOT's work are closely linked and to some degree overlap. All share an essentially qualitative approach to the understanding of behaviour of both transport users and providers. Research approaches include in-depth interviews with managers and operational staff (such as those involved in the operation of the Stockholm Tunnelbana), or with users (such as the panel survey of the effects of a two-month free travel offer by Karlstadsbuss, including a control sample of those who did not take up the offer). The work with Varmlandstrafik, especially that by an industry-funded PhD student, is a further notable example. This approach enables a good understanding to be obtained of the perceptions and motivations of those involved, and may be contrasted with the disaggregate approach often adopted in of quantitative work elsewhere (for example, using stated preference methods) in which monetary values are assigned to variations in each attribute of a transport service.

It is important to ensure that a quantitative analysis is produced of the overall outcome of such initiatives, even if the contribution of separate elements cannot be disaggregated. For example, a gain in market share is cited as an outcome of the work with Varmlandstrafik, but it would be useful to have such indicators from other work the group has undertaken. If so, how might this be evaluated in terms of financial impacts (such as increased revenue), or wider public effects (such as modal transfer from car)? In this respect, it may be necessary to draw on other academic disciplines in addition to the core competency of service industry analysis to provide some guidance in assessment of outcomes (for example, from economics). The SAMOT group indicated that such expertise could be available either from within Karlstad University, or other institutions with which they have links.

In comparison with the physical sciences, the type of work undertaken by SAMOT is unlikely to produce technological outcomes or patentable products. Rather, it assists transport operators and authorities in expanding their expertise in marketing and improving service quality and thus achieving their desired outcomes.

Recommendation:

- 1 That the Centre strives to quantify more fully the impact of their work on organizations implementing their results

Processes for Idea Generation and Project Management

The group at SAMOT has been able to generate a wide range of ideas for research within the broad area of transport service industry marketing, and this may develop further through links with the transport operating industry and authorities. Project management is handled through a coordinator for each theme (three in total) within which a number of such studies by research staff and PhD students are undertaken.

Overall Conclusion - Scientific Quality and Productivity

Within the five years over which SAMOT has been operating, a substantial output has been produced. As might be expected, a substantial growth has been reported in the output of published works between stages 1 and 2, since for this to be attained the research firstly has to be carried out, and then the sometimes lengthy process of submitting papers to academic journals, followed by refereeing and eventual publication. Productivity in terms of output per member of staff appears to be appropriate. In some cases, PhD studies have not been completed due to changes in personal circumstances of the research students involved, but this is not untypical of academic research groups.

The overall output in terms of scientific quality and productivity within the field of service industry studies is thus welcome and appropriate. The main issue for future work may be that of ensuring that where necessary, expertise from other disciplines is brought in as required, especially in the evaluation of outcomes. Researchers from other disciplines may challenge the scientific approach thus it becomes more innovative.

Some scope may exist for expanding the transfer of results to industry by consultancy work based in the studies already undertaken, provided this does not detract from the wider academic research activity.

Recommendation:

- 2 That the Centre undertakes to engage expertise from other relevant disciplines such as economics, information technology, political science, through collaboration and/or cooperation with others

2.14.4 Centre Partners

Existing Partner Group Profile

The seven original partners were three public transport authorities, two municipal transport authorities, one trade organisation and one private provider. The main interests of these partners are closely related to the main competence of SAMOT research: transport-related service, business administration, customer satisfaction, communication. During stage 2 all original partners have been retained and two more partners, one public transport authority and one private provider, with much the same main interests have been added.

Processes for Needs Identification and Articulation

SAMOT has put great effort into identifying the research interests and needs among their partners. Project proposals from companies and researchers are communicated via the executive team to the Board for evaluation and decision.

Very commendably, SAMOT with the help of a consultant has conducted a survey with the aim of charting the partner companies' views and expectations with respect to the SAMOT activities. The survey shows that the SAMOT research program fits well with partner interests and has the potential to fulfil partner expectations. However, partners also expressed that there is a need for better communication with SAMOT, in particular during initiation of projects and identification of their objectives, and also with respect to finding the correct target individuals for communication of results from SAMOT to partners. SAMOT appears to be well aware of these issues and the evaluators strongly encourage the Centre to continue their efforts to improve the communication with partners, as this is of vital importance for SAMOT sustainability. One possible way seems to put more effort into identifying the appropriate contact persons at different levels in the partner companies.

Recommendation:

- 3 That SAMOT continue their efforts to improve communication with partner companies and endeavour to identify the most appropriate channels of contact with each partner

Partner Participation in Innovation and Technology Translation

During stage 2, strong development has taken place in the way partners utilize SAMOT research for innovation and development of their activities. Of particular interest is the increased engagement of SAMOT representatives in bodies undertaking planning of public transport policies and developments. This shows clearly that SAMOT research is receiving national recognition as important for the future development of public transport in Sweden. SAMOT endeavours to have direct participation of partners in as many projects as possible. Our general observation is that SAMOT's efforts to foster innovation and transfer of results to partners have been strong and successful.

Prospective Partner Complement

As noted, the main interests of present partners are closely related to the main competence of SAMOT research. SAMOT has realised that there is a need to broaden the scope of the partners and strategy defining the need for this and prospective types of partner has been formulated. The evaluators submit that the results of SAMOT research should be of considerable interest to manufacturers of transport equipment (buses, trains etc) although the research may not be central to their short-term needs for development. One way that has proven to be successful in other Centres is to introduce graded partnerships with the more limited access to Centre research for partners that contribute less funds to the program or wish to participate through projects directed very specifically to their short-term needs.

Recommendations:

- 4 That the Centre, with the help of the Board actively pursue new Centre members from the transport equipment sector

- 5 That the Centre establishes more than one type of partnership so that smaller companies and organizations with less centre interest might participate.

Overall Conclusion - Research Program Relevance, Utilization and Commercialization

SAMOT has identified some weaknesses with regard to communication with partners and is actively endeavouring to alleviate this problem. Addition of partners from the transport equipment sector would be beneficial. In all, however, SAMOT is well organized, the research program in the eyes of partners is highly relevant and partners are actively engaged in planning and utilization of SAMOT results.

2.14.5 Organization and Management of the Centre

The Board's Role

Members of the Board include senior representatives of partner organizations, the University and two senior academics not directly involved in Board projects. The Board meets three times per year and apparently functions well in support of the Centre. The evaluators expressed their concern that few members of the Board were present for the generalist evaluation; the chair who intended to attend was ill and four members were “booked elsewhere”. It is desirable to have more Board members present to meet the evaluators. In the event that they cannot be present the evaluators would appreciate some message from them or if they send an alternate.

Management Team Structure, Processes and Performance

The Executive Team appears to function well under the capable leadership of the Director and the newly appointed Deputy Director. The Centre has wisely provided ample administrative infrastructure and personnel to support the mission of the Centre. The evaluators were impressed by the various forms of graphical presentation of the SAMOT brand in handouts, business cards, a banner and the web site. The web site is useful.

International Scientific Advisory Board's Role

The International Scientific Advisory Board (ISAB) met in 2007 and is appropriately constituted. The ISAB prepared a critique of the SAMOT research program that was constructive and insightful. However, it is important that the ISAB visit Karlstad at regular intervals, to meet with the SAMOT board, senior researchers and students.

Recommendation:

- 6 That the Centre arranges annual meetings, in Karlstad, of the International Scientific Advisory Board

Financial Management

The Stage 2 budget plan calls for the Centre to receive MSEK 21 from VINNOVA, MSEK 21.3 in kind and in cash from the University (MSEK 2.25 in cash) and MSEK 21 from partner organizations (MSEK 1.051 in cash). The evaluators pointed out that more cash would provide greater opportunity to take on more PhD students and suggested that it would be desirable to

have greater cash contributions from both the partners and the University. It should be noted that support for industrial PhD students is classified as being ‘in kind’ rather than ‘in cash’

Recommendation:

- 7 That the Board undertakes to raise the cash contribution from the partners and from the University

The Centre has been somewhat successful in winning funding from agencies in Sweden and has said that they have made applications to the EU. They should persist in competing for international funding.

Recommendation:

- 8 That the Centre undertakes to apply for EU funding, making use of the UITP and perhaps using the services of an appropriate consultant

2.14.6 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

SAMOT has developed contact with international research groups in Europe and East Asia and has also been by several international guests. There are no lecturers or postdocs from abroad.

Mobility of Personnel between University and Industry

There is close collaboration between industry and SAMOT in many research projects, but this has not taken place by direct work of researcher at partners and vice versa. SAMOT plans to enhance the number of industrial PhD students, as a means of increasing mobility. It should also be noted that both PhD students and senior scientists have been employed by industry.

Gender Perspective

SAMOT does not do well on the gender issue; there are very few females among senior researchers, none in the board and a lower fraction than expected of the PhD students are female. Karlstad University has in 2010 adopted plans for working with equal opportunities and SAMOT in accordance with these plans works for increasing the number of females

Recommendation:

- 9 That the Centre continues its work to proactively recruit women at all levels in the organization

Contributions to University Education

Senior researchers and PhD students are all involved in undergraduate education in their respective subjects. SAMOT has also participated in development of a Master’s program on Service Management. Thus, commendably active transfer of SAMOT research results directly into undergraduate curriculae is taking place. The PhD students were very positive about the relevance of their work and their supervision.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Centre strives to quantify more fully the impact of their work on organizations implementing their results
- 2 That the Centre undertakes to engage expertise from other relevant disciplines such as economics, information technology, political science, through collaboration and/or cooperation with others
- 3 That SAMOT continue their efforts to improve communication with partner companies and endeavour to identify the most appropriate channels of contact with each partner
- 4 That the Centre, with the help of the Board actively pursue new Centre members from the transport equipment sector
- 5 That the Centre establishes more than one type of partnership so that smaller companies and organizations with less centre interest might participate.
- 6 That the Centre arranges annual meetings, in Karlstad, of the International Scientific Advisory Board
- 7 That the Board undertakes to raise the cash contribution from the partners and from the University
- 8 That the Centre undertakes to apply for EU funding, making use of the UITP and perhaps using the services of an appropriate consultant
- 9 That the Centre continues its work to proactively recruit women at all levels in the organization

Recommendation to the VINNOVA

In conclusion:

- The evaluation team is of the opinion that the Centre has made commendable progress since the last review and is making a good contribution to the field of service- and market-oriented transport research. The evaluation team recommends continued VINNOVA support.

Doug Reeve (Chair)

Per Stenius

Jon Sundbo

Peter White

2.15 Evaluation of SuMo Biomaterials

VINN Excellence Centre at Chalmers University of Technology, Gothenburg

Introduction

On September 28-29, 2011, the Centre Director, Magnus Nyden, colleagues of the SuMo Biomaterials Centre, PhD students, industry partners, and university representatives, had meetings with the international evaluation team at Chalmers University of Technology to evaluate the Centre's performance so far in Stage 2 (January 1, 2009 – December 31, 2011). The scientific experts of the evaluation team, Monika Schönhoff and Dominique Langevin, addressed matters concerning research strategy, projects, and progress. The generalist evaluators, Robert Johnston (Chair), Mary O'Kane and Heidi Dreyer together with the scientific experts, in a subsequent meeting, addressed matters such as organisation and management, finance, interaction between industry partners and the university, and educational activities. In addition, the whole evaluation team met with 7 PhD students and 3 postdoctoral fellows, discussing their background, research topics and experiences in the SuMo Biomaterials Centre. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.15.1 Scientific Quality and Productivity Part 1

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

The Centre's main objective is to put together a toolbox to achieve quantitative predictions for transport in heterogeneous soft matter systems. The systems of interest to the industrial partners are extremely varied, from drug delivery systems to wound dressings, cellulose matrices, food products, diapers, packages and others. The research problem addressed is very difficult, and despite many efforts from both academic and industrial researchers, no satisfactory solution has emerged to date. The toolbox will include a numerical code based on structural data which will be provided by 3D-tomography experiments. The results of the code will be compared with data from various experimental methods, including NMR and FRAP.

After Stage 1, the numerical tool being still not operational, it was recommended that the Centre expertise in the area of transport modelling be extended. This was done by hiring two mathematicians who recently successfully produced a numerical code that was tested both with numerical models (such as packed spheres) and an experimental realisation of a Sierpinski sponge made with a polymer in which diffusion of spherical tracers was measured. This is a very nice achievement, which opens the way for testing other systems closer to those of interest for the industrial partners. With these new researchers, the competence profiles are now well adapted to the aims. It has to be noted that most of the work has been done by PhDs and post-docs, so it is necessary to make sure that the methodological competencies are conserved when the corresponding projects are terminated. To achieve this, the Centre proposes enhanced participation of senior scientists in the Stage 3, a strategy which the evaluation team fully supports.

Recommendation:

- 1 That a strategy of maintaining methodological competences built up in the past 4 years in the Centre should be devised.

The number of *people* associated with SuMo is large, about 100. It was decided to separate the projects into three clusters, each containing a range of people with all the competences. This allows easier interactions during the regular meetings, which in addition are open to other cluster members. The **critical size** is therefore not a problem in this centre.

The *facilities* include electron microscopy, NMR, FRAP, numerical tools, and a clean room, all being available at Chalmers. Thus, the methods involved in the toolbox approach described above seem now sufficiently operational to achieve the aim of predictability. However, the feasibility of 3D-tomography of soft materials still has to be confirmed. A valuable addition will be NMR flow imaging planned to be implemented and added to the SuMo toolbox. Other techniques, such as TOF-SIMS, are available through the industrial partners.

International Comparators with other Centres and Collaborations

The experts found it difficult to compare the Centre with similar initiatives in other countries. To their knowledge, most initiatives include a university (or a single scientific group) and an industrial R&D company (or centre). It is obvious that the SuMo centre is a great initiative, which benefits all the associated companies. Indeed, these companies share the same modelling difficulties, as mass transport in heterogeneous systems is a common problem to them all. It is therefore not possible to compare the Centre to others, since its approach is rather unique.

The SuMo members list quite a large number of *collaborations* with other scientists in various countries. Some of these collaborations will likely end, since their aim was to transfer expertise to SuMo to make elements of their toolbox operational (FRAP for instance). The remaining ones are probably useful and necessary. The question of intellectual property could of course pose problems afterwards. However, the core of the Centre's knowledge is intended to remain public (for instance the code will be in open access) and hence no particular IP difficulty is expected. In the long term, we expect the Centre to rely on internal expertise and to be distributing expertise rather than receiving it from external collaborations. In the meantime, however, there still remains a serious risk of losing control of projects that are predominantly collaborative.

Recommendation:

- 2 That the Centre ensures that the scientific relevance and quality of projects that are dominated by collaborators are consistent with Centre needs.

2.15.2 Scientific Quality and Productivity Part 2

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

The research program commenced with projects that establish the *toolbox* of methods on the one hand and with studies of specific materials on the other hand.

The *method establishment projects* are now at a stage where the expertise has been developed and implemented at Chalmers. Even the flow simulation by the Lattice-Boltzmann approach, which was only recently added to the toolbox, seems to be well integrated and the velocity histogram might turn out to be an important tool to characterize flow. While the establishment of some techniques at Chalmers such as FRAP and μ PIV is a rather standard procedure, the performance of the electron microscopy techniques is a convincing research highlight. The swelling of single cellulose fibres has been observed in-situ by environmental SEM. By 3D-TEM, the 3D visualisation of silica or solid polymeric gel structures was achieved. Although this has demonstrated that imaging is possible even with a low contrast, it is not obvious that the soft gel structure was preserved in the procedure used.

The outcome has so far been mainly methodological improvement rather than gaining knowledge about material properties, but this should change in Stage 3. Altogether, the establishment of methods can be considered to have been successfully pursued and almost completed.

Less convincing so far is the approach to *compare results from different methods and validate* them against each other. Here, it is not sufficient to compare qualitative trends (e.g. attempted comparison of FRAP and PFG-NMR), as quantitative comparison is essential. Further, an evaluation of deviations in results obtained from different methods should lead to additional information. A successful result for example is the NMRD versus TEM image analysis on alginate gels. Several such comparisons and thorough studies of the same material with the full toolbox of methods are desirable, so that fundamental knowledge can be gained, in particular in order to obtain an understanding of flow in soft porous materials and of the structure-flow relationships. It is thus strongly recommended that the Centre keeps a focus on the validation of several methods on one or a few soft model materials. This focus should be supported by more than one joint post-doc project as suggested in the current plans for Stage 3. General questions such as the influence of molecular interactions with interfaces and the deformability of the material on the flow properties should be investigated and tested to determine whether indicators of their influence can be extracted from any of the methods.

Recommendation:

- 3 That the Centre researchers fully validate the interplay of structure analysis, simulation of flow, and prediction of transport properties in soft systems (the Centre's core premise). For this purpose, the Centre should continue focussing on the basic research (which will be done on model systems) at the same time as transferring the methods established in the early stages to industry partner systems.

Concerning *materials design*, several interesting examples have been demonstrated, such as pore size control in a phase separated system, or T_g tuning by addition of rigid fibrils, or decomposable polypeptide multilayers. The Centre clearly has strong expertise in biopolymers and it is well used in SuMo.

Concerning the *simulation* outcomes, the Centre has clearly strengthened its expertise during Stage 2. Very good results were achieved in modelling self-assembly and the modelling of flow has reached the stage where the Lattice-Boltzmann method has been implemented and is

working, at least for rigid structures. Inclusion of surface interactions and deformability remains a challenge for Stage 3. For instance, it has not become clear which role the MC simulations of charged molecules at interfaces should play. The relevance of the corresponding project for the flow simulations was not convincingly shown.

The *scientific quality* is not yet up to the expectations, probably due to the fact that the Centre members have so far concentrated on establishing methods. The publication list in the report contains only few “pure” SuMo publications in high quality journals. In the coming Stage 3 it is expected that increased application of the methods in the toolbox should lead to a significantly larger number of high quality publications.

The technological outcome with 5 patents is more appropriate and shows the interest of the company partners in SuMo results.

Several projects (e.g. electron microscopy and innovation management) have been running over a long time without apparently achieving great numbers of results/ publications. The presentation of the innovation project was not convincing at all.

It is very difficult to identify relevant SuMo-funded publications from the two lists in the report.

Recommendation:

- 4 That the Centre improves the output in form of publications, especially in high quality journals and introduces a regular recording and reporting bibliometric system to accurately document the Centre’s research achievements.

Processes for Idea Generation

The process chosen by the Centre to create ideas at monthly cluster meetings seems to be working well. The open environment with industry partners sharing ideas instead of competing is successful. The PhD students appreciate the lively scientific environment and feel confident contributing to a bottom-up process of ideas generation. While the bottom-up process seems to work well, not least due to industry partners’ input, there seems to be a lack of top-down generation of ideas which would foster new basic research projects (see also comments in the section on management, below).

2.15.3 Long-term Vision, Mission and Strategy

The Centre has realised that its **original long term vision** of obtaining a general understanding and predictability of transport in soft materials is probably unachievable within the term of the Centre. However, advances have been made concerning studies of several types of materials. Main efforts during Stage 2 were put into setting up the toolbox, i.e. gaining expertise in different characterisation and simulation techniques. The new strategy is now showing the first interesting results.

The flexible structure adopted for the Centre has been an advantage, and has, for example, been used to put the focus more on flow problems than on diffusion (as compared to Stage 1). In addition, single projects have been redirected when necessary.

The mission to transfer knowledge and competencies to the industry partners appears to be working very well, as documented by high interest of these partners.

While the methods newly implemented have been adjusted to the state of the art, the toolbox approach is still far from delivering predictions of mass transport in soft materials. The Centre should keep basic research in its focus in addition to delivering competence to industry. A complete proof and validation of the toolbox and predictability is still mandatory for Stage 3, see recommendation no. 3.

2.15.4 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

At the end of Stage 2 the Centre has 8 industry partners: AstraZeneca AB, BohusBioTech AB, Eka Chemicals AB, Lantmännen R&D AB, Mölnlycke Health Care AB, SCA Hygiene Products AB, Södra Cell AB, and Tetra Pak Packaging Solutions AB; and 2 research partners: Chalmers AB and SIK AB.

The evaluation team was impressed by the spread of industry partners. Representatives from the industry partners seemed to be happy with both the search processes (for potential new partners) and also with the mechanisms for accepting (or rejecting) such new partner applications. In interview we were told that discussions are underway with several potential new partners.

Research partner profile is somewhat restricted and given the large number of significant collaborations that are in place, it would seem appropriate for the Board to consider raising the status of some of these collaborations to partnership status. In particular the Centre researchers seem to be currently very dependent on collaborations with facilities at Lund University.

Processes for Needs Identification and Articulation

The evaluation team was very impressed by the mechanisms developed in the Centre for stimulating creative thinking to identify partner needs. Company representatives were extremely positive about articulation.

Partner Participation in Innovation and Technology Translation

Industry partners are obviously very involved in cooperative work with the research partners and participate fully in both innovation (through open cluster meeting discussions) and with technology translation. Representatives were very clear at interview on the importance they place on SuMo's potential to produce useful results.

Commercialization Successes and Benefits to Society

Industry partners clearly see opportunities to utilise Centre results, and indeed are working strenuously to ensure that the research directions match their expectations. There are already some commercialisation successes.

2.15.5 Organization and Management of the Centre

The Centre has achieved much in its first five years, not least a strong sense of shared purpose between the academic and industrial partners. However it also has significant challenges including:

- a new Director who has had to take up midway through Stage 2. This challenge is less serious than it might have been as the new Director brings abundant expertise, determination and enthusiasm to the role
- an unusually large accumulation of funds that was to have been spent during Stage 2 but has not yet been allocated.
- the need for a more integrated planning and project management system whereby the strategic planning process retains a clear focus on delivery against the Centre's core scientific premise *and* recognises the need for accelerated transfer of Centre knowledge and expertise to end-user partners. The strategic plan must then be translated into an operational plan covering unexpended funds to date and Stage 3, with the Board monitoring progress against this plan on a regular basis. The planning process in turn needs to be complemented by a more professional approach to project management so that components of the plans (projects) are delivered in time, on budget and to appropriate quality standards
- the lack of overt quality control processes to assist in delivery of the highest possible quality of outcomes (especially scientific outcomes) from the Centre so that it reaches its full potential in the second half of its existence and makes a lasting impact both in science and in its assistance to Swedish industry

The Board's Role

The Centre's Board is clearly composed of dedicated and talented individuals who display admirable commitment to the Centre. The evaluation team was impressed by the good representation of the Board and involvement of Board members at the Centre interview. This talented and committed Board needs to be more proactive and directive in assisting and over-sighting management in addressing the significant challenges outlined above.

The evaluation team was concerned that the Board is essentially representative in composition and, as such, needs to have formal processes for managing any real or apparent conflicts of interest in the allocation of funds. No such processes were described either in the Report or in interview.

Recommendations:

- 5 That the Board take firm responsibility for ensuring integrated and coherent strategic and operation plans are in place for Stage 3 and to address the effective use of unexpended funds. Progress against plans needs to be monitored carefully by the Board to ensure the Centre delivers effectively on its core scientific premise *and* transfers Centre knowledge and expertise to end-user partners expeditiously
- 6 That the Board ensure the planning process is complemented by a formal project management process
- 7 That the Board take a more direct interest in and over-sight of the implementation of a quality control system addressing the quality of core activities/outputs of the Centre, especially its research outputs and that it make effective use of the International Scientific Advisory Board in this process

- 8 That the Board ensure that any conflicts of interest at Board level are appropriately managed.

Management Team Structure, Processes and Performance

The management team displays dedication and vision. But if the Centre is ultimately to be successful, management needs to improve significantly some mundane but very necessary functions.

Recommendation:

- 9 That the management team urgently improve, integrate effectively and, where possible, automate the Centre's planning, financial control, project management, and quality control systems and report regularly to the Board on progress in this regard, flagging any problems as early as possible.

Communication

The Centre has taken steps recently to improve its communication and profile. Effective communication clearly needs attention. The evaluation report contained several significant errors and several significant inconsistencies.

Some examples are:

- Non recording of research personnel in Table 10, e.g. Röding is listed in the report as researcher but not in research personnel table - you have to go to internet to see that Röding was doing his PhD in the Math department but this does not explain why his name was not in the list. The question also remains as to whether an in-kind contribution should have been claimed for him. Diana Bernin is not listed either but presumably that is a typo because there is a Diana Berlin listed. Maria Skepö is listed as a researcher but not in the Research personnel list.
- On page 23 it states that EKA will become a partner in stage 3 but clearly it already is a partner
- There are several annoying instances where the reader is asked to go to the website for information e.g. for the management organisation diagram.
- The important change in Centre Director was barely mentioned in the report – it is necessary to get to page 45 to work out that the change occurred in March 2010.
- Listing of centre publications is totally inconsistent; some papers that were clearly from Stage 1 or even earlier are listed under research output. There are two lists in the report and it is very difficult to get a true picture of the publication output of the Centre in Stage 2. In one list (page 77), a typical entry is No. 5 where there is no journal mentioned, and the only author mentioned is not a listed participant in the Centre.
- Website linkages in the report as sent to evaluators do not function
- The lack of a contents page made the location of material, particularly information on projects very difficult. This was exacerbated by the fact there was no numbering system for the projects as presented.

Recommendations:

- 10 That the Centre ensures all reports are carefully edited and checked for consistency especially in financial and personnel data and that its web pages are clear

- 11 That the Centre produces material which articulates the significant benefits the Centre contributes to society

International Scientific Advisory Board's Role

A VINN Excellence Centre needs high quality and fearless advice to audit its science plans and output. The appropriate mechanism for this is the International Scientific Advisory Board but for such a body to be effective, its members need to be truly independent of any of the programs and projects in the Centre, which is not the case at present.

Recommendation:

- 12 That the International Scientific Advisory Board comprises top scientists from the fields covered by the Centre but who have no involvement in the Centre's research programs.

As noted in the sections on the scientific program above, there is need for additional specific guidance to the Centre in the area of simulation of flow in heterogeneous media.

Recommendation:

- 13 That the International Scientific Advisory Board be strengthened by the addition of another member with very strong expertise in simulation of flow in heterogeneous media.

Relationship to the University and to University Units

It was not clear either from the report or the interview precisely what the arrangements are for formal membership of the academic component of the Centre.

Recommendation:

- 14 That the Centre produces a clear statement of the criteria and funding arrangements under which scientists (either from Chalmers or other research bodies) are formally included in or attached to the Centre and, using this, provide a membership list of all scientists in the Centre giving their precise roles and the Centre's expectation of what they will deliver. This material should be provided in all formal documents of the Centre such as the website and the annual report.

2.15.6 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The Centre has managed to put together a vital and solid group of people consisting of Masters students, PhD students, post docs, senior scientists, managers and administrative staff. The main research resource is full time PhD students and postdocs. In the meeting with the PhD students and the postdocs, they gave an enthusiastic impression of their research and indicated great dedication to the scientific activity in SuMo. This is an important strength and value for the Centre which should be utilised in future research and for building further strong relationships with industry and international academic partners.

The recruitment model in SuMo seems to be one whereby some PhD students continue as post docs in the Centre while the rest of the post docs have been specifically recruited into the Centre from other institutions. The PhD students are either recruited from the industrial companies

involved in the Centre, from general position announcements, and/or from being a Masters student in the Centre. The vast majority of the personnel are domestic Swedish researchers with a good blend of academic and industrial experience. There are some examples of personnel who have been recruited based on their international competence through the outcome of a dedicated recruitment process. Thus recruitment of highly qualified people into the Centre does not seem to be a difficulty; this is a major strength of the Centre.

However neither in the evaluation report nor in the interviews was there any sign of specific career training or career planning for the personnel involved. The scientific and international training was more or less embedded in the ongoing research activities which of course can be a very efficient way of career training, but there is a danger of missing the benefits of the more mentor-based approach. Additionally there was no reported evidence of a conscious strategy concerning management and leadership training.

Mobility of Personnel between University and Industry

Several examples were provided during the meeting with the PhD students and post-docs that demonstrated that mobility between the universities is satisfactory. As mentioned above, some of the PhD students are recruited from the companies. Also most of the personnel in the Centre were working on projects involving the industrial partners either in joint teams, or through provision of data and tools to industry. The report states that some senior academic scientists are working part time in the industry. Additionally, different arenas such as physical meetings, workshops, reference groups for PhD/post-doc projects, etc. contribute to the mobility and transfer of knowledge and people in the Centre.

Several of the academics, as well as the PhD and post-docs have been abroad for some period which has resulted in valuable international relationships and increase in scientific competencies.

Gender Perspective

The gender balance in the Centre is good. In the management team the share is 50%-50%, while for the researchers the share between female and male personnel is approximately 60%-40%.

Contributions to University Education

Together with the BioMatCell Centre, the BIOSUM PhD school has been established. Additionally scientists in SuMo contribute to education at Chalmers University, both in teaching activities and in the planning of future courses and programs. This seems to be a well accepted and embedded model in the Centre, which of course is excellent. However an interesting question remains as to what degree the industrial and international partners do contribute to the education activities of the Centre.

Recommendation:

15 That the Centre develop and implement a career plan for PhD and Post-doc personnel

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That a strategy of maintaining methodological competences built up in the past 4 years in the centre should be devised.
- 2 That the Centre ensures that the scientific relevance and quality of projects that are dominated by collaborators are consistent with Centre needs.
- 3 That the Centre researchers fully validate the interplay of structure analysis, simulation of flow, and prediction of transport properties in soft systems (the Centre's core premise). For this purpose, the Centre should continue focussing on the basic research (which will be done on model systems) at the same time as transferring the methods established in the early stages to industry partner systems.
- 4 That the Centre improve the output in form of publications, especially in high quality journals and introduce a regular recording and reporting bibliometric system to accurately document the Centre's research achievements.
- 5 That the Board take firm responsibility for ensuring integrated and coherent strategic and operation plans are in place for Stage 3 and to address the effective use of unexpended funds. Progress against plans needs to be monitored carefully by the Board to ensure the Centre delivers effectively on its core scientific premise *and* transfers Centre knowledge and expertise to end-user partners expeditiously.
- 6 That the Board ensure the planning process is complemented by a formal project management process
- 7 That the Board take a more direct interest in and over-sight of the implementation of a quality control system addressing the quality of core activities/outputs of the Centre, especially its research outputs and that it make effective use of the International Scientific Advisory Board in this process
- 8 That the Board ensure that any conflicts of interest at Board level are appropriately managed.
- 9 That the management team urgently improve, integrate effectively and, where possible, automate the Centre's planning, financial control, project management, and quality control systems and report regularly to the Board on progress in this regard, flagging any problems as early as possible.
- 10 That the Centre ensures all reports are carefully edited and checked for consistency especially in financial and personnel data and that its web pages are clear
- 11 That the Centre produces material which articulates the significant benefits the Centre contributes to society
- 12 That the International Scientific Advisory Board is comprised of top scientists from the fields covered by the Centre but who have no involvement in the Centre's research programs.
- 13 That the International Scientific Advisory Board be strengthened by the addition of another member with very strong expertise in simulation of flow in heterogeneous media.
- 14 That the Centre produces a clear statement of the criteria and funding arrangements under which scientists (either from Chalmers or other research bodies) are formally included in or attached to the Centre and, using this, provide a membership list of all scientists in the Centre giving their precise roles and the Centre's expectation of what they will deliver. This material should be provided in all formal documents of the Centre such as the website and the annual report.
- 15 That the Centre develop and implement a career plan for PhD and post-doc personnel

Recommendations to VINNOVA

- Strengthen instructions to Centres on reporting, particularly against operational plan and budget
- Develop a checklist for VINNOVA contact staff to more tightly choreograph the two-day centre evaluations
- Ensure that Centre Boards operate under well understood conflict of interest guidelines

In conclusion

The evaluation team is of the opinion that the Centre has displayed significant potential both in the science and the translation of results to industry. Provided the recommendations above are addressed satisfactorily and quickly, the evaluation team recommends continued funding for Stage 3 at the original planned level. The team recommends that the accumulated funds from Stage 2 could be released in Stage 3 but only against well-articulated strategic and operational plans which specifically address them.

Robert Johnston (Chair)

Heidi Dreyer

Dominique Langevin,

Mary O’Kane

Monika Schönhoff

2.16 Evaluation of Wingquist Laboratory

VINN Excellence Centre for Virtual Product Realization at Chalmers University of Technology, Gothenburg

Introduction

On March 8-9, 2012, the Centre Director, Rikard Söderberg, colleagues of the Wingquist Laboratory VINN Excellence Centre, PhD students, industry partners, and university representatives, had meetings with the international evaluation team to evaluate the Centre's performance so far in Stage 2 (April 1, 2009 – March 31, 2012). The scientific experts of the evaluation team, Alison McKay and Dawn Tilbury, addressed matters concerning research strategy, projects and progress. The generalist evaluators, Doug Reeve (Chair) and Mary O'Kane, together with the scientific experts, in a subsequent meeting, addressed matters such as organisation and management, finance, interaction between industry partners and the university, and educational activities. In addition, the whole evaluation team met with PhD students, discussing their background and future plans, and their research and other experiences in the Centre. We thank all members of the Centre and the VINNOVA team for their efforts in providing information and facilities for the evaluation.

2.16.1 Long-term Vision, Mission and Strategy

From discussions at the interview, the Centre is clear about its research vision. There is excellent buy in from the industrial partners who described their aspiration for more predictable digital design models that would have a significant impact on the performance (reduced time and cost, increased quality) of their product development processes by minimizing (rather than eliminating) the amount of physical prototyping and testing needed. The vision statement in the report and presentation materials does not communicate well this complexity. The mission and strategy are proving an effective way of delivering the vision.

Recommendation:

- 1 That the Centre refines the vision statement to express the envisaged future role and planned impact of the Centre in the product development processes of the industrial partners

2.16.2 Scientific Quality and Productivity

The Centre projects are arranged around a set of research questions that are defined jointly by the researchers and the industry partners. There appears to be sufficient flexibility for the specific research to evolve (as research often does) and for multiple PhD students to be working on the same project but maintaining individual identities for their research.

The research results are transferred effectively to industry through direct industrial participation in the projects, development of demonstrators based on industrial data sets and implementation of results in company processes. The Centre should be commended for their excellent track record on technology transfer and strong industrial participation.

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

The Centre has defined its areas of research to include product design (from concept through system and detailed design) and production (factory sequencing and flow). Specific topics within these areas that are addressed by research projects are identified and related at a high level through the four themes of interfaces, configuration, sequences, and visualization. We suggest that the research contributions of the Centre would be better described in the context of a broader technical landscape, in order to highlight ways in which Centre results help improve the time, cost and quality metrics that are important to their vision.

The Centre personnel include a diverse group of faculty, PhD students and other researchers from different departments and institutes within Chalmers. The number of personnel appears to be adequate for the research program. The Centre has significantly increased its gender diversity since the last review. The Centre should be commended for its efforts in this area, and should be encouraged to continue those efforts to further improve diversity measures.

The Centre's facilities are excellent and enhance its ability to communicate research results.

Recommendation:

- 2 That the Centre positions its research in the context of a broader technical landscape

International Comparators with other Centres and Collaborations

In response to a recommendation from the Stage 1 evaluation, the Centre has undertaken a benchmarking effort to better understand the international activities that overlap with and/or complement its research efforts. Eleven international organizations are listed in the report, primarily from Europe and North America. The reason why two organizations identified in the last evaluation (MIT and University of Tokyo) are not included on this list is unclear. The home institutions of the three ISAB members have been highlighted as the top potential collaborators. The Centre may wish to use the more detailed description of the technical landscape resulting from Recommendation 2 to place potential collaborators within the broader research area, and identify both collaboration opportunities (when working on similar problems) and synergies (for working on complementary problems).

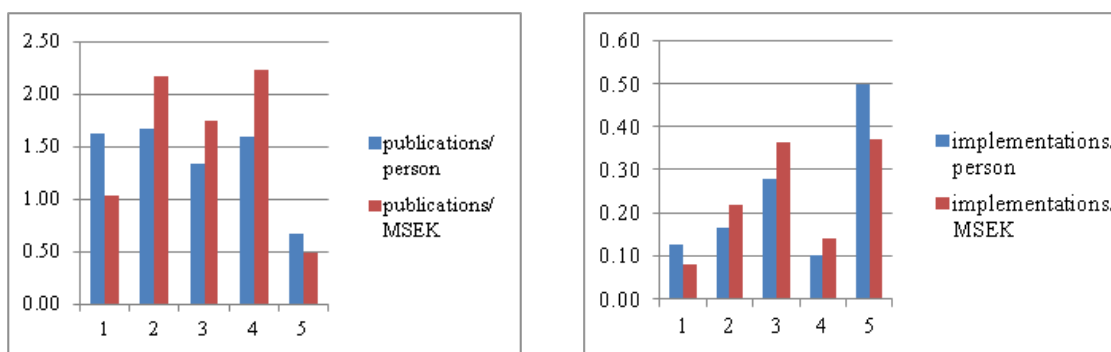
The Centre has hosted several international visitors and is planning to host more. In addition, PhD students sponsored by the Centre have been able to spend time abroad working on their research. We compliment the Centre for its efforts to establish international connections and encourage the continuation of those efforts. The Centre could consider sponsoring workshops with invited PhD students and faculty from selected international institutions with a view to initiating joint research activities.

Recommendation:

- 3 That the Centre positions its research in the context of the broader international academic community

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

The Centre's research has focussed around five project areas in Stage 2. We compliment the Centre on the consistent way in which the projects were presented in the report and at the interview. All projects have strong connections with industrial needs and research results have been evaluated with industrial collaborators. Every project has at least one implementation at an industrial partner. As might be expected given the different subject areas, there is some disparity across the five projects both in terms of their size and in their outputs (publications and implementations). This is illustrated by the following charts.



Processes for Idea Generation

The research methodology used by the Centre is effective in bringing together industrial needs with research questions, resulting in industrial implementations. The wider research community could benefit from a peer reviewed publication that included a distillation of learning on methodology from Stage 2 supported by examples of successful industrial implementations. Synergies identified from the Stage 2 projects have informed Stage 3 plans. The Centre could capitalise more on learning across projects. For example, there appear to be opportunities for interdisciplinary publications that draw from multiple projects and contribute general findings related to the key themes of interfaces, configuration, sequences and visualisation.

Overall Conclusion - Scientific Quality and Productivity

The Centre is conducting applied research in the area of virtual product and process realization. The research is conducted in close collaboration with industrial partners, often resulting in a significant effect on industrial performance. The overall quality of the research conducted in the Centre is excellent. In addition to the industrial implementations, the Centre has a large number of publications in international conferences. However, the Centre should also consider publishing more papers in high quality journals.

Recommendation:

- 4 That the Centre prioritises publishing research results in high quality international journals

2.16.3 Centre Partners

Existing Partner Group Profile and Prospective Partner Complement

The Centre Partners have worked together exceptionally well. All have contributed to the success of the Centre and all report satisfaction with their participation. The Centre's 'implementations' have in some cases led to very significant productivity increases for industrial partners - the evaluation team suggests there is value in attempting to quantify this.

All the Stage 2 partners (with the exception of Saab Automobile which is currently under bankruptcy administration) are enthusiastic about continuing into Stage 3. The Centre is also exploring potential membership with a range of other companies, some from vehicle-related industries and some from more diverse industry sectors such as dental care.

The interest in joining the Centre from this list of potential new partners is encouraging to see but the risk of too many partners diluting the performance of the Centre should be considered. This risk could be ameliorated in various ways, for example by developing careful partner selection criteria and/or by having new partners join on a one-year provisional basis with either party able to dissolve the partnership without penalty at the end of the first year.

Recommendation:

5 That the Centre be selective in determining the complement of partners for Stage 3

Processes for Needs Identification and Articulation

The Centre is effective in needs identification, both productivity needs of industrial partners and the research-interest needs of university participants. Under the guidance of the Board the Management Team then prioritises which needs will be formally addressed in the Centre's work program.

Partner Participation in Innovation and Technology Translation

Partner participation in innovation and technology translation has been a key factor in the Centre's overall success.

Commercialisation Successes and Benefits to Society

As indicated earlier, the key commercialisation successes of the Centre are the productivity gains achieved by industrial partners. At a more modest level there have also been software, consulting and contract research spinoffs by staff and students associated with the Centre.

While the prime society benefit of the Centre is the direct contribution to industrial partner economic success, the evaluators note the creativity of the Centre as it plans for Stage 3 in exploring how the Centre's research might be applied effectively to areas of high direct social benefit such as health care.

2.16.4 Organisation and Management of the Centre

The Board's Role

The Board has been active and effective in its role in identifying and advancing needs-driven research, in aiding the growth of the Centre activities through related large-scale initiatives, and in assisting the transformation of the management processes of the Centre. There is excellent representation from industry, the University and the Fraunhofer-Chalmers Centre.

Management Team Structure, Processes and Performance

The Management Team has been transformed since the first evaluation and now is a highly functional and effective team providing outstanding leadership and organization for the Centre. The evaluation team sees evidence of this in several organizational symptoms (quite apart from the excellent progress in research). The evaluation report was clear, concise, informative, consistent, complete and beautifully laid out. The financial tables were informative and complete. The presentations included precisely what was required and the companion handouts very professionally rendered. The generalist interview was well attended by the Management Team and the Board (including industry partners) all of whom participated in a thoughtful and easy manner.

The evaluation team offers its compliments to the entire Management Team and Board for the high quality and excellent results of Centre. Special mention should be made of Rikard Söderberg for his exemplary leadership of the Centre especially given his substantial other duties.

The International Scientific Advisory Board (ISAB)

The ISAB is well constituted and meets annually. Their report of their last meeting was constructive and supportive.

Communication and Promotion

The Centre has done well in presenting itself in a professional and appealing manner.

Financial Management

During the three years of Stage 2 VINNOVA has contributed 21 MSEK in cash. The University has contributed 3.75 MSEK in cash (including 1.5 MSEK from the Department of Product and Production Development) and over 20* MSEK in kind. The industry partners have contributed 1.5 MSEK in cash and over 19.5* MSEK in kind. (*In kind figures are based on thirty months of reporting.) The companies provide significant in kind in the form of testing, use of equipment, and the like which is not reported in the personnel-based in kind figures reported.

Recommendation:

- 6 That the Centre works with industry partners to estimate, on a regular basis, in kind contributions from industry arising from testing, use of equipment, and the like using arms-length competent third parties.

As the companies are clearly deriving significant value it is suggested that the cash input in Stage 3 be increased.

2.16.5 Training Personnel of High Competence

Recruiting and Developing People of International Competence and Experience

The research training activities of the Centre at both PhD and postdoctoral levels appear well thought out and well tailored to the needs of the Centre partners. PhD students expressed satisfaction with supervision, industry exposure, training in university teaching and coursework. They also reported that they are encouraged to publish and are given appropriate opportunities to participate in international conferences.

Like many other VINN Excellent Centres, the Centre has welcomed industrial PhD students. The Centre has been particularly innovative in extending this concept, introducing the role of an industrial postdoc, whereby the Centre offers selected former PhD students now working in industry employment in the Centre for up to 10% of their time.

Mobility of Personnel between University and Industry

Mobility of Centre personnel between university and industry has been good with all the PhD students interviewed reporting close links to industry partners and most of them indicating that they would work in industry on graduation.

Gender Perspectives and training for senior roles in research

The Centre has made very significant improvement in female participation in its various activities throughout Stage 2. There are now two female board members and two female project leaders. There has also been an increase in numbers of female PhD students. However there is still a gender imbalance in all levels of the Centre's activities. The evaluation team applauds the Centre's determination to improve gender balance in Stage 3.

Recommendation:

- 7 That the Centre continues to strive to improve gender balance in all aspects of its operation.

Recommendations to Strengthen the Centre

In summary, our recommendations are:

- 1 That the Centre refines the vision statement to express the envisaged future role and planned impact of the Centre in the product development processes of the industrial partners
- 2 That the Centre positions its research in the context of a broader technical landscape
- 3 That the Centre positions its research in the context of the broader international academic community
- 4 That the Centre prioritises publishing research results in high quality international journals
- 5 That the Centre be selective in determining the complement of partners for Stage 3
- 6 That the Centre works with industry partners to estimate, on a regular basis, in kind contributions from industry arising from testing, use of equipment, and the like using arms-length competent third parties.
- 7 That the Centre continues to strive to improve gender balance in all aspects of its operation.

Recommendations to VINNOVA

In conclusion:

The evaluation team is of the opinion that the Centre is doing excellent research of high industrial impact and can be counted on to continue to do so. The Centre clearly meets the standards of a VINN Excellence Centre. The evaluation team recommends continued funding.

Doug Reeve (Chair)

Alison McKay

Mary O’Kane

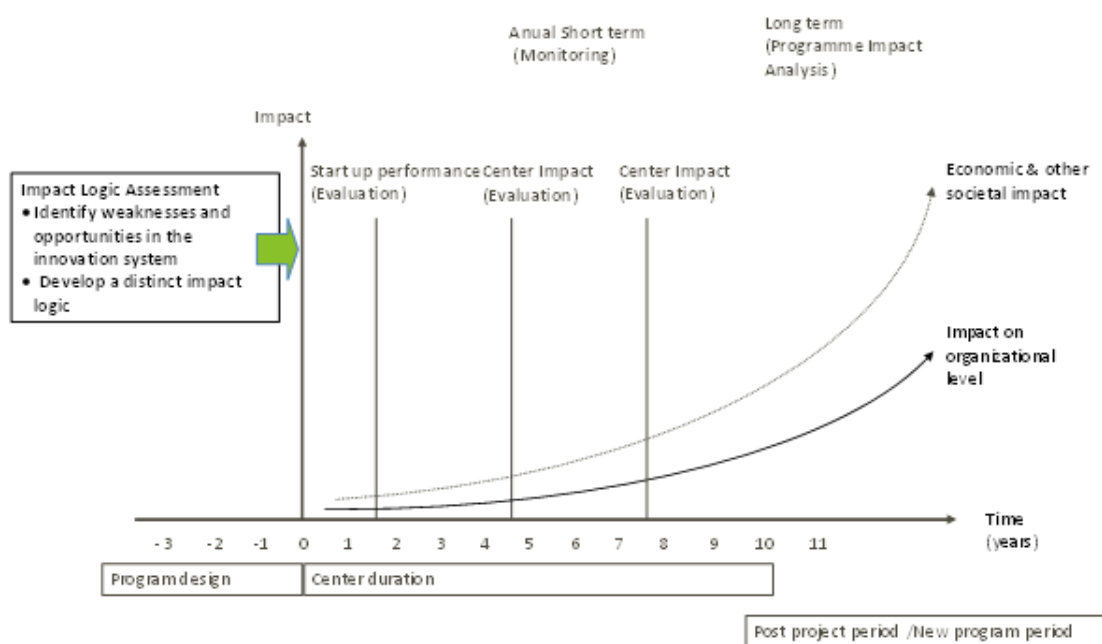
Dawn Tilbury

Appendix A

Guidelines for the second Evaluation of VINN Excellence Centres, Group 5-7

Summary

The major purpose of evaluation is to give feedback to each centre and its partners. The output of the evaluation is given in the form of clear recommendations in order to improve the industrial and scientific output and outcome for the next coming stages. 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 second evaluation.



Source: VINNOVA

1. Background

1.1 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 actors. 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.

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 www.VINNOVA.se.

1.2 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. 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 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 second evaluation during the fifth year. 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.

In order to fulfil the main purpose of the evaluation (to give an input to the negotiations, decisions about stage 3, the development of the Centres, or other specific actions), the evaluation has to be completed in good time (preferably 3 months) before the expiration of stage 2. The nineteen VINN Excellence Centres will be evaluated in different groups during the period October 2010 – September 2012. The first group will be evaluated in October 2010 - see appendix 1.

2. 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 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 participate in the evaluation of one specific Centre while the “generalist” experts will participate in the evaluation of two or more Centres. Each Centre has suggested up to 5 suitable 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.

3. The task of the evaluators

This second evaluation of the Centres will be carried out during the fifth year 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 achievements to date and that could be produced within a year. For a successful evaluation Centres will need to demonstrate that new products or processes have been, or soon will be, taken up by industry, i. e. evidence of concrete results of centre-generated innovation that has been applied in industry.

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 3 and 4, but also vision 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 2
- 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 and the site visit.

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

4. Organisation of the evaluation

The composition of the evaluation team is decided by VINNOVA. The evaluation team itself decides on the distribution of work among its members.

The basic documentation, in principle:

- the Centre report to the evaluation team, delivered by the Centres to VINNOVA,
- the operational plan of stage 2 (If the operational plan has been upgraded during stage 2 the new version should be submitted to VINNOVA)
- last report of the International Scientific Advisory Board
- the evaluation report of stage 1.

These documents will be distributed by VINNOVA to all members of the evaluation team not later than one month prior to the evaluation. Each evaluation starts with the evaluation team introductory meeting the day before the evaluation interviews begin and ends when the evaluation report is completed. The goal is that the first draft of the evaluation report should be finished the same evening as the final interview is performed (second day).

The VINN Excellence Centres will be evaluated in different groups during the period October 2010 - October 2012, the first group in October 2010 - see appendix 1.

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

During the site visit the evaluation team is interested in meeting:

- the Centre Director,
- the Chairman of the Centre Board of Directors,
- representatives from the industrial and/or public partners,
- university staff incl. representatives from the Vice-Chancellor's office,
- research leaders and/or program directors active within the Centre, and
- doctoral students.

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

Each evaluation will take place over two days. On Day 1 the scientific experts meet parties from the Centre (usually 0900 to 1500). For the Scientific Expert Evaluation Session, the Centre should prepare a 20-minute introductory presentation of the overall scientific strategy and output, and approximately 70 minutes of presentation of key scientific work, subdivided as the Centre sees fit, leaving ample time for questions and discussion. The session will be chaired by one of the experts who will have responsibility for guiding the pace and direction of the interview.

On Day 2 the “generalist” experts together with the scientific experts meet parties from the Centre (usually 1000 to 1200). At the beginning of Day 2 (0900 to 0945) the evaluation team will meet with PhD students in the Centre (up to 10 students). For the “Generalist” Evaluation Session, the Centre should prepare a presentation on the overall centre vision, mission, organization and operation of not longer than 20 minutes, leaving ample time for questions and discussion. This should include a short summary of the Day 1 presentation with emphasis on research output. The session 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.

5. Centre arrangements in connection to the evaluation

The Centres are asked to propose at least four scientific experts for the evaluation and send the suggestions to VINNOVA not later than March 31, 2011. 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 4 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 during the two weeks after this submission, if required.

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 2 the centre is responsible to send this as a pdf-file to VINNOVA not later than one month prior to evaluation. These documents, along with the evaluation report (stage 1) 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 20th of June 2011.

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 (Day 1 and Day 2) - see detail time planning of each individual centre in appendix 2
- book a location for the evaluation team to meet that is close to the evaluation location for 2 hours after each day's evaluation.
- invite Centre representatives to the interview sessions
- inform VINNOVA of the address of the location
- arrange lunch for the evaluation team and the administrative (VINNOVA) staff (chamber separee) during Day 1. Inform VINNOVA about the arrangements.
- provide paper copies of presentations at the start of evaluation interviews
- provide name cards for the table for all participants during the interviews
- arrange that the evaluation team can meet with up to 10 PhD students during Day 2 before the second evaluation session, preferably in the evaluation location, or close to this location.
- provide to the evaluators access to password-protected parts of Centre web sites where project plans and reports should be available.

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.

6. Report of the evaluation team

The work of the evaluation teams shall result in a report on the VINN Excellence Centres evaluated during autumn 2011. 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 above. 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.

6.1. 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.

6.2. 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 evaluation team for the evaluation of a specific Centre.

Appendix 1. Group of interviews 2012

GROUP 5	
CENTER	Dates
WINGQUIST LABORATORY	8-9 March

GROUP 6	
CENTER	Dates
AFC	3-4 May
WISENET	7-8 May
CESC	9-10 May

GROUP 7	
CENTER	Dates
IPACK	24-25 September
BIMAC INNOVATION	26-27 September

Appendix 2. Delivery dates and Detail Time Schedule

Group 5

DOCUMENT	LATEST DELIVERY TO VINNOVA
IP AGREEMENTS	January 5
FINANCIAL REPORT	January 18
CENTRE REPORT INCLUDING FINAL FINANCIAL REPORT	February 1
LAST REPORT OF THE INTERNATIONAL SCIENTIFIC ADVISORY BOARD	February 1
UPDATED OPERATIONAL PLAN (ONLY IF UPDATED)	February 1

Group 6

DOCUMENT	LATEST DELIVERY TO VINNOVA
IP AGREEMENTS	February 27
FINANCIAL REPORT	March 12
CENTRE REPORT INCLUDING FINAL FINANCIAL REPORT	March 26
LAST REPORT OF THE INTERNATIONAL SCIENTIFIC ADVISORY BOARD	March 26
UPDATED OPERATIONAL PLAN (ONLY IF UPDATED)	March 26

Group 7

DOCUMENT	LATEST DELIVERY TO VINNOVA
IP AGREEMENTS	July 23
FINANCIAL REPORT	August 6
CENTRE REPORT INCLUDING FINAL FINANCIAL REPORT	August 20
LAST REPORT OF THE INTERNATIONAL SCIENTIFIC ADVISORY BOARD	August 20
UPDATED OPERATIONAL PLAN (ONLY IF UPDATED)	August 20

Evaluation group 5

March 7 – 9, 2012

VINN Excellence Center Wingquist Laboratory

Wednesday, March 7, 2012

Stockholm

Afternoon

Introductory meeting for the Wingquist Laboratory (Wingquist L) Evaluation Team (Generalists and experts) in Stockholm.
Transport of experts to Göteborg.

Thursday, March 8, 2012, Wingquist

Göteborg

09:00 - 12:00

Wingquist L Scientific Expert Evaluation Session at Chalmers

12:00 - 13:00

Lunch

13.00 - 13:15

Preparation for the next session

13:15 - 15:00

Wingquist L Scientific Expert Evaluation Session at Chalmers

15:10 - 22:00 Wingquist L Scientific report writing
19:00 – 20.00 Meeting between Wingquist L Scientific and Generalist Evaluators

Thursday, March 8, 2012, SBI

Stockholm-Göteborg

14:00-18:00 Evaluation team of SBI: Work session for the evaluation team including transport by train to Göteborg.

Friday, March 9, 2012

Göteborg

09:00 - 09.50 Meeting with up to 10 Wingquist L PhD students at Chalmers

10:00 - 12:00 Generalist Evaluation Session at Chalmers

12:15 – 20.00 Work session for the evaluation team including lunch/dinner and Wingquist L report writing

Evaluation group 6

May 2 - 10, 2012

VINN Excellence Center AFC, WISENET and CESC

Wednesday, 2 May, 2012

Lund

20:00 - 22:00 Introductory meeting for the AFC Evaluation Team (Generalists and experts) in Lund

Thursday, May 3, 2012

Lund

09:00 - 12:00 AFC Scientific Expert Evaluation Session at Lund University

12:00 - 13:00 Lunch

13.00 - 13:15 Preparation for the next session

13:15 - 15:00 AFC Scientific Expert Evaluation Session at Lund University

15:10 - 17:00 Meeting between AFC Scientific and Generalist Evaluators

17:00 - 22:00 AFC Scientific report writing incl. dinner

Friday, May 4, 2012

Lund

09:00 - 09.50 Meeting with up to 10 AFC PhD students at Lund University

10:00 - 12:00 Generalist Evaluation Session at Lund University

12:15 – 22.00 Work session for the evaluation team including lunch/dinner and AFC report writing.

Saturday - Sunday, May 5 - 6, 2012

Transport for generalists from Lund to Uppsala

Sunday, May 6, 2012

Uppsala

20:00 - 22:00 Introductory meeting for the WISENET Evaluation Team
(Generalists and experts) in Uppsala

Monday, May 7, 2012

Uppsala

09:00 - 12:00 WISENET Scientific Expert Evaluation Session at Uppsala
University

12:00 - 13:00 Lunch

13.00 - 13:15 Preparation for the next session

13:15 - 15:00 WISENET Scientific Expert Evaluation Session at Uppsala
University

15:30 - 17:00 Meeting between WISENET Scientific and Generalist Evaluators

17:00 - 22:00 WISENET Scientific report writing incl. dinner

Tuesday, May 8, 2012, WISENET

Uppsala

09:00 - 09.50 Meeting with up to 10 WISENET PhD students at Uppsala
University

10:00 - 12:00 Generalist Evaluation Session at Uppsala University

12:15 – 22.00 Work session for the evaluation team including transport to
Stockholm, lunch/dinner and WISENET report writing.

Tuesday, May 8, 2012, CESC

Stockholm

19:00-21:00 Introductory meeting for the CESC Evaluation Team (Generalists
and experts) in Stockholm

Wednesday, May 9

Stockholm

09:00 - 12:00 CESC Scientific Expert Evaluation Session at KTH

12:00 - 13:00 Lunch

13.00 - 13:15 Preparation for the next session

13:15 - 15:00 CESC Scientific Expert Evaluation Session at KTH

15:30 - 17:00 Meeting between CESC Scientific and Generalist Evaluators

17:00 - 22:00 CESC Scientific report writing incl. dinner

Thursday, May 10, 2012

Stockholm

09:00 - 09.50 Meeting with up to 10 CESC PhD students at KTH

10:00 - 12:00 Generalist Evaluation Session at KTH

12:15 – 22:00 Work session for the evaluation team including lunch/dinner and CESC report writing.

Evaluation group 7

September 23 – 27, 2012

VINN Excellence Center IPACK and BiMaC Innovation

Saturday - Sunday, September 22-23, 2012

Transport for generalists from Uppsala to Stockholm

VINN Excellence Center IPACK

23-25 September

Sunday, 23 September, 2012

Stockholm

20:00 - 22:00 Introductory meeting for the IPACK Evaluation Team (Generalists and experts) in Stockholm

Monday, September 24, 2012

Stockholm

09:00 - 12:00 IPACK Scientific Expert Evaluation Session at KTH

12:00 - 13:00 Lunch

13:00 - 13:15 Preparation for the next session

13:15 - 15:00 IPACK Scientific Expert Evaluation Session at KTH

15:10 - 17:00 Meeting between IPACK Scientific and Generalist Evaluators

17:00 - 22:00 IPACK Scientific report writing incl. dinner

Tuesday, September 25, 2012

Stockholm

09:00 - 09:50 Meeting with up to 10 IPACK PhD students at KTH

10:00 - 12:00 Generalist Evaluation Session at KTH

12:15 – 22:00 Work session for the evaluation team including lunch/dinner and IPACK report writing.

VINN Excellence Center BiMaC Innovation

Tuesday, September 25, 2012

Stockholm

19:00 - 21:00 Introductory meeting for the BiMaC Innovation (BiMaC I) Evaluation Team (Generalists and experts) in Stockholm

Wednesday, September 26, 2012

Stockholm

09:00 - 12:00 BiMaC I Scientific Expert Evaluation Session at KTH

12:00 - 13:00 Lunch

13.00 - 13:15	Preparation for the next session
13:15 - 15:00	BiMaC I Scientific Expert Evaluation Session at KTH
15:10 - 17:00	Meeting between BiMaC I Scientific and Generalist Evaluators
17:00 - 22:00	BiMaC I Scientific report writing incl. dinner

Thursday September 27, 2012

Stockholm

09:00 - 09.50	Meeting with up to 10 BiMaC I PhD students at KTH
10:00 - 12:00	Generalist Evaluation Session at KTH
12:15 – 22.00	Work session for the evaluation team including lunch/dinner and BiMaC I report writing.

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).

0.0 Title page bearing the signatures of the co-authors and, indicating approval, the signature of the chair of the board

0. Summary (maximum 1 page (all pages indicated below are maximum)), Popular version for non-specialist audience

- Progress and prospects of the Centre, important quantitative results for Swedish growth, highlights, breakthroughs, etc.

0.1 Summary (2 pages)

- Progress and prospects of the Centre, important quantitative results for Swedish growth, highlights, breakthroughs, etc.
Provide a summary of how results have been utilized by partners.

1. Long-term Vision, Mission and Strategy (1 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.

2. Research Area, Competence Profile and Critical Size (4 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".

3. Centre Partners - Companies and public service partners (4 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.

4. Research Program and results (10 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.

5. Impact on partners (5 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.

6. Financial Report for stage 2 (2 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.

7. Organisation and Management of the Centre (3 pages)

- 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.

8. 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 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

9. Plans for Development (5 pages)

- Describe the plan for development of the Centre over the next three years (stage 3) in relation to the long-term objectives. Concentrate on results and implementation of results in industry/public sector.

10. 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.

11. Facts about the Centre

A *CV* in summary of the Centre Director (2 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.)

Appendix 5. Templates for the Financial Statements of stage 2 (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 5 (12 months) should be included. Outcome for year 5 should be for first six months (or other suitable period for year 5 -
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.
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 grantst that are bigger than € 70 000.

VINN Excellence Center:	Fyll i denna ruta endast på denna sida, övriga fylls i automatiskt!
Dnr:	
Year 3:	200x-xx-xx - - 200x-xx-xx
Year 4:	200x-xx-xx - - 200x-xx-xx
Year 5:	200x-xx-xx - - 200x-xx-xx

Please indicate the actual time of year 5 that cover the outcome, budget figures should cover Stage 2!

Table T8: Overall resources available (cash and in kind) Include all contributions that supports Centre activities

This table should present the overall resources available (cash as well as in-kind) for center activities, one row for each financial source.

Affiliation	Year 3			Year 4			Year 5			Summary Stage 2		
	Budget (kSEK)		Outcome (kSEK)	Budget (kSEK)		Outcome (kSEK)	Budget (kSEK)		Outcome (kSEK)	Budget (kSEK)		Outcome (kSEK)
	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total
VINNOVA												
University												
Industrial & Public Partners												
Partner A												
Partner B												
Part.....												

VINN Excellence Center:	
Dnr:	
Year 3:	200x-xx-xx -- 200x-xx-xx
Year 4:	200x-xx-xx -- 200x-xx-xx
Year 5:	200x-xx-xx -- 200x-xx-xx

Please indicate the actual time of year 5 that cover the outcome

Table 9: Overall Expenditures

List all expenses for the centre at an aggregated level.

	Year 3						Year 4										
	Budget (kSEK)		Outcome (kSEK)		Total	Cash	Budget (kSEK)		Outcome (kSEK)		Total	Cash					
	In kind	Cash	In kind	Cash			In kind	Cash	In kind	Cash							
Salaries (from "Staff sheet")																	
External services																	
Equipment																	
Material, running costs etc.																	
Travel																	
Other																	
Overhead costs																	
Sum																	

	Year 5						Summary Stage 2										
	Budget (kSEK)		Outcome (kSEK)		Total	Cash	Budget (kSEK)		Outcome (kSEK)		Total	Cash					
	In kind	Cash	In kind	Cash			In kind	Cash	In kind	Cash							
Salaries (from "Staff sheet")																	
External services																	
Equipment																	
Material, running costs etc.																	
Travel																	
Other																	
Overhead costs																	
Sum																	

VINN Excellence Center: Dnr: Year 3: 200x-xx-xx -- 200x-xx-xx Year 4: 200x-xx-xx -- 200x-xx-xx Year 5: 200x-xx-xx -- 200x-xx-xx

Please indicate the actual time of year 5 that cover the outcome

Table 11: Project expenditures **Include all contributions that supports the Centre activities**

Follow up that resources have been used for learning activities and communication (5% of VINNOVA funding), list of projects and financial size

	Year 3						Year 4						Year 5						Summary Stage 2						
	Budget (kSEK)			Outcome (kSEK)			Budget (kSEK)			Outcome (kSEK)			Budget (kSEK)			Outcome (kSEK)			Budget (kSEK)			Outcome (kSEK)			
	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	Cash	In kind	Total	
Management of center																									
Communication																									
Learning activities																									
Reserved for NEW PROJECTS																									
Projects (subprojects included)																									
Sum																									

VINNOVA´s publications

November 2013

See VINNOVA.se for more information

VINNOVA Analysis

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
- 14 Företag i energibranschen i Sverige - 2007-2011
- 15 Sveriges deltagande i sjunde ramprogrammet för forskning och teknisk utveckling (FP7) - Lägesrapport 2007-2012. *Only available as PDF*
- 16 FP7 and Horizon 2020. *Only available as PDF*

VA 2012:

- 01 Impact of innovation policy - Lessons from VINNOVA´s impact studies. *For Swedish version see VA 2011:10*
- 02 Lösningar på lager - Energilagringstekniken och framtidens hållbara energiförsörjning
- 03 Friska system - eHälsa som lösning på hälso- och sjukvårdens utmaningar
- 04 Utan nät - Batterimarknadens utvecklingsmöjligheter och framtida tillväxt

- 05 Sveriges deltagande i sjunde ramprogrammet för forskning och teknisk utveckling (FP7) - Lägesrapport 2007 - 2011. *Only available as PDF*
- 06 Företag inom fordonsindustrin - Nationella, regionala och sektoriella klusterprofiler som underlag för analys- och strategiarbete
- 07 Svensk Life Science industri efter AstraZenecas nedskärningar. *Only available as PDF*
- 08 EUREKA Impact Evaluation - Effects of Swedish participation in EUREKA projects
- 09 Uppföljning avseende svenskt deltagande i Eurostars. *For English version see VA 2012:10. Only available as PDF*
- 10 Follow-Up of Swedish Participation in Eurostars. *For Swedish version see VA 2012:09. Only available as PDF*

VINNOVA Information

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 Challenge-Driven Innovation - Societal challenges as a driving force for increased growth. *For Swedish version see VI 2012:16*
- 05 *Replaced by VI 2013:14*
- 06 Årsredovisning 2012
- 07 Trygghetsbostäder för äldre - en kartläggning. *Only available as PDF*
- 08 Äldre entreprenörer med sociala innovationer för äldre - en pilotstudie kring en inkubatorverksamhet för äldre. *Only available as PDF*
- 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 New Paths to Innovation - VINNOVA Sweden´s innovation agency
- 12 *Replaced by VI 2013:19*

- 13 När företag och universitet forskar tillsammans - Längsiktiga industriella effekter av svenska kompetenscentrum
- 14 Innovationer på beställning - en möjlighet till förnyelse och utveckling
- 15 Handledning - för insatser riktade mot tjänsteverksamheter och tjänsteinnovation
- 16 Att efterfråga innovation - förberedelseprocessen
- 17 Innovationer på beställning - tidning pm att efterfråga innovationer i offentlig sektor
- 18 Din kontakt i EU:s forsknings- och innovationsprogram
- 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

VI 2012:

- 02 Så blir Sverige attraktivare genom forskning och innovation - VINNOVAs förslag för ökad konkurrenskraft och hållbar tillväxt till regeringens forsknings- och innovationsproposition
- 03 Idékatalog - Sociala innovationer för äldre
- 04 *Replaced by VI 2013:05*
- 05 Årsredovisning 2011
- 06 *Replaced by VI 2012:15*
- 07 *Replaced by VI 2013:18*
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