The Research Council of Norway

Midway evaluation of the Centres for Research-based Innovation

Evaluation
Division for Innovation

Centre for Research-based Innovation

The Research Council of Norway

Midway Evaluation of Centres for Research-based Innovation (SFI)

Centres for Research-based Innovation with funding from The Research Council of Norway

Evaluation
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The report can be ordered at:
www.forskningsradet.no/publikasjoner

or green number telefax: +47 800 83 001

Cover design: Design et cetera AS
Photo/illustration: Anne Mellbye Design
Printing: Allkopi (cover) and The Research Council of Norway
Number of copies: 300

Oslo, December 2010

ISBN 978-82-12-02865-4 (printed version)
ISBN 978-82-12-02866-1 (pdf)

Preface

This evaluation report presents the midway evaluation of the 14 centres for research-based innovation, SFI, that were started in 2007. The SFI-scheme is new for Norway, but the Norwegian centres are based on extensive international experience with such models both in Europe, North America and Australia.

The SFI-scheme is intended to promote innovation by supporting long-term industrially oriented research and forging close alliances between research-active enterprises and prominent research groups. The scheme is also expected to enhance technology transfer, internationalization and researcher training.

The centres are co-financed by the Research Council, host institutions and the partners in the centre. Enterprises participate actively in a centre's governance, funding and research. The main criterion for selecting centres was their potential for innovation and value creation. The scientific quality of the research had to be of a high international standard.

When the centres were established, they were given a contract for five years. Based on a successful midway evaluation the contract may be extended for another three years.

Each Centre has been evaluated by a panel of four international experts; two scientific experts with competence to evaluate the research activities of the Centre, and two experts with experience from similar programmes for university – industry research collaboration. These generalist experts looked at the Centre from a general point of view.

The report from the evaluation panels has two main purposes:
1. It will form the basis for a decision about whether to continue the individual centre for the remainder of the overall eight-year term, or to wind it up after five years. The Executive Board of the Research Council of Norway makes the decision based on recommendations made by the Board for the Division for Innovation.
2. The evaluation will give advice to the centres on aspects of their activity that should be improved.

It is the Council's decisions to prolong individual Centres, the Evaluation Committee was asked not to comment specifically on this issue.

The Research Council of Norway wants to express a great appreciation to the international evaluators. A particular thanks goes to Per Stenius for his professional leadership of the panels and the process of writing the report. The evaluators have accomplished to communicate well with the centres and have produced a report which will be of great value both for the further activities of the centres and for the Research Council in administration of the SFI-scheme.

Oslo, December 2010

Arvid Hallén
Director General

Eirik Normann
Acting Executive Director

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Introduction

The fourteen Centres for Research-Based Innovation (SFI) supported by the Research Council of Norway (RCN) were evaluated by one-day site visits from Tuesday, October 12 to Friday, October 29 2010, approximately 3.5 years after they were started and about midway of the planned eight-year program. The evaluation had two main purposes:

- To form the basis for a decision by RCN about whether to continue financing of each individual centre for the final three years of the eight-year term
- To give comment and advice to the centres on their activity and how it should be improved

Each Centre was evaluated by a team of four experts. Two of them were experts that had the competence to evaluate the Centre from a scientific point of view. Two further "generalists" had experience from similar programs for university-industry research collaboration. The "generalists" evaluated the management, organisation and funding of the Centre, and also its interactions with user partners, in terms of mutual mobility of researchers, transfer of results and stimulation of innovations.

Each site visit followed the same procedure. A two-hour morning session was mainly centred on research at the Centre. After lunch, there was a one-hour meeting with graduate students followed by a two-hour discussion on management and organisation of the Centre. The reports of the evaluation team are based on these interviews as well as on the extensive written report and self-assessments supplied by the Centre beforehand. A first draft of the report was compiled in the evening after the site visit. The report was finalised by email between the members of the evaluation team.

We were impressed by quality of the written material, including the SWOT analyses, supplied by the Centres as well as by the well organised and informative site visits. We wish to thank the RCN staff for the efficient organisation of the evaluation scheme, which was carried out without a hitch in spite of the extensive travelling and rather tight timetable involved. Our particular thanks go to Dag Kavlie, who represented RCN at all the evaluations, for his quiet and efficient managing of the arrangements and for being instrumental in creating the open and informative atmosphere prevailing at all our meetings with the Centres.

In the opinion of the generalist evaluators the evaluation did identify progress, strengths and weaknesses of the Centres and the SFI program as a whole. We felt that evaluation process was well designed to enable us to provide feedback and advice to both the individual Centres and to the RCN.

Overall impressions

The achievements of the Centres were generally impressive. They engage highly competent scientists, many of them with established international recognition, as well as clever and enthusiastic students. Overall, the Centres are well supported by the host universities, institutes and industry. They are engaged in application-oriented research that demonstrably

has benefitted supporting industries and organisations in the public sector by providing innovative ideas for enhancement of processes and development of improved or new products. Several Centres engage two or more research partners, and in this have been successfully fostering increased research cooperation across institutional borders. The supporting companies (user partners) are big Norwegian industries and SMEs, as well as foreign enterprises. There was good evidence that the latter took an interest in enhancing innovation and value creation in Norway, in addition to transferring research results into their own international activities.

At the time of the evaluation the SFIs had been operative for a little less than half of the eight years of the eight-year financing period envisaged by RCN. A general conclusion is that, so far, the SFI scheme initiated by the RCN has proven to be very successful and that there is every reason to believe that it will continue to develop in a very positive way.

Having said this, we also note that opportunities for improvement were identified both in individual centres and in the SFI program as a whole. Recommendations for the Centres are given in the individual reports. In the following we discuss some aspects that we find are of more general importance.

Visibility of the SFIs

A general observation is internal communication between the SFI researchers and partners in general seemed to function well, although some weaknesses were identified in some Centres with respect to contacts and transfer of results between industries and researchers, in particular at the PhD student level.

The websites of most Centres are developed with good publicly accessible information given on the aims, leadership, research program and ways of contacting the Centre, in addition to information and reports restricted to Centre partners. The annual reports of the Centres are impressive and give excellent overviews of Centre research.

There is also excellent information on the SFIs at the RCN website.

However, with respect to the external visibility of the SFIs there is also opportunity for some improvement:

- On several websites the Centres are identified as projects at host institutions, obscuring that in practise they are individually operating distinct units.

- In most Centres, authors of scientific publications and conference reports are not identified as belonging to the Centre, although publications are of major importance for the international visibility and assessment of research at the Centres. Authors report only their affiliation to the host institution or research partner. Host institution demands are said to be the reason for this but some Centres have found no difficulties in overcoming this obstacle.

- The SFI organisation is presented as an informative part of the RCN website. However, we note that only two highlights from SFI research in 2010 and none at all from 2009 or 2008 are reported in English.

- To assist the SFIs in finding new industrial partners, the SFI project and notable achievements by SFIs could be made more visible at the RCN website and in other information material from the RCN.

We recommend that the RCN develop guidelines on how the affiliation of SFIs and authors of publications describing results from SFIs should be presented and pay more attention to highlighting news from the SFI in English.

International Scientific Advisory Boards

The science at the Centres is expected to attain an internationally recognized level. For this to be achieved, regular peer review by internationally leading scientists is essential. A well-established and commonly used way to achieve this is for a centre to establish an International Scientific Advisory Board (ISAB). The ISAB should visit the Centre at regular intervals for review and advice of research at all levels: vision, focus and level of research program, participation of senior scientists, activities of PhD students. Some centres already have established ISABs, but the ways they have been utilized vary between centres, and some centres have no ISAB. We advise RCN to ensure that all Centres establish ISABs, to prepare guidelines for how these should be utilized effectively and to monitor ISAB reports.

Board and management

The evaluators were impressed by the commitment and support that most centres receive from Board chairs and members. In some cases Board members are even directly involved in some research projects. However, the ways Boards are engaged in centre activities and supported by management groups vary and some weaknesses in organisation and processes were identified:

The Chairman of the Board in some Centres represented the host institution, in other Centres one of the user partners. In one case the Chairman was also the manager of the Centre. To avoid any possible conflicts of interest, the Board chair should be independent of the general management of the centre and of relationships between the host institution and the centre. Hence, we strongly advocate that the Board chairman should be selected from among the user partners.

Several management teams would benefit from being better formalized and structured so that processes for review of centre strategy and projects become better structured. For sustainable development of a centre it is important that the way user partners and participating scientists are able to observe progress of research and have an influence on project planning and decision is clearly defined. Presently, there are cases where this procedure is too sensitively dependent on ad hoc formation of advisory groups and personal contacts between Centre managers and user partner representatives. We advise the RCN to develop instructions that ensure participation of both scientists and user partners in monitoring and planning of projects through clearly defined management procedures and management groups in all Centres.

Planning for the next financing period and beyond

All centres have submitted plans for the final three-year financing period from RCN. Some of them have set up clear milestones and defined deliverables, while others present their plans as outlines or in more general terms. That continued support is secured from research and user partners is reassuring. For further comments we refer to the reports on each Centre.

In addition, some discussion is warranted of the way Centres have addressed the question of how to handle the resources created once the support from RCN ends. In view of the high scientific quality, the experimental resources, the networks built up at the Centres and the considerable potential for implementation of the research results in industrial innovations, it is very important to plan for how to ensure preservation of cooperation, skills and resources after 2014. Questioned on this matter by the evaluation team, all centres said that they were aware of these circumstances and that they wished for some continuation, but only a few had started formulating concrete plans for how this would be implemented beyond the simple idea that one must look for additional funding.

We note that a very important source of such funding is increased utilization of EU framework programmes, other international funds and deeper contacts with international user partners, all of which require continuing enhancement of the visibility of centres, international review, and international recognition. While the task of achieving this primarily falls on each individual Centre, we urge RCN to consider ways to encourage and support the Centres in their efforts to sustain the resources and competencies they have created beyond the present RCN financing period.

Recommendations to RCN

The generalist evaluators conclude that to this date the SFI scheme as a whole has been very successful, meeting the success criteria defined by RCN when the Centres were started and that there is every reason to believe that it will continue to develop in a very positive way. We find this achievement very commendable. We have identified some opportunities for improvement and, in summary, recommend:

- that instructions be developed that ensure participation of both scientists and user partners in monitoring and planning of projects and project portfolios through clearly defined management procedures and management groups

- that RCN ensure that all Centres establish International Scientific Advisory Boards, and prepare guidelines for how these should be utilized effectively and monitor ISAB reports

- that clear instruction be given to the centres to select their Board chairman among the user partners.

- that guidelines be developed for how the affiliation of SFIs and authors of publications describing results from SFIs should presented.

- that more attention be paid to highlighting news from the SFI in English on the RCN website

- that ways be considered by which RCN can encourage and support the Centres in their efforts to sustain the resources and competencies they have created beyond the present RCN financing period.

12 November 2010

Eric Fercher
(sign.)

Silke Stahl-Rolf
(sign.)

Per Stenius
(sign.)

David Williams
(sign.)

Cancer Stem Cell Innovation Centre - CAST

Host institution: Oslo University Hospital (OUS)

1 Introduction

On October 28, 2010, the evaluation team met with the director, representatives of the host institution, the research partners, project leaders, students and corporate partners of CAST. In the morning discussions centred on the research at CAST. In the afternoon there was a meeting with graduate students and postdocs as well as discussions on management and organisation of the Centre. This evaluation is based on these meetings as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole CAST team for a well-organised meeting as well as open and informative discussions.

2 Research activities

Research program and competence: CAST is an integrated biomedical innovation centre that works towards the identification and characterization of stem cell parameters in tumours. CAST develops innovative approaches for finding small drugs, cancer vaccines and antibodies that address specifically stem cell issues in cancer. Furthermore, CAST works towards high-resolution visualization of specific cell sub-populations in the body as a tool for tracking therapeutic success.

As a whole, the competence profile represented by the CAST Centre is high and the science produced so far by the groups participating in CAST is of medium-to-very good-to exceptional (in one case) quality. The research groups are working on cancer in a number of different organs. Considerable effort and funding has been spent on creating an instrumental park of high quality. The research program is attractive but at the same time broad and somehow diffused. Some of the groups seem to collaborate more actively, but it is the perception of the evaluation team that a couple of groups are working isolated without taking advantage of or contributing much to the overall conceptual scheme of the Centre.

It is also the impression of the panel that the PIs have well in mind and discussed internally the challenges they will have to face in future activities. However, because of the shortage in funding and the achievements obtained in some research projects, the panel also believes that an internal process should be put in place by CAST members in order to identify and focus on those projects that are most likely to bring the Centre to a higher level of competitiveness and bring products closer to application.

The outcome of this process should not be the exclusion of some partners from the consortium, not to lose the constructive and open-to-exchange atmosphere that was evident also from the discussion with the PhD students and postdocs and that may develop into other or additional hot spots of research.

At the present time, however, the Panel thinks it is mandatory that in the future funds be allocated to specific, and synergistic and most promising research projects, as, at this stage, a spread of the money would be a too high risk for the entire Centre.

It is clear that the consortium has the potential to enhance the work of the Centre. Some of the scientists should take more active part in the leadership and research activity of the Centre.

Long-term industrial research in the field outlined in the project description. The research partners are aware that they need to attract more companies and that they need to focus on products that have the highest possibilities to reach the market.

Scientific publications: The number of publications is high although most of the papers published so far come from work that was done before the start of CAST period. Some of the PIs have made outstanding contributions in very high impact journals. It also became evident during the site visit that several new papers are now submitted as joint publications between groups. The evaluators are fully aware of the time that it takes to go from setting up collaboration and a Centre to joint publications and looks forward to this positive outcome, as this is a critical measure of the added value of the Centre.

Research profile and visibility: The research profile of the Centre is overall good with several prominent scientists participating. Visibility is also verified by the large number of conferences attended by the PIs as invited speakers. The students are also frequently involved in international conferences (ISSCR, Keystone). The Centre has also been active in hosting conferences attended by top scientists in the world.

3 Internationalisation

International research cooperation: The PIs have both participated in and coordinated a number of networks within the EU and ESF. One PI has recently won a very competitive ERC grant.

Collaboration with international research groups. All PIs have strong international links and the students and post docs are actively working for short or long term in other labs abroad. Many of the collaborating groups are well-recognized scientists, further highlighting the fact that CAST PIs can attract prominent international collaborations. Most of these, however, apparently do not specifically involve CAST but are created by partners individually. CAST as such has active interaction with the ChemBioNet and the Nordic EMBL and with some researchers individually.

Foreign senior researchers, postdocs and PhD-students in the centre. Currently there is no foreign senior scientist specifically engaged in connection with CAST. 23 PhD students are listed as associated with CAST, 7 of them non-Norwegians. Only three of the students receive their funding from CAST. The Centre also reports that 24 postdocs are working in the Centre (13 of them Norwegians), 8 receiving full funding and one part of funding from CAST.

The number of publications, impact factors, citation indexes, participation in international projects etc. gives indications of the international level of research at CAST. However, the evaluation panel find that it would be important for CAST to look for more hands-on external evaluation of their research efforts and organization in an international perspective on a regular basis. We therefore recommend that the IAB would visit CAST at regular intervals

(e.g. annually), for assessment, discussions and advice on CAST research at all levels (board, senior scientists, PhD students).

4 Researcher training, engagement in education

After talking to the PhD students, and Post docs it was clear that the collaboration between groups was significant at the student/post doc level, especially with regard to technical issues. It is also the impression of the Panel that the Centre organization is giving important opportunity to the young scientists to develop their own communication and strategies with students and postdocs from other partners' labs.

The competence of the students and Post docs seems to be high and they take active part in the CAST projects, including seminars, retreats. The Panel greatly appreciates the effort by one postdoc (together with all the others) to develop a seminar series by themselves without involving the PIs in order to better face technical problems and common interests. The Panel encourages the postdocs and the students to continue in this direction through new organized forms of interaction.

The students and postdocs also brought forward that the meetings they are having with the PIs and, in particular, the retreats are critical and important but could be improved by leaving room for more discussion and reducing the time spent for formal slides-based presentations.

5 Plans for final three-year period

The Panel judges that there are four research lines that, if further developed, can increase the uniqueness of the Centre, in addition to fitting well with the purpose of the funding from the RCN:

- stem cell signalling including wnt and Hh antagonists
- cancer stem cell programming, specifically addressing the role of HMGA2 and Let7 microRNA
- mechanisms that transforms normal cells into malignant cells with a particular attention to intracellular trafficking and the role of PI3-Kinase and of endosomal sorting proteins in regulating EGF and Notch signalling
- to search for candidate stem cell molecules as novel markers.

The Panel recommends that the Centre restrict its focus to cancer stem cell properties in epithelial tissues such as lung, breast and pancreas as well as mesenchymal cancer. Although glioma derived cancer stem cells are equally important, more critical mass would be needed in order to be competitive internationally.

Technological platforms such as production of stem cell lines, imaging, proteomics, genomics, analytical chemistry are important and they should be integrated into the next phase of the project on demand and in the way that is most appropriate to the biological questions raised.

The Panel recommends that due to the fact that the intracellular signalling is at the heart of symmetric and asymmetric cell division, Prof. H. Stenmark's lab should play a more active role in the next phase.

6 Organisation and Management of the Centre

Visibility and identity. The scientific work is carried out by ten research groups (eight groups at OUS and 2 groups at UiO).

At a first glance the Centre seems to have a strong appearance (homepage, annual reports) with a distinctive corporate identity and own homepage address (not using the address of its host institution). The national and international visibility is testified by three conferences and symposia, organized by the Centre, by a long list of cooperation / collaboration with international and national scientific institutions and by an impressive number of publications.

Management. CAST is hosted by the Oslo University Hospital HF. The Director and Deputy Director of the Center showed great enthusiasm and drive to further develop the Center. Both are also scientific group leaders and spend about 40 % of their work time in the center. The other eight group leaders are involved in the CAST between 5 % and 20 %. The Board consists of two representatives of OUS (incl. Chairman), one of UiO as well as of one of each industrial partner.

The evaluation panel found that, as least as they were presented in the evaluation meeting, the structure, responsibilities and levels at which decisions are taken are not handled transparently. Unfortunately, the chart of the organization structure in the annual report 2009 does not alleviate this problem. The chart show the name of the scientists leading the different workgroups, but here is no indication of how these relate to the work packages. The self-evaluation report states that the management team, consisting of the Director and deputy Director, is responsible for follow-up on milestones, reports and scientific follow up, mainly by personal contacts. This seems to be a heavy task as there are ten workgroups and the directors themselves are leading two of them. The industrial partners seem to engaged in planning and evaluation of Centre research mainly through participation in board meetings.

The Director reports to the Board, which has the usual responsibilities of supervising how the research plan is carried out. However, it is not evident how changes in the research plan and possible suggestions for new directions brought up by either researchers or industry partners are evaluated and brought up for decisions in the board.

In addition, both the Chairman of the Board and the Director report to a Steering Committee appointed by the host OUS, that apparently also has responsibilities with regard to decisions on CAST activities.

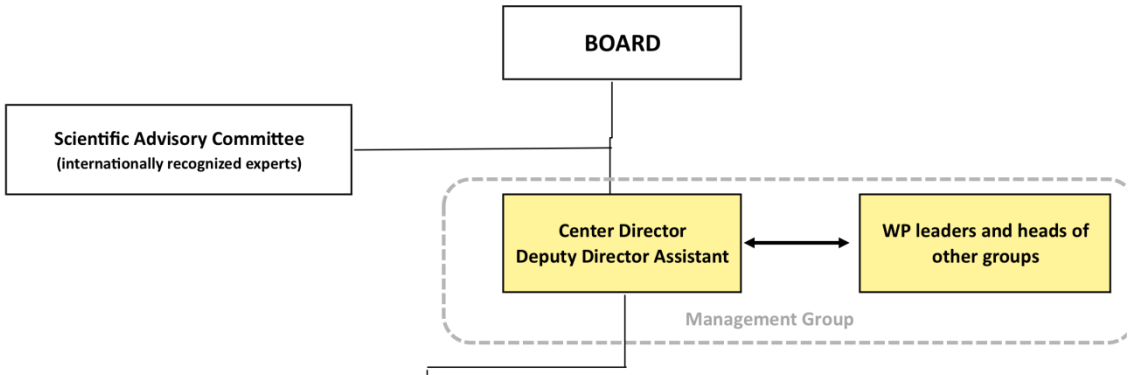
The evaluation panel understands that the extensive reorganization accompanying the merger of three hospitals into OUS has caused some lack of involvement in CAST by the host institution, due to more pressing organizational and administrative problems. Hence difficulties have occurred to establish a clearly defined division of mandates between OUS, the Board of CAST and the Director.

However, we find that the present situation, where the host organization appears to be more involved in the decision making process of CAST than the Board, needs to be changed as a matter of urgency.

In addition, the evaluation panel believes that some of the difficulties associated with maintaining memberships of industrial partners and engagement of new ones may be

associated with the lack of transparency in the organization. For industrial partners, in particular if they are to engage in more long-term research, it is very important to be able to immediately define the main research themes at CAST (or at any Centre), the way the different research groups participate in research within the themes, and in which way the industry is able to participate in research planning, transmission of results and decisions on projects at the Centre. This, unfortunately, cannot be clearly identified from the present organization scheme.

Obviously, the evaluation theme is not sufficiently familiar with the organization and communication lines within OUS or UiO to be able to suggest precisely how the problems outlined above should be solved. However, many Centres are working in a matrix structure basically similar to the one underlying CAST research. The organization on the working group level should show clearly the competences, the collaboration needs and responsibilities within the matrix. The following chart is an example of how such a matrix has been successfully implemented in the organization at several Centres. (Crosses indicate the participation of each group in WP:s):



			in cooperation with				
		Leader of workpackage	**Group 1** Name of Scientist	**Group 2** Name of Scientist	**Group 3** Name of Scientist	**Group 4** Name of Scientist	.....
WP 1	Side Population with stem cell characteristics	**Group 1 Name of WP leader**		x	x		x
WP 2	From tumor stem cells to therapeutic antibodies	**Group 4 Name of WP leader**	x				
WP 3	From tumor stem cells to pathway specific drugs	...					
WP 4	chancelled in Workplan						
WP 5	Targeting tumor stem cells by photochemical internalization	...					
WP 6	.....						

Note: The implementation of this type of organization need not be very formal. However,

- Main decisions with regard to Centre strategy and project structure should be taken by the Board following written rules of procedure and clear schemes for evaluation of ongoing and new projects. The Board should have representatives from all partners. The Chairman could be either from the host institution or from industry. The latter is preferable, as it signals that the Centre is open for the needs of the industry.

- Matters (other than pure routine cases) that need to be further considered by the host department (in the case of CAST, UOS) should be brought to the department according to decisions by the Board.
- The Director reports to the Board and is responsible for management of the Centre. The Management group, consisting of the Deputy Director, administrative assistant and the group leaders (some of them also WP leaders), assists the Director.
- The Group leader of a group that has the main responsibility for a WP is also WP leader and reports on the progress of the WP to the Director. The WP leader cooperates with those of the Group leaders that have projects within the WP as well as with industry partners that taken an interest in the WP. It has in many cases been found advantageous to establish reference groups for each WP, consisting of group leaders and industry representatives, which meet regularly e.g. twice a year or stay in contact in more in formal ways. New ideas, project reports etc. pass through the WP leaders/reference groups to the management group for evaluation and then to decision by the Board.
- The Groups can be defined by group leader names, as is customary in biomedical research. However, in the description of the WP:s it is imperative that the contribution of each participating group is clearly defined. If possible, it would be useful to define milestones and deliverables for each group.
- The International Scientific Advisory Board helps to focus the scientific work onto scientifically and commercially promising areas and evaluates the research in an international perspective

We would like to stress that is absolutely no need to change anything at the Directors' level; what is needed is clearer processes of decision and project evaluation and a more distinct identification of the present quite successful research activity.

Communication within the centre. The daily communication within the CAST seems to be more or less easy. The preferred media for internal communication are email and phone. Beside that, PI-meetings are held, if necessary and postdocs, PhD and master students organize regular meetings on project basis by themselves.

7 User partners and other innovation aspects

Involvement of user partners and other innovation aspects. The research program of CAST was generated as a result of discussions between several partners at OUS (then Rikshospitalet-Radiumhospitalet) and UiO (analytical chemistry). The outcome of the research would be transferred to companies with interests in human therapeutic antibodies (Affitech), coupling of antibodies to different particles and molecules for potential use in diagnosis an localised treatments (Invitrogen), identification of TSCs (Alpharma) and cancer stem cell targeting therapy /PCI Biotech) Invitrogen and Alpharma have subsequently left the Centre, which thus presently has only two member companies, both SME:s In addition a spin-off company working with differential high throughput screens for drugs (ODIN) is closely associated with CAST research but not a partner. The evaluation showed that all three companies are interacting strongly with CAST, indeed, to the extent that their development of innovations is directly dependent on the results from CAST activities.

Need for additional partners. It is the opinion of the evaluation that the industrial partnership in CAST must be increased, preferably by involving larger pharmaceutical companies that have the resources to take an interest in the long-range potential offered by the whole (focused) research programme at CAST, not just results for immediate implementation. Centre management is well aware of the importance of extending industrial support in this way and has after the first two start-up years been actively pursuing contacts with several companies, commendably supported in this activity by the TTO office at OUS. So far these efforts have not been successful but negotiations are in progress.

We recommend that these efforts to add additional partners be pursued vigorously. The strategy of CAST has been to develop its results to pursue their research on stem cell pathways and drug discovery to a level where companies are attracted because they can relatively directly undertake development of potential new drugs. We suggest that a more vigorous marketing of the strengths of the research team and the structure of the research programme (e.g., as outlined above) would make it easier to persuade also companies that can take a more long-range interest in CAST research to join.

CAST also reports that there is additional research on stem cell based tumour therapy at UOH that is not associated with CAST. In any negotiation with industry the relationships between all research on this topic at UOH should be clarified.

It was repeatedly noted during the evaluation meeting that the conditions for joining the Centre defined in the consortium agreement have made it difficult for new partners to join. The main problem has been that the restrictions on IP rights will apply to too large parts of research at each of the research groups. Attempts to change these conditions have been going on for about two years, but so far have not yielded any results. It is our understanding that this is, among other things, due to the large organisational changes resulting from the merger of three big hospitals to form the OUS. Nevertheless, it seems obvious to the evaluation team that removing the obstacles to joining new members caused by the present consortium agreement is a matter that should be given highest priority.

Potential for social ramifications over and above the partners' participation. For a Centre working with finding new ways to address and predict tumour spread and relapse and new anti-cancer drugs the social ramifications are self-evident.

Mutual mobility of personnel and other joint activities. PhD students and postdocs seem to be interacting and cooperating actively and informally, to a large extent due to the initiative taken by them during the first years to arrange seminars/workshops where students and postdocs have presented and discussed their research plans and results. They have clear feeling of identity with CAST and the importance of the contacts between research groups facilitated by the Centre.

CAST research has also initiated some mobility between the Centre and partner companies, in the form of industrial PhD students, joint projects run by postdocs and appointment of a CAST scientist as researcher in one of the partner companies.

Mechanisms for transfer of research results to the partners. Scientific results are reported in the customary way through seminars and workshops, papers in scientific journals and presentations at conferences. Transfer of results involving IP issues has taken place with active help of the technical transfer office at OUS.

Attempts to commercialise results that fall outside user partners' core areas. Several innovation projects in collaboration with industries have been generated that are hosted by research groups belonging to CAST, but are not part of the CAST programme.

8 Gender aspects

Women are well represented on the board and staff members OUS and UiO that are engaged in MI Lab activities, a majority of the PhD students and half of the Postdocs are female. Thus, women are well represented and gender equality is not an issue at CAST.

9 Financial aspects

The budget of CAST is about 19 MNOK per year for the residual time. This is close to the target planned in the application of 2007. The financial contribution of RCN will be about 50 % of the total budget. The scientific partners will contribute some 46 % and the industrial partners only 4 %. The recruitment of new industrial partners in 2011 and 2012 is essential to increase the low contribution of industrial partners. Furthermore CAST is planning to apply for additional external (national) funds in future.

CAST deploys the OUS system for economic, legal and administrational issues.

10 Future activities

The continuation of CAST after the end of the present financing period has been discussed by its board and management. The valuation panel was told that a joint memorandum with some other SFI:s to be sent to RCN and other government bodies highlighting the need to have a strategy for continuation of SFI activities after 2014. Presently there is apparently no clearly defined strategy with regard to CAST specifically.

11 Conclusion and recommendations to the centre

The researchers associated with CAST represent a highly competent group of scientists with international standing in stem cell and tumour therapy research. CAST has created a very interesting research programme with the potential to result in important innovations in stem cell based tumour therapy. However, the research programme should be better focused, the organisation needs to be rendered more transparent and the industrial partnership should be broadened. We recommend:

- that an internal process be put in place in order to identify and focus on those projects that are most likely to bring the Centre to a higher level of competitiveness and bring products closer to application
- that the Centre restrict its focus to cancer stem cell properties in epithelial tissues, such as lung, breast and pancreas as well as mesenchymal cancer.
- that CAST as soon as possible establish an International Advisory Board, consisting of a minimum of three internationally recognized scientists

- that the present situation, where the host organization appears to be more involved in the decision making process of CAST than the Board, be changed as a matter of urgency
- that the matrix organization of CAST be rendered more transparent and marketable by defining the WP:s as the main research themes, led by WP leaders, and describing the contributions of each group of researchers to the WP:s
- that the Centre director be assisted by a management group consisting of the deputy director, assistant and all group leaders
- that the industrial partnership in CAST be increased, preferably by involving larger pharmaceutical companies that have the resources to take an interest in the long-range potential offered by the whole (focused) research programme at CAST
- that removal of the obstacles to joining new members caused by the present consortium agreement be given highest priority.

Oslo, 28 October 2010

Professor Per Stenius

Dr. Erich Fercher

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Center for Integrated Operations in the Petroleum Industry - IO Center

Host institution: NTNU Faculty of Engineering Science and Technology

1 Introduction

On October 26, 2010, the evaluation team met with the director, representatives of the host institution, the research partners, project leaders, students and corporate partners of IO Center. In the morning discussions centered on the research at the IO. In the afternoon there was a meeting with graduate students as well as discussions on management and organization of the Centre. These meetings were partly based on contacts by telephone or video with some of the Centre people. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole IO Center team for a well-organized meeting as well as open and informative discussions.

2 Research activities

Research activities including competence profile, research program The research has been formulated and executed in four different subprograms. The program was built on existing activities that employed experienced and capable staff. This facilitated production of promising results of a high quality in a short time. The researchers have successfully employed a good win-win strategy of pursuing academic results of high quality while still being industrially relevant. The first two subprograms, dealing with 'drilling' and 'reservoir management', are a continuation of international research efforts that started some 15 years ago. One new development that has contributed to the success of the research is the exploitation in new areas of the modern process control and optimization technologies that are routinely practiced in refineries etc.

Research in the first project (safe and efficient drilling) has resulted in the development of a model-based decision support technology and a diagnostic system. A refined integrated drilling simulator is now available. These are successful results that are directly relevant to industry. It is suggested to review the current proposals for future research in Programs 1 and 4 once the findings from the enquiry into the recent major incident in the Gulf of Mexico is available.

The second research project focuses on closed-loop reservoir management and on production optimization. The reservoir management program has resulted, through co-operation with an industrial partner, in the development of the highly significant (Norne) reservoir data set that will form the basis of an upcoming, SPE sponsored, "Applied Technology Workshop".

A new approach to short-term production optimization, based on spatial decomposition and piece-wise linear models has obtained positive acclaim from academia and industry. Further research is being devoted to the coupling of a near-well model and a top-side process model. However, project 2 still requires much additional work in order to increase the robustness of the modeling and optimization techniques to a degree where reservoir engineers who are not

specialized in control and optimization can reliably work with the developed tools in a routine fashion.

Closed-loop reservoir management and production optimization have been traditionally treated as different disciplines and their integration has been recognized in the suggestion to combine them under "closed loop reservoir management" in the proposal for future work.

The third sub-program focuses on diagnostics and maintenance. A general data analysis platform for diagnostics and prognosis (Mimir) has been realized. In addition, condition monitoring methods, which have become industrially accepted for rotating equipment, are being developed using acoustic, gamma-ray and other techniques, for the monitoring of safety-critical, static equipment such as valves, separators, etc. The results are important and significant.

Program 4 ('new work processes') has obtained new insights on the communication processes within distributed teams and the enabling of cross-discipline cooperation. This project has benefited strongly from the collaboration of the industrial partners in the IO project; allowing important modeling concepts and data acquisition efforts to be successfully realized.

Critical size. The subdivision of the four sub-programs into some 15 projects could be viewed as introducing a lack of focus into the project as a whole. A large number of researchers are involved in the projects, many for a relatively small fraction of their available time.

However, the existence of the centre has allowed the organization of many events, which resulted in strong professional interactions amongst this multitude of researchers. Thus this (potential) fragmentation does not seem to have harmed the project significantly, while giving the project a scale far beyond the critical magnitude.

Industry-academia collaboration and personal exchanges are possible and effective at this scale. The project has thus significantly profited from these advantages of scale.

Long-term industrial research in the field outlined in the project description. The research carried out in the project has the character of long-term, industrially relevant research in the field of enhanced and integrated oil production operations. The first half of the project has taken a direction that was successful. The long-term character did not restrain the interest from the side of the industry. This (remarkable) industry support for long-term work has been stimulated by the project being able to combine long-term studies with the delivery of industrially relevant, short-time results.

Scientific publications and papers at recognized international conferences. The total of number of publications (206 of which 32 are in refereed journals) is a good outcome for the first three years of a new program of this size. The number of conference publications provides a good measure of the presence and visibility for the Center at major international conferences in the IO field. A target that increases these numbers of publications is recommended for the final three-year period. This should be feasible due to the inevitable delay of one or two years in the journal publication process and the fact that PhD students make their greatest contribution during their third and fourth year.

Research profile and international visibility. The chosen directions of research in the Center lie on the edges and cross-sections of, amongst others, petroleum engineering in its broad

sense together with real-time decision optimization and systems control. Relatively few international research groups exist that are involved in the combination of these areas. The Center has initiated effective collaboration with five of these groups. This has guaranteed not only effective and successful collaboration, but also an excellent flow of new ideas and early knowledge of new research results.

Unfortunately, this is not true in the area of drilling (program 1); though it is recognized that few, if any, academic research partners exist in this field.

In summary, the research profile realized by the Centre is effective and possesses all the potential to be clearly visible in the international scientific arena.

3 Internationalisation

The IO Center has achieved an increasing level of international research cooperation and collaboration during the past three years. Currently there is collaboration with a total of 7 international industrial partners and 5 international academic groups. It is thus considered as being effective and successful. A significant fraction of the budget (2 MNOK) is spent outside Norway with the aim of increasing collaboration. There are plans to increase this fraction in the coming years.

One result is that several joint publications with international experts have been realized. Secondly, the publications in international refereed journals, and the papers presented at international conferences, further support the international visibility of the Centre.

The organization of the annual international conference with several hundreds of participants, a significant portion of them international, is extremely positive and obviously contributes significantly to the international visibility of the Centre.

In addition, there is an ongoing program of exchanges of several international experts. This has been realized most systematically in the international exchange program for PhD students within the Centre. The development of joint PhD degree program might also be explored (see below.)

4 Researcher training, engagement in education

Researcher training. Several pilot and case projects have been created in the past four years to stimulate innovation and value creation within the IO Center. Strategic, think-tank style seminars were organized early in the life of the IO project to engage more people in the process of identifying innovative ideas for the Centre's detailed research plans. The Centre judged this necessary since the initial research directions were formulated in terms of long-term achievements.

In another direction, several successful dedicated technical workshops and workshops for transferring technology and challenges for SME clusters have been held. These are regarded as having been valuable to all concerned.

Finally it must be concluded from the assessment forms handed in by the industrial partners that the existence of the Centre has effectively facilitated and stimulated the forming of

personal networks between industry staff who are not normally in a position to meet and discuss technical aspects with colleagues from competitive companies.

Engagement in education on Master's and PhD levels. It is planned to complete 15 PhD theses that contribute to the research of the IO Center's research program over a period of 5 years. Several of the PhD students have a co-supervisor outside the main supervisor's department. In some cases, the co-supervisor works for a different organization. This could be further encouraged by exploring the opportunity of joint PhD degrees.

One project, program 2.3, brings the oilfield to Masters students in the classroom via the use of IO infrastructure, an enrichment of the conventional teaching process.

Industries have explicitly indicated that they value the provision of Masters students with IO awareness. It is planned that 125 MSc Engineering and ICT students will contribute to the IO Center through their thesis work during the project's 5 year life. These educational efforts provide the industry with IO-competent staff. In addition, there have been summer internships and collaborative master projects for PhD and MSc students with the industry partners that provide the students with practical experience; as well as bring industry into detailed contact with the Centre's research projects.

Typically, 25 % of the 4-year PhD program is spent working closely with industry.

5 Plans for final three-year period

The four sub-programs are planned to continue with minor modifications. The need for tighter integration between the main projects has been recognized at the board level and "cross-border" projects are being initiated and / or further developed.

These four projects will be devoted to bridging and providing interaction between the sub-programs. One project focuses on the science of integration while the second focuses on integrated planning and logistics. The third project studies proactive environmental protection and monitoring. Finally, the fourth project studies optimal asset management and production optimization.

It can be concluded that the more generic character of these four projects provides a mild change of focus with more cross-discipline thinking and attention for human factors, the environment, management and logistics. These projects will thus strengthen the overall value of the IO Centre if they successfully achieve their objective.

6 Organization and Management of the Centre

Visibility and identity of the centre. The IO Center is accepted as a project of the host institution NTNU. Its identity is adequately communicated by the Centre management group as well as by the PhD students. The website of the IO Center appears as a part of the NTNU webpage. The contents give sufficient background information about the needs and goals for the research, about the structure, results and contacts.

The international visibility of the IO Center has been discussed above. Up to now, 32 papers have been published in journals and 92 conference contributions have been performed.

Regretfully, these papers do not always mention the IO Center as the author's affiliation. The IO Center is encouraged to ensure that the IO is mentioned in addition to the University's departments as the affiliation of authors on all publications that report results obtained through work at the centre.

Performance of the Board and Management. The IO Center is hosted by NTNU and connects two additional research partners (SINTEF and IFE) to 12 industrial partners. The center Director is NTNU employee, as well as the center's manager. The management team is completed by the four program managers, which are affiliated to NTNU, IFE and SINTEF.

The main governance body, the Board consists of the representatives of all user partners and of the scientific institution. The Board meets twice a year and makes decisions about strategic targets, work plans, budgets, new memberships and other critical issues. It is evident that the overall organization and performance of the management and governance structure works well.

The director of the centre also acts as chairman of the Board. Although the evaluation team was told that this has not been associated with any problems so far, this is a very unusual situation, as the Director should report to the board on the execution of its decisions and thus will be reporting to himself. We strongly recommend that the situation be resolved by appointing a new chairman of the Board, preferably delegated from an industrial partner.

The Technical Committee consists of up to 4 members of each user partner and of representatives from research partners and international academic collaboration institutions. It meets twice a year and gives advice to the Board on all relevant activities.

IO Centre has not appointed an International Scientific Advisory Board, as international scientific institutions are involved already in the Technical Committee.

Organization and communication within the centre. The daily communication within the IO Center is challenging, as the scientists are working on various different locations. The preferred media for internal communication are email and phone, supplemented by video conferencing. Besides that, the PhD students organize regular meetings by themselves.

We note that the four sub-programs lack a strong interaction. As mentioned earlier, this is due to the program's start-up that (naturally) focused on the (high quality) results that could be rapidly achieved in each separate domain. Each of the sub-programs is clearly still pursuing a (sometimes limited) manifestation of the concept of integrated operation. The centre's management team has clearly recognized this lack of interaction. It is being remedied by basing the plans for the final three years on the definition of interaction projects between the sub-programs. This is an on-going process as confirmed by the changes between the review material submitted in August 2010 and the slides presented at the October review meeting.

Participation of researchers from the host institution and university in the centre's research. Presently 35 scientists are affiliated to SINTEF, 14 to NTNU, 17 scientists to IFE and 14 to other collaborating scientific institutions. The average fulltime equivalent in the group of scientists amounts to some 30 %. The director of the centre is engaged with 20 % of his working time but is assisted by an operational manager and a project consultant, both engaged 100 %.

Influence on research activities of host institution and university. The IO Center has established internal collaboration between 7 NTNU departments and 3 faculties and external collaboration with research partners SINTEF, Marintek and IFE. The following types of cooperation have been used: cross organizational R&D teams, multidisciplinary seminars, team building sessions and colloquia as well as publication of joint papers

The IO Center has also stimulated some national research groups, such as Reservoir modeling, Drilling and well construction, etc. Through the IO Center NTNU has established and strengthened their collaboration with a considerable number of international universities and R&D centers, e.g. Stanford University and IBM Watson Research Center.

7 User partners and other innovation aspects

Involvement of user partners and other innovation aspects. Having added two new partners in 2008 and 2010, IO Center now has 12 user partners that in total contribute 27 MNOK or almost two times the total contributions from RCN and the research partners. This substantial contribution in funds is matched by strong engagement of user partners in IO Center activities at all levels. All partners are represented on the board. They meet in the biannual 2-day meetings of the Technical committee (50 representatives from user partners), the annual International IO Conference and in about 10 workshops and seminars/year. Researchers from partner companies participate in supervision of PhD students. Furthermore the IO Center endeavors to stimulate SME to participate in the IO market by organizing annual SME Innovation Forums. The Centre has provided continuous education for industrial staff by organizing courses, which attracted about 25 participants per year.

Partner participation in project generation and implementation. The four sub-programs are executed under the supervision of well-trained researchers. The collaboration of many (12) NTNU groups in this program, together with the SINTEF and IFE institutes, has made available a research profile that extends from the fundamental to the practical. This research profile and the quality of researchers involved may explain the increasing number of national and international companies wishing to participate as a partner in the IO Center's program. The increasing number of research partners will also further extend this research profile.

User partners participate in both the generation and the implementation of projects by mechanisms that seem to ensure relevance of the research program. Ideas for new projects are coming up from both scientific and industrial partners through Board meetings, through the Technical Committee meetings and through the workshops.

An interesting way to generate new ideas is also brainstorming sessions in the Crystal ball project, which focuses on radical solutions for future IO. Project ideas are evaluated on the basis of well-defined success criteria and discussions in the Technical Committee with final decisions being taken by the Board. Projects are reviewed by a standardized procedure twice a year by the Technical Committee and the Board.

Many user partners are also engaged in the implementation of projects through participation in case studies and pilot projects. A considerable number of Master student projects have been done in collaboration with user partners.

Most user partners in their written assessments of the IO Center state that networking between the partners is a strong benefit from participation in the Center. This was also corroborated by

the interviews with industrial representatives during the evaluation session. It seems likely that this strong networking is a result of the way the Center management has managed to activate user partner participation at all levels in the Center.

In summary, it is the opinion of the evaluation board that partner participation in IO Center activities has been implemented in a commendable way.

Potential for social ramifications over and above the partners' participation. Center research does not have any direct effects on society beyond the benefits resulting from a more efficiently managed petroleum industry. However, the more general research results on IO management may be of use to industries and organizations in society (e.g. health services) that could benefit from more integrated operations. Indeed, exchange with other branches was already planned by the Center.

Mutual mobility of personnel and other joint activities. Three researchers from industry are engaged as Professors II at NTNU. Some PhD students have been working at user partner facilities as part of their thesis work. All PhD students use 25 % of their time for teaching or industrially related project work. Several students stated that the possibility to have these close contacts with industrial practice is a distinct advantage of belonging to the IO Center. Representatives of user partners have participated in work sessions at the IO Center. It is planned that during phase II of IO Center, researchers will be working in user partner projects to assist in implementation of results.

Mechanisms for transfer of research results to the partners. The different ways of partner participation in implementation of projects and work by IO senior researchers and students at industries are very efficient ways of transferring results to partners. In addition, the Center is also using customary ways of knowledge transfer through journal and conference papers, reports in a database on the Center website, workshops and seminars etc. A very successful way of presenting and discussing new results and increasing IO Center visibility has been the 2-day International Annual IO Science and Practice Conference, which has been arranged four times so far and gathered around 300 participants.

Attempts to commercialize results that fall outside user partners' core areas. A new company, eDrilling solutions that delivers technology-based systems for planning, training, optimization and control of drilling operations, has been founded partially on the basis of results from the IO Center. IO Centre has also been giving courses at enterprises not being partners of the Centre.

8 Gender aspects

Participation of women in centre administration and research. There are several women in the Centre Board, but the management group is wholly male. Also, only 8 % of the senior researchers are female, which is far from the target 30 %. The Centre is aware that this situation needs to be improved.

Recruitment of women for Master's and PhD education. Of the 31 MSc students that did their Masters projects in 2009-2010, about 25 % were women, while about 1/3 of the PhD students are women. This is satisfactory, but there is room for improvement and NTNU and IO Centre are strongly endeavoring to engage more female students.

We note that the only woman among those present at the evaluation was a PhD student.

9 Financial aspects

The budget of IO Centre is about 43 MNOK per year for the remaining years. This is close to the target planned in the application of 2007. The contribution of RCN will be about 27 % of the total budget. The scientific partners will contribute some 13 % and the industrial partner 60 %.

The recruitment of new industrial partners in 2011 and 2012 may increase the mentioned budget substantially. Furthermore the IO Centre is planning to apply for additional external funds in the future.

The IO Centre deploys NTNU´s system for economic, legal and administrational issues. The daily operation and administration is and will be handled in future by NTNU staff members.

10 Future activities

The Centre Board and management have already been planning for how IO Center activities should be preserved after the funding from RCN ends. As a point of departure it is deemed that the capacities and knowledge created by the IO Center must not be allowed to dissipate. Several measures to be taken have been considered, of which perhaps the most interesting is the possible extension to IO in other industrial branches and joint industrial projects (JIP-projects) with multiple industrial funding. We strongly recommend that this planning be continued vigorously, as it would be a considerable loss if the high and coherent competence represented by IO Centre were not preserved in one way or another.

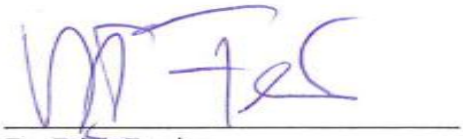
11 Conclusion and recommendations to the centre

IO Center has rapidly grown into an efficient and research organization with strong support from industry and producing results that create considerable potential for innovation in the petroleum industry and its suppliers. We commend this achievement and note that it would be a considerable loss if the high and coherent competence represented by IO Centre were not preserved. For further improvement of the Center, we recommend:

- that the research program for the final three years be focused by definition of interaction projects between the sub-programs
- that the planning for preservation of IO Center resources after year 2014 be continued
- that the current proposals for future research in Programs 1 and 4 be reviewed once the findings from the enquiry into the recent major incident in the Gulf of Mexico are available.
- that the affiliation to IO Centre be mentioned by authors of scientific articles and conference presentation
- that a new Chairman of the Board be appointed, preferably delegated from an industrial partner.

Trondheim, 26 October 2010

Professor Per Stenius



Dr. Erich Fercher

Professor David Davies

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Centre for Research-Based Innovation in Aquaculture technology - CREATE

Host institution: SINTEF Fisheries and Aquaculture, Trondheim

1 Introduction

On October 14, 2010, the evaluation team met with the director, representatives of the host institution, SINTEF, and the Norwegian University for Science and Technology (NTNU), project leaders, students, and representatives of the industrial partners of CREATE. In the morning the discussions centred on the research at CREATE. In the afternoon there was a meeting with graduate students as well as discussions on management and organisation of CREATE. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole CREATE team for a well organised meeting as well as open and informative discussions.

2 Research activities

Research activities including competence profile, critical size, and research program. The three main "research pillars" that encompass CREATE's primary objectives were reviewed and discussed during the meetings. They are: (i) Equipment and constructions (i.e., the physical equipment used to farm fish); (ii) Operation and handling (i.e., the process of executing and carrying out operations necessary to farm fish); and (iii) Farming intelligence (i.e., the control of the total process of farming by understanding the integrated use of equipment and the process of operations). The research staff as well as graduate students and post-docs meet the competence profile required for conducting the research proposed. The critical mass of qualified personnel is present, and there is still time and resources to continue to recruit talent. The success of the research program will depend on the group's continuing performance, which in the evaluators point of view must be result-driven.

The presentations by the director of CREATE and researchers as well as the feedback received from the industry partners present at the meetings, corroborated what was described in more details in the reading materials previously handed to the evaluators. Based on these facts, the evaluators found that the Centre has been providing basic scientific information to integrate the knowledge between the primary objectives with relative success.

The meetings, visits and the interviews we were able to conduct during the evaluation process revealed a vibrant group of researchers, post-docs and graduate students working in a Centre poised for further growth and development. CREATE has clearly valuable research and education tools. The Centre's continuing engagement and collaboration with the industry is of paramount importance.

Long-term industrial research in the field outlined in the project description. The basic research conducted at the Centre has focused on the following general topics: (i) understanding fundamental biological preferences and behaviour of fish, primarily salmon; (ii) to set criteria for technology development; (iii) to develop improved management and operational protocols and systems based on the needs of the fish; (iv) to develop equipment and systems to improve performance and safety of fish farming operations; (v) and to develop a framework for simulation,

optimization and monitoring of all aspects of fish farming. Based on the presentations and interviews conducted by the evaluators during the meetings, it appears that the basic research conducted by the Centre is experienced as helpful to the industry partners, leading the evaluators to believe that the Centre is on its way to achieve the main proposed goals.

So far, the Centre has focused on increasing productivity of salmon aquaculture. An important future development would be that CREATE diversifies its activities by conducting research to develop aquaculture technologies of other commercially important species of fish, molluscs, and crustaceans, as well as microalgae and macroalgae species with potential for biofuel and food production. This research need not be strictly related to temperate species nor to Norway.

CREATE should continue and increase R&D efforts on less invasive, more environmentally sound methods to control biofouling in nets and sea lice infestations in salmon farms. Research should focus on proactive methods to prevent rather than therapeutic methods to just alleviate or cure (chemicals, etc.) sea lice breakouts in salmon cages. To this effect, we recommend that CREATE prioritizes the development of reliable hatchery technology for mass production of wrasses to naturally control sea lice infestations in salmon farms by establishing facultative symbiotic relationships. This concept has been tested and is currently being used in some Norwegian salmon farms. However the wrasses being used are wild caught, limited in number and of high value. This strategy will likely prevent future shortages and/or depleting wild population of wrasses in Norway – a negative ecological impact of salmon aquaculture that must be avoided by all means.

Scientific publications and papers at recognised international conferences. The absolute number of scientific peer reviewed publications and papers at recognised international conferences is acceptable. However in relative terms - considering the large number of researchers, PhD students and post-doctoral fellows supported by CREATE – the evaluators found the number of such publications only moderate.

The evaluators recommend that the publication record for both peer-reviewed and technical papers in trade journals should increase. There are several manuscripts in preparation and currently in review, primarily prepared and submitted by graduate students, so the outlook is promising.

Research profile and international visibility. The research profile of CREATE is satisfactory. However, although the Centre has a very good reputation in Norway, the evaluators' perception is that it still lacks proper international visibility. It is therefore recommended that the Centre increase efforts to improve this visibility and achieve a recognition on par with the Norwegian aquaculture industry.

CREATE should constantly challenge and critically self-evaluate its overall performance to ensure that the Centre is conducting basic and applied research that are advanced and innovative in key scientific areas. As a means of improving visibility and obtain independent advice on progress of Centre research and its level in on an international level we recommend that the Centre establish an International Advisory Board. This board should meet at least annually at the Centre for reviewing and discussing ongoing research.

3 Internationalisation

International research cooperation. The international collaborative agreements are informal at best, based on communication between professors and researchers of CREATE and those institutions. These collaborations need to be better structured with respect to establishing clear

objectives, defined time frames, specific budgets, travel schedules, etc., and formalized through memoranda, agreements or contracts.

Collaboration with international research groups. There are collaborations with The Open Ocean Aquaculture group at the University of New Hampshire, James Cook University in Australia, The Sustainable Aquaculture Laboratory – Temperate and Tropical of the University of Melbourne in Australia, the Shanghai Jiao Tong University, China and the Zheijang University, China. These seem in principle adequate but should have been presented and described in more detail. The evaluators suggest that the international strategic collaboration of CREATE should increase and expand in order to increase the Centre's visibility. We recommend that in such collaborations focus be placed on achieving scientific and public credibility and on demonstrating clear international leadership. This will be very important in order to obtain funding from external government and EU grants and from the private sector.

Foreign senior researchers, post-doctoral fellows and PhD-students in the Centre. Several of the PhD students and post-doctoral fellows of the Centre are recruited from outside Norway. This is viewed as a highly positive move in regards to diversity but may represent a problem for leaching Norwegian technology as they complete their training and return to their homeland.

Out of the seven researchers listed as actively participating in CREATE projects in 2010, only two (Gui Fukon and Shixiao Fu from China) visited the Centre for a short time this year. The level and extent of their contributions to and collaboration with the Centre is not evident. These aspects should be elaborated and better explained in future reports.

4 Researcher training, engagement in education

Researcher training. CREATE has a diverse and large number of PhD students and post-doctoral fellows working a broad range of research topics, including oxygen and hypoxia in salmon cages, biofouling, numerical simulation and analysis of hydraulic flow around the cages, mathematical model of fish swimming, telemetry, improved feeding management techniques, developing new models of submerged cages and so forth. Out of 11 PhD students and 2 post-docs currently at CREATE, only 8 (7 students and 1 post-doc) were present at the meeting with the evaluator and were interviewed.

Engagement in education on Master's and PhD levels. The engagement of the Centre's researchers in education seemed limited. The students demonstrated to be qualified and competent to carry out the research they are involved with and were mostly interested in continuing their presence at the Centre even after graduation. They were generally satisfied with the level of advising and mentoring of their supervisors but expressed the need to have more access and meet with them more often.

5 Plans for final three-year period

The Centre is committed to continue the same scientific approach and topics, indicating that the board is satisfied with the first years' *modus operandi*. The evaluators agree with the "user driven" approach to keep technology and supplier focus and the decision of continuing research on biological and physical research to develop technology and systems.

We commend the recruitment of three new industry/user partners (Marine Harvest, Lerøy and Salmar), the three largest producers of salmon in Norway. This represents a major success.

We further support the Centre's commitment to put more focus on technology development than in the first years and to turn basic research into products and solutions and to use of demonstrators as delivery mechanisms. The evaluators would like to see these results in practice. We are also very supportive of the Center's proposal of organizing an international conference on marine aquaculture technology and operations.

As for the winding up, the evaluators suggest that the Centre researchers must concentrate on gaining enhanced credibility with the industry to the point of becoming indispensable within the next few years, prior to the end of the funding cycle from the RCN. The greatest challenge and measure of the Centre's success will be to become self-sufficient in the next few years so it could carry its own weight.

The evaluators feel that CREATE has been somewhat inward looking and should look at increasing true collaborations with renown international research institutions and universities.

The evaluators firmly believe that the conceptual framework established to develop CREATE encompasses all the ingredients of a perfect recipe: the government providing funding through the RCN to the institution hosting the CREATE (SINTEF Fisheries and Aquaculture) to carry out basic research to benefit the salmon farming industry through its private sector partners (the companies manufacturing products and services) that direct benefit increased productivity of the end product to the benefit of the consumer and society.

6 Organisation and Management of the Centre

Visibility and identity of the centre. CREATE has worked hard on its branding and publicity material. This has resulted in a shared and coherent perspective of its vision and way of working. Centre identity is clearly visible inside Norway, in the broader Nordic context and in key European fora including the relevant ETP. International visibility could be higher and should be addressed as part of the Centre's emerging international strategy.

Performance of the Board and Management. The Centre clearly has strong and effective leadership both by its Director, the Chairman of its Board and the key department of the host institution, SINTEF. The Board is complemented by a Scientific Committee which proposes areas of focus to an industry dominated Board.

Organisation and communication within the centre. The Centre is both professionally presented and managed. It has installed a number of very effective processes, for example that for exploring important new ideas, frequently building on experience of the partners. Communication between the Centre partners is good, Centre CREATE days being an effective mechanism for broad cross centre communication. Now there are a significant number of research students the opportunity should be taken to bring them together as a group more frequently. Discussion with the students and post docs identified both a need and wish for more industry contacts by students at a project level. In some projects contacts were good, however in many the industrial contact was solely primarily made via the supervisor.

Interaction with the host institution and university. Interactions with SINTEF and NTNU are good with each making significant contributions to centre management and to project supervision and execution. CREATE is a valuable component of SINTEF, helping SINTEF to realize the potential and challenges of conducting basic and applied research in key scientific areas. The centre should be leading innovative R&D efforts that in turn support new technology advances to benefit the aquaculture industry growth in Norway. The university is perhaps the "junior partner" in the consortium.

Participation of researchers from the host institution and university in the centre's research. There is good participation of researchers from the host and the university in the research. As indicated below access to larger facilities in the two Institutes is important to the value of the work.

Influence on research activities of host institution and university. The Centre has clearly allowed the partners to take a long term approach to research relationships and to increase the scale, visibility and standing of their work. With the increase of scale they have taken the opportunity to install a number of additional professional research management processes. Importantly CREATE funding and its pilot project process had identified opportunities for further, subsequently successful, proposals therefore further increasing scale and gearing.

7 User partners and other innovation aspects

Involvement of user partners and other innovation aspects. The Centre currently engages well with three industry partners, these partners being equipment suppliers to aquaculture. Two of the initial partners have now merged into a single entity. The Centre is now actively engaging three large company partners who are fish farmers. The centre effectively links industry partners, two SINTEF departments, the Institute of Marine Research (in turn linking to Bergen University), NOFIMA Marin and NTNU. Each of the partners confirmed the added value of the CREATE consortium. Projects effectively link industry and research partners. One industry representatives stated that CREATE has provided the opportunity for the company to have a research and development arm, another representative noted that the company is incorporating several components from the research conducted at CREATE into new products.

An important feature of project execution is that access to key facilities within SINTEF, IMR, NOFIMA Marin and the industrial partners allows work to be done at realistic scale and in real situations – this is critical in the challenging sub-sea environment. The Centre via its Director has an important influence on standards for aquaculture equipment. Discussion during the evaluation emphasised that aquaculture was an emerging industry and that an SFI intervention was particularly important in this context.

There are potential conflicts of interest, though: the company's principals are concerned about proprietary issues and intellectual control of new discoveries.

Partner participation in project generation and implementation, relevance of research. Partners contribute to project generation via the CREATE day and via the Scientific Committee. The project selection and prioritisation process is primarily by consensus between the stakeholders, with the Board having the final sign-off.

The industry and research partners confirm that the fundamental knowledge generated in the Centre is of real value to them and that it would be difficult to generate this knowledge without the SFI funding. Research results are now signalling product opportunities for the partners. The demonstrator approach being explored is also an excellent mechanism for increased participation of more partners in project implementation.

Potential for social ramifications over and above the partners' participation. The Centre by its focus on foodstuffs, its sensitivity to the marine environment and its emerging industry approach has broad social and societal impacts.

Mutual mobility of personnel and other joint activities. Joint activities are carried out between partners at a Centre level, for example the CREATE day and at an individual project level. Mobility between research partners could however be improved by increasing interactions between individual students and their industry customers. Many of the students and post docs indicated an interest in a research career in academia or research institutes.

Mechanisms for transfer of research results to the partners. Each project had its own steering group permitting both results transfer and feedback. Steering group processes varied from project to project, but problematically rarely included student attendance – this should be addressed. Opportunities for results transfer by people transfer were becoming apparent now students were nearing their completion date. These opportunities where between the academic partners and SINTEF and primarily used CREATE funding.

Attempts to commercialise results that fall outside user partners' core areas. This is permitted by their collaboration agreement, but there has not yet been an occasion to test the process.

8 Gender aspects

There are no women on the CREATE board and of the ten members of the scientific committee only one is a woman. Three of the 15 seniors staff members listed as spending more than 10 % of their time working in the centre are women. Of the 11 PhD students listed in the fact sheet 4 are women; one out of the three post docs are female. Thus, while the level of female participation in the host institution, SINTEF Fisheries and Aquaculture, is quite high, it would clearly be desirable to increase the number of women engaged in CREATE activities. Thus we recommend that CREATE focus more on the participation of women in the Centre, in particular at the board and staff levels

9 Financial aspects

The RCN requirements from funding from the host institutions have been well fulfilled, with the exception that the number of industrial partners (3) has been very low. With the recent addition of three fish farming companies this situation has been substantially improved, in particular as these companies represent a part of aquaculture technology that, although obviously related to CREATE research, has not been previously represented in the centre.

The financial reporting gave details only on funds directly allocated to CREATE. An assessment of the total funds related to CREATE research in addition to the detailed report on how CREATE funds have been spent would give a more comprehensive picture of the total volume of research related to CREATE projects.

10 Future activities

The Centre manager, the director of the host institute and industrial representatives all expressed strong interest in preserving CREATE activities beyond the present funding period. This will imply substantial needs for increased external funding and partnership, but the Centre leadership seemed confident that these could be fulfilled. This confidence is by no means unjustified but success will be strongly dependent on the recognition of CREATE as a research organisation with unique capabilities. This is another reason for our recommendation that measures to increase the international visibility of CREATE and recognition of the CREATE brand be undertaken vigorously.

11 Conclusion and recommendations to the centre

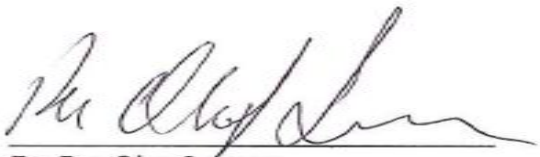
CREATE has developed into an effective research organisation that produces results of high scientific quality and of documented importance to innovative activities at the partner industries. While this development is commendable, there are also aspects of it that could be improved. We recommend:

- that CREATE improve its outreach activities and assists with promoting salmon aquaculture as a socially responsible, environmentally sound and economically viable industry in Norway
- that while maintaining focus on increasing productivity of salmon aquaculture, CREATE diversify its activities by conducting research on aquaculture technologies of other important species with potential for biofuel and food production
- that R&D efforts on less invasive, more environmentally sound methods to control biofouling in nets and sea lice infestations in salmon farms be continued and increased
- that CREATE focus on proactive methods to prevent rather than therapeutic methods to just alleviate or cure (chemicals, etc.) sea lice breakouts in salmon cages
- that the development of reliable hatchery technology for mass production of wrasses to naturally control sea lice infestations in salmon farms be prioritized
- that overall performance of CREATE be constantly challenged and critically self-evaluated in order to ensure that the Centre is conducting basic and applied research that are advanced and innovative in key scientific areas
- that CREATE improve international visibility to achieve a recognition on par with the Norwegian aquaculture industry, including a recognition of its differentiated capability and leadership role
- that international strategic collaborations be increased and better structured and formalized
- that CREATE appoint an International Scientific Advisory Board
- that the publication record for both peer-reviewed and technical papers in trade journals be increased
- that CREATE focus more on the participation of women in the Centre, in particular at the board and staff level

Trondheim, 14 October 2010

Professor Per Stenius

Professor David Williams



Dr. Daniel Benetti
(sign.)

Dr. Per-Olov Larsson

Centre on marine bioactives and drug discovery - MabCent

Host institution: University of Tromsø

1 Introduction

On October 18, 2010, the evaluation team met with the director, representatives of the host institution, the University of Tromsø (UiT), project leaders, students and other partners at MabCent. In the morning the discussions centred on the research at MabCent. In the afternoon there was a meeting with graduate students as well as discussions on management and organisation of MabCent. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole MabCent team for a well organised meeting as well as open and informative discussions.

2 Research activities

The overall structure of MabCent is well designed for the planned activities. The different WPs are in different stages of development with the primary focus so far having been on WP's 1 and 2 (biology). The efforts in WP3 (chemistry) have been inadequate for the needs of the pipeline and WP4 (drug discovery) is still in its infancy.

MabCent has access to a fantastic and unique natural resource and an established infrastructure for harvesting a broad range of marine organisms. The challenge is to exploit these organisms for biotechnology and drug discovery in an efficient and commercially viable way. The biological expertise for sampling and screening of invertebrates has worked well in the initial phase of the project but other organisms are underrepresented so far.

There is an inherent challenge in sampling with respect to renewed collection of samples with the same characteristics as the original sample, due to seasonal and biological variations, including possible contamination of microbes. There is an unexpected disinterest in cultivation of microbial samples. On the other hand, metagenomic approaches have been successfully exploited for isolation of novel enzymes with potential applications for molecular biological work. However, there is an apparent lack of resources for cloning of interesting genes for novel enzymes and their biochemical characterisation.

The screening activities selected for the centre are dependent on the interests and wishes of the academic and commercial partners of the consortium. The panel of targets is impressive and represents a broad range of important therapeutic areas. The assays used have been optimised for throughput rather than sensitivity and information content. A consequence is a rather disappointing overall hit rate from a commercial perspective. This can partially be attributed to a very pragmatic prioritization of samples for isolation, purification and characterization. Any new activities in this work package should focus on exploiting the samples more efficiently, either by development of assays for additional targets, or by saving samples, fractions and purified compounds for later use.

The expertise and instrumentation available for structure determination of both proteins and small organic compounds need to be significantly strengthened in order to get an appropriate balance between the different work packages. There is an acute need for expansion of this activity and establishing the appropriate competence and capacity in the MabCent premises. For example, NMR and mass spectrometry that allow high throughput are essential. Also, there was no evidence of organic synthetic activities being conducted within the project. It is essential that such work can be performed in close connection to the screening and structure determination facilities. There was an astonishing unawareness of the critical importance of these types of chemistry facilities for the success of the centre. It is therefore recommended that external experts are recruited to aid in the establishment of efficient chemistry labs and that postdocs trained in the experimental work are hired to quickly increase the critical mass in the area.

It is not yet possible to evaluate activities in WP 4.

3 Internationalisation

It is important that more international cooperation be initiated for the needs of both the centre and the students being trained within the project. For the strengthening of the chemistry required for WP 4 this is essential, while the earlier work packages should be encouraged to do this as a means of marketing the activities and increasing the visibility of the research and innovation taking place in Tromsø. Collaboration with international research groups is also seen as important for education of the students already hired in techniques not available within MabCent and also for increasing the possibility of recruiting scientists and future PhD-students from abroad.

MabCent has established an International Scientific Advisory Board which participates in MabCent Scientific Days and Workshops, and reports on scientific and strategic issues to the board, management and scientific leaders.

MabCent should actively search to become an attractive partner in EU-projects and other international research activities.

4 Researcher training, engagement in education

The students and researchers should be given more opportunities to actively collaborate with the industrial partners within MabCent and be trained for entrepreneurial and industrial careers. Considering the small size and distant location of MabCent, it is recommended that students are offered participation in courses at other universities in topics not given at Tromsø University.

5 Plans for final three-year period

The plans for the final period were very vague and did not address the critical problems of the centre. It is recommended that there is a redistribution of resources so that WP 3 is strengthened to a point where it no longer is a bottle-neck for the overall pipeline. This will enable WP 4 to start. The resources must allow hiring of full-time personnel (at least on postdoc level) and purchase of additional equipment for separation and structure determination. Since the centra Norstruct and Smallstruct obviously already are integrated in

the work of MabCent and there still is a need for increased accessibility to trained personnel and equipment for them. This part needs more attention in the planning for the next phase. In addition, the possibility of establishing a library of pure compounds should be considered. Recruitment of postdocs is an important strategic question that should be prioritized strictly with respect to the needs of MabCent.

The goals of the activities should be reconsidered to also include other positive spin-offs, for example developing tools for drug discovery, i.e. identify new mechanisms-of-action and reference compounds/samples for pursuing such novel strategies. Technical developments during the screening phase should be evaluated with regard to their commercial value. It is furthermore important to evaluate the possibility of using whole cells or enzymes and/or organic synthesis for production of identified compounds. The possibility to produce analogues to the natural compounds should be evaluated.

In order to increase the dynamics and competence of the research and innovation activities, it would be an advantage if additional collaborators and perhaps also partners become affiliated with the centre. This should be part of securing the future of MabCent, one of the most important questions to be addressed in the next period. The ambitions should be above simply adopting already established techniques in a rather standard manner. A clear goal should be that MabCent becomes internationally recognized as a centre of excellence in marine bioprospecting for biotechnology and drug discovery.

6 Organisation and Management of the Centre

Visibility and identity of the centre.
A successful centre is both externally visible and shows strong commitment of its partners to the centre. This implies that there should be

(a) a clear (and clearly communicated) message concerning the aims and the achievements of the centre and
(b) a communication strategy: target groups, instruments and aims of communication.

From reading the written documentation and from our discussion with the centre team we got the impression that especially with respect the project phases 1 and 2 the centre has gained strong visibility during the past years, which has, for example, led to international cooperation with research groups active in similar fields. The instrument of communication usually has been conference presentations.

However, we have also identified potential for the optimisation of existing communication activities:

- First and most important, publications (and patents) are the most efficient means of signalling excellence and uniqueness. We understand that because WP 1 and 2 took more time than initially estimated and due to the necessity to prepare the ground for the subsequent work packages, publication of results may have been delayed. Nevertheless, we strongly suggest to put more emphasis on publication activities – also within the context of WP 1 and 2.
- Patents were – at least partly – described by the MabCent partners as a precondition of communication activity. It was argued that extended communication activities with potential partners and customers – especially those from abroad – should only start after appropriate IPR had been secured to the MabCent group. We understand that the thematic field of MabCent is highly competitive and – given the enormous market potential – the protection of IPR is crucial. However, we suggest that, despite

legitimate IPR concerns, contacts with potential (international) partners should be more actively pursued. One instrument for doing so would be the involvement in (pre-competitive) European projects in which all partners are, in principle, in a similar IPR situation as MabCent. Then the benefits of cooperation will probably outweigh potential losses with respect to existing knowledge advantages so far accumulated at MabCent.

Performance of the Board and Management. The organisation structure and management of the Centre have proven to be quite efficient. The roles of the different organisational entities are apparently well understood by the partners and operate well within the given organisational set-up. In particular the company partners seem to be very motivated to contribute to the centre and to use the board to participate in the strategic decision making process, for example with respect to the way industry interacts with research and the use of research outcomes with respect to IPR and commercialisation.

Due to this well-functioning board structure and the high and very competent involvement of the company partners in the board's activities we suggest that some board members could be given more responsibility in the daily operations of the Centre. In particular, we suggest that this might contribute to give WP 3 and WP 4 that are lagging behind the further momentum that is urgently needed in order to demonstrate the added value of the centre and pave the way for the centre's medium to long term sustainability.

Organisation and communication within the centre. With its clear structures (board, scientific advisory committee, thematic groups) the centre has all the preconditions for efficient and well-functioning communication and, indeed, we got the impression that the MabCent partners have an open and target-oriented discussion culture. A possible improvement might concern the way how suggestions of the board and the scientific advisory committee are implemented by the centre management and, conversely, how ideas generated by researchers (e.g. PhD students) are taken up and evaluated for further action by management and board. We recommend that the centre management regularly report to the board and the scientific committee about the follow-up of suggested project ideas and make all those in the Centre aware of the processes and criteria according to which suggestions of the board and scientific advisory committee are prioritized.

Influence on research activities of host institution and university. We have seen that the interaction with the host institution works very well and that the centre gets all support that is needed to run the centre. Moreover, our impression is that UiT strongly supports the centre on its way of becoming a unique place for research on bioactives from Arctic and sub-Arctic organisms and the (fast) commercialisation of results:

- UiT is eager to attract and support the building-up of enterprises in the region. Currently some 19-25 companies are working in the field of bio prospecting and they are expected to locate in a new building near the MabCent facilities in early 2011.
- UiT supports the development of projects that have been generated within the MabCent context and are executed at the level of the university's research institutes. These projects are all linked to the thematic groups of the Centre and, accordingly, contribute to its specific profile.
- As an effort to mobilize further resources for MabCent, faculty at UiT are committed to contribute, especially to the supervision of PhD students. It is at the same time

important that when new PhD-students are recruited, they become active in topics of central interest to the center.

As can be seen from these examples MabCent has an influence on the research activities of its host institution (as a "breeding ground" for new projects and a home for "project families") and the host institution contributes to research in the centres, in particular via the supervision of PhD students.

Possibly these linkages with the host institution will require modifications in the consortium agreement. We see this especially with respect to IPR questions that might come up within the context of the new projects. These projects started after the professors' privilege had been abolished; involvement of the commercial partners in these projects might vary considerably and might require flexible IPR solutions. We recommend that the MabCent partners and the host institution find a solution to this challenge in due time in order to avoid uncertainty with respect to IPR. The modifications of the existing rules might also take into consideration the fact that new (commercial) partners may join the Centre in the years to come.

7 User partners and other innovation aspects

Involvement of user partners and other innovation aspects. Of the four companies that originally joined MabCent as partners one has left, but it was replaced by another partner. Three of the partner companies are SME:s located in Tromsø. Only two companies were represented at the evaluation meeting.

The written assessment of MabCent done by the companies before the evaluation show that they consider the usefulness of research at the Centre to the companies to be moderate (mean score 3.5 out of 6). This may be due to the strong focus on screening research of research at MabCent so far with, as discussed above, little or no output in terms of structure determination of molecules, mode of action studies and synthesis. The companies present at the evaluation actually gave evidence of strong involvement in the goals of the Centre, but also of some concern with regard to the relatively low number of novel metabolites fully characterised so far.

Partner participation in project generation and implementation. Project planning and monitoring of progress takes place through nine thematic groups. University and MabCent researchers are represented in all groups. Partner industries are represented in the six of them that are directly concerned with applications. The groups meet six times a year and report to the MabCent director, who then brings suggestions that involve allocation of resources for decision to the board. This is an effective way of ensuring that all partners can take part in the overall planning and supervision of projects.

Company partners pointed out that – in addition to their role in the board – they also see possibilities to be more actively involved in the centre's research activities. As an example they referred to synthesis activities for which company partners have the necessary equipment that could be used by master and PhD students within the framework of internships, thus both contributing to the quality of PhD education and improving the recruitment possibilities of the enterprise partners.

Potential for social ramifications over and above the partners' participation. It was strongly emphasized by the UiT research director and the dean of the host faculty that MabCent is very

important as a measure of the impact and importance of scientific research and innovations in the Tromsø community. Of particular significance is that MabCent is based on a natural resource which is uniquely available to Tromsø and therefore may contribute to a sustaining development of the Tromsø region.

Mutual mobility of personnel and other joint activities. Three of the partner companies are located close to MabCent facilities, which creates excellent conditions for mutual mobility. However, contacts with partner industries take place primarily through senior researchers. Our impression is that the knowledge about MabCent and its partners among the PhD (and probably also master) students leaves room for improvement. Some PhD students were not even aware of which companies are partners of MabCent and in general the students had very little or no direct contact with partner industries. PhD students are ideal "ambassadors" of the centre and they need to have a clear understanding of the centre's mission and partners, the role their projects play within the centre's structure and the potential benefits collaboration with industry offers. Having students (or student representatives) participate at Board meetings and bringing students to enterprise site visits will contribute to this aim.

Mechanisms for transfer of research results to the partners. Results have been reported to partners through the thematic groups, project meetings, workshops and the annual "MabCent science days". Research results which are patentable or in other respects have the potential for commercialisation are communicated to the partners through a well-defined mechanism, "deliver pipeline". The establishment of this procedure is very commendable.

Attempts to commercialise results that fall outside user partners' core areas. This has not been necessary to date. Should the need arise, a mechanism for handling this is defined in the consortium agreement.

8 Gender aspects

Participation of women in centre administration and research. The centre follows the general policy of the university of Tromsø to increase the number of women in scientific positions. The aim is to increase the number of women in professor's positions to 25 % within a time period of five years. Accordingly, and in line with this university policy, several scientific positions within the centre are held by women, as for example the position of the Marbank leader. However, the vast majority of the scientific centre positions are occupied by male researchers.

In the centre administration the situation looks somewhat different. Here all but one positions are occupied by females.

Recruitment of women for Master's and PhD education. The recruitment of women as master and PhD students might be a way to give the above described situation a decisive turn. For this to happen, however, more is needed to keep female PhD students in the research systems, by encouraging them to work on post doc positions and by supporting them through tailor-made work environments that enable them to serve as role models for the next (female) PhD generation to come. This should be particularly feasible in the field of biotechnology where the share of females among the students is usually near to 50 % or even higher. Accordingly, we suggest that the MabCent – together with a general action line with respect to PhD Students – develop measures that contribute to keep female researchers in science.

9 Financial aspects

Funding from the host institution and partners. This has so far been adequate, but if the planned continuation of screening activities are realised to the extent planned, additional funding of research in WP3 and WP4 will be required. It is important that the Centre put strong efforts in resolving this dilemma. The representatives of UiT noted that this could (at least to some extent) be managed by allowing senior staff to allocate more time for supervising PhD students at MabCent.

Efforts to attract new partners and securing other external funding. There is a strong reluctance to engage additional partners in the Centre, based on the need to limit dissemination of detailed knowledge of pharmaceutically interesting compounds and, according to the director, the considerable costs involved in engaging new partners due to the increasing demands on analysis of identified metabolites. However, in view of both the very large database created through the screening and the long-term sustainability of the competencies created through MabCent engagement of additional partners is to be recommended. Contracts with new partners should be negotiated in a way that would ensure that any additional costs to MabCent are fully covered. This may imply that the present consortium agreement will have to be to some extent revised, which should not be considered an insurmountable obstacle.

Addition of new partners may imply increased emphasis on WP 3 (molecular production) and WP 4 (molecular action studies). As discussed above, this shift in the research strategy is strongly recommended also for other reasons.

There has also been some reluctance to seek external funding, e.g. from EU projects. The reason was stated to be that patent issues needed to be overcome first. In view of the need for additional funding of WP3 an WP 4 research and a sustainable long term development of MabCent activities, this reluctance seems unnecessarily cautious and we recommend that the Centre strengthen it efforts to find external funding, if necessary in cooperation with other research institutions.

10 Future activities

Plans for continuation of centre activities when the SFI status and RCN funding expire. The centre is aware of the importance of this issue, but so far no definite plans have been formulated.

11 Conclusion and recommendations to the centre

MabCent has an exceptional position to become a leading institute, in view of its closeness to unique natural resources and a research community that cooperates smoothly, its strong support from the hosting university and its potential importance for the development of the Tromsø region. However, to achieve this position, the Centre must broaden and rise its scientific level by engaging international expertise in its work, increase its international recognition and overcoming the special challenges offered by the large distances involved.

We recommend:

- that resources be redistributed so that WP 3 is strengthened to a point where it no longer is a bottle-neck for the overall pipeline.
- that external experts be recruited to aid in the establishment of efficient chemistry labs
- that postdoctoral scientists trained in the experimental work be hired to quickly increase the critical mass in WP 3
- that any new activities within WP2 be focussed on more efficient use of samples.
- that the Centre put more emphasis on publication activities – also within regard to results from WP 1 and WP2.
- that the Centre strengthen its efforts to find external funding, if necessary in cooperation with other research institutions.
- that the Centre partners and the host institution revise the consortium agreement in order to avoid obstacles that may make it difficult to accept new partners as members of the Centre.
- that further momentum be given to WP 3 and WP 4 that are essential to the exploitation of results by user partners.
- that some board members from user partners with interests in WP3 and W4 be given more responsibility in the daily operation of the centre.
- that the Centre actively search to become an attractive partner in EU-projects and other international research activities
- that students be offered participation in courses at other universities in topics not given at University of Tromsø
- that possibilities to establish a library of pure compounds be investigated
- that students and researchers be given more opportunities to actively collaborate with commercial partners in the Centre
- that all researchers, including PhD students, in the Centre be made aware of the processes and criteria according to which suggestions of the board and scientific advisory committee have been prioritized.
- that the PhD students be clearly informed about the centre's mission and partners, the role their projects play within the centre's structure and the potential benefits collaboration with industry offers

Tromsø, October 18, 2010

Professor Per Stenius

Dr. Silke Stahl-Rolf

Professor Bo Mattiasson

Professor Helena Danielson

Concrete Innovation Centre - COIN

Host institution: SINTEF Byggforsk, Trondheim

1 Introduction

On October 25, 2010, the evaluation team met with the director, representatives of the host institution, SINTEF Byggforsk, the research partner, NTNU, project leaders, students and user partners at COIN. In the morning the discussions centred on the research at COIN. In the afternoon there was a meeting with graduate students as well as discussions on management and organisation of COIN. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole COIN team for a well-organised meeting as well as open and informative discussions.

2 Research activities

The target defined at the start of the Concrete Innovation Centre, COIN, was to contribute to the quality of the built environment by improving the attractiveness of concrete structures. With regard to its definition "attractiveness" was supposed to imply functionality, sustainability, energy efficiency, indoors climate, industrialized construction, improved work environment and cost efficiency during the whole service life. The intention is to reach these goals by achieving a better understanding of mechanisms in order to develop advanced materials, efficient construction techniques and new design concepts combined with more environmentally friendly material production. Initially the following research areas were defined:

Task 1: Advanced cementing materials and admixtures
Task 2: Improved construction techniques
Task 3: Innovative construction concepts
Task 4: Multifunctional design

Under those headings a number of sub-projects were defined.

After two years it turned out that the resources were spread on too many fields, which was feared to become a reason for lack of high quality research results on the long run. Therefore it was decided at the end of 2009 to reorganize the program with more focus on a smaller number of topics. The revised program is composed of the following mean research areas and subprograms:

Focus Area 1: Environmentally friendly concrete structures

- Project 1.1 Binders with low emission and reduced resource consumption
- Project 1.2 Utilization of concrete in low energy building concepts

Focus Area 2: Economically competitive construction

- Project 2.1 Robust and highly flowable concrete with controlled surface quality
- Project 2.2 High tensile strength ductile concrete
- Project 2.3 High quality manufactured sand for concrete

Focus area 3: Technical performance

- Project 3.1 Crack free concrete structures
- Project 3.2 Service life:
- a) improved methods for predicting the initiation of chloride corrosion

- b) accelerated method to detect the danger of alkali-aggregate reaction in an early stage
- c) electric resistivity
- Project 3.3
- a) Structural performance: development of a super lightweight concrete.
- b) Ice abrasion

All research areas can be qualified as being of high actual relevance. After many years in which structural safety and serviceability have been the major goals of structural design, now it is realized that durability and sustainability should become design criteria with the same level of importance. In Focus Area 1 two projects in the field of sustainability have been defined. The Focus Areas 2 and 3 contain projects with high relevance with regard to design for service life. Projects 2.1 2.2 2.3 and 3.3 concentrate on the development of new types of concrete with defined properties. This fits well into the growing international interest in the development of defined performance design methods.

Altogether 13 PhD researchers are working in the projects. They have a solid background and ambition to carry out scientific research. At SINTEF and NTNU a sufficient number of qualified supervisors is available. The research program has been defined in cooperation with 9 industrial partners. This guarantees utilization of the research achievements in a later stage. The topics chosen offer sufficient chances to carry out fundamental research.

As a result of the procedure for the selection of research topics, it is unlikely that programs with high risk will show up in the program. Hence, the research at COIN has an "incremental" character, leading to gradual pushing forward of the frontiers of knowledge. The evaluators suggest that one or two programs with larger risk be included, challenging the creativity of talented young researchers. Such a component in the program could, moreover, add to the international exposure.

The program concentrates predominantly on the material properties and development. Some more interaction with the structural side could be helpful. A good example of this is the research program 1.2 "Utilization of concrete in low energy building concepts", where material research is combined with conceptual structural design.

By selecting the research areas listed above the access to international peer reviewed journals is open, and memberships of leading international research commissions is a possible option. Moreover, in those fields of attention conferences are organized frequently, which offer the possibility of exposing the COIN-programs to a large international audience.

At this stage of the program it is too early to judge the quality of the research on the basis of publications in peer-reviewed journal. It should be realized that for achieving substantial results at least two years are necessary, whereas the review process, requires 1-1.5 years more. However, in 2008 and 2009 12 papers have been published in peer-reviewed in journals and 67 conference presentations have been given. This demonstrates the potential of considerable output in the near future.

3 Internationalisation

Many of the researchers in the program, both PhD- and senior researchers, are active in international commissions and working groups (fib, RILEM, CEN, ACI and ISO). This offers good opportunities to exchange results and ideas. In a number of the projects contacts exist with leading researchers in other countries where experiences exist in the fields considered. A good

example of this is the research on AAR (Project 3.2), where Canadian experience is involved. Other examples are Swedish experience in the project on crack free concrete surfaces (Project 3.1), Danish experience with regard to the effect of chloride penetration in Project 3.2 (through Prof. M. Geiker, who participates in the Coin program and is as well professor in Copenhagen), Icelandic experience in self-compacting concrete (the concrete-rheology experts Prof. O. Wallevik and dr. J. Wallevik). In the project 1.1 "Binders with low emission and reduced resource consumption" profit can be gained from SINTEF's participation in the international network "Nanocem".

The international discussion is further stimulated by the regular organization of workshops with international participation. A more hands-on way to obtain evaluation and comment on research efforts, organization and student performance in an international perspective would be the establishment of an International Advisory Board, consisting of a minimum of three internationally recognized scientists. The IAB would visit COIN at regular intervals (e.g. annually), for assessment, discussions and advice on COIN research at all levels (board, senior scientists, PhD students).

Up to now only one Post-doc researcher was involved in the program. To attract more post-docs is certainly an option to be regarded in the sequel of the program. Post-docs with experience in the field considered can enrich the program by bringing in different views and have a large capacity to add to the scientific value of the results

4 Researcher training, engagement in education

In its initial bid, the Centre made a strategic commitment to using PhD students to deliver much of the core research programme. This approach is viewed positively as it provides a resource that is committed fully to the research objectives of the COIN programme without other distractions. On completion of their research studies, the students provide a further mechanism for technology transfer through employment by the participating industries. Initially this strong commitment proved somewhat problematic as the most academically gifted students were more attracted to immediate careers in the very buoyant industrial sector, but more recently, recruitment of suitable candidates has eased as a result of the prevailing economic conditions. Over the first three years of the programme a total of thirteen PhD students have been recruited including six from Norway. A good gender balance has also been achieved. Five of the students have been funded entirely by COIN, including three, which are affiliated with the host organisation. The balance has been funded by other means by NTNU as part of their financial commitment to the project.

All research students undergo a period of formal research training in their first year amounting to 30 credits. Their development and progress is then the responsibility of their academic supervisor, which generally seemed to be of a good standard. In some cases students also had access to a second industrial supervisor and this is clearly sensible in projects with strong industrial content or company sponsorship.

The panel had a chance to meet the vast majority of these students during the evaluation visit and was impressed with their evident quality and commitment to their research. They were all articulate and enthusiastic about their work and those towards the end of their research projects were starting to position themselves either for academic careers or for industrial positions. Although some had been attracted to apply for positions due to the existence of the COIN programme, there did not appear to be a strong commitment to COIN with some of the students seeing their main affiliation to be with their academic department. On the positive side, some had benefitted from additional COIN funding for experimental work and all had access to funds to enable them to present their work at international conferences and to participate in special interest

groups in their area of interest. When questioned about publications, they all seemed to understand the importance of publishing regularly in the best quality journals and international conferences but this situation needs to be monitored and support provided if necessary in individual cases.

PhD students are invited to project meetings and the annual COIN seminar. They see each other in lunch meetings and generally felt they had a lot of freedom to follow their own direction and this encouragement of independent thinking is to be applauded. PhD student access to the industrial partners seemed patchy and one instance was reported where it was felt that an industrial partner had stopped research due to possibly negative findings that could have damaged them commercially.

Masters level students were also involved in some of the COIN projects where appropriate and further involvement is to be encouraged wherever possible in order to involve as many students as possible in on-going research and to provide them with improved networking opportunities with the industrial partners.

Recommendations: All COIN personnel, staff, students and industrial sponsors should meet together more often to strengthen their affiliation to the COIN programme and to improve general networking opportunities for the PhD students. The student body itself should be encouraged to initiate a seminar programme to broaden their academic understanding and to develop their communication skills.

5 Plans for final three-year period

COIN is now well established and in its fourth year of operation. Some organisational changes have been made within the last year to adjust for the loss of one partner and to accommodate two new partners and also to focus the research in to just three thematic areas. Some of the earliest projects are drawing to a close and the plans for the next year or so are well advanced with funds already committed to the end of Year 5.

The Management Board has approved a plan for COIN to continue for a further three years, which largely proposes a continuation of activity in the three existing thematic areas. This places a greater emphasis on the reduction of CO_2 emissions, saving energy and the protection of natural resources than was apparent in the original proposal and reflects the changing priorities of industry and end users alike over the past few years. The overarching research methodology is the application of nano/micro level scale experimental investigation to achieve practical applications through fundamental understanding. This is the core strength underpinning much of the research by the SINTEF and NTNU researchers and it is appropriate that this methodology is maintained, as there is still a need for fundamental materials research in many aspects of cement and concrete technology. One obstacle uncovered in the research done to date is a lack of field data and a greater emphasis will be placed in the last three years to validate laboratory data and analysis with field data wherever possible.

Some limited detail is given on two or three projects within each of the three thematic areas (eight in all) and it is recognised that these will be firmed up or possibly amended over the next year as the current research projects are concluded. Milestones for these eight new projects are presented and it is indicated that the industrial contributions in both cash and kind will be maintained at present levels.

Individually, all of the proposed projects seem worthwhile and are often valuable extensions of existing projects. However, the opportunity for major innovation seems somewhat limited and the

research, although valuable, seems in many instances to be rather incremental in nature. Whilst this is appropriate in some areas and may provide industry with some short-term payback, the panel would encourage the COIN consortium to introduce some more risky elements to the programme. Whilst this might increase the chances of failure it will also improve the chances of making major technological advances that could provide significant commercial benefits over the longer term. It will also help to raise COIN's profile in the national and international research communities.

The proposal as it stands indicates an intention to recruit a further seven PhD students to supplement the five continuing students recently appointed. Although the recruitment and training of PhD students is viewed a strong and positive aspect of the COIN programme, the evaluation panel would like the Management Board to consider using some of the remaining funds to recruit one or two research fellows. Ideally these should be from internationally recognized research groups who could bring some new ideas and working practices in to the programme as this might also assist in the identification of some more risky elements of research as recommended earlier.

Recommendations: Some consideration should be given to using some of the resource set aside for further PhD students to be used to recruit one or more research fellows. Ideally these fellows would be from established international groups rather than extensions to existing PhD students working in the COIN programme. Urgent attention needs to be given to developing a bid for EU funding if the COIN consortium is to continue after the conclusion of the current programme of research.

6 Organisation and Management of the Centre

Visibility and identity of the centre. The COIN centre appears in an attractive corporate design. Its identity is well communicated by the Management group as well as by the PhD students.
The homepage of COIN conveys autonomy; the contents are sufficient to give background information about the needs and goals for the research, about results and contacts. The visibility of COIN is also given by participating in international projects and organisations. Furthermore there are two PhD students, which have supervisors from coadjutant institutions outside Norway.

*Performance of the Board and Management.*The structure of the center was adapted in 2009. The initial four research fields were reduced to three areas and 8 projects are presently performed. Instead of one Advisory Committee for the whole center three Technical Advisory Committees were installed, one for each research field. This re-organization as such is very commendable. Presently, the Director acts as Chairman of all three committees. However, the evaluation panel suggest that in order to obtain more independent advice a separate Chairman, preferably from industry, should be appointed for each of the committees.

The main governance body, the Board consists of one representative each of companies that contribute more than 1 MNOK per year, representatives of the scientific institutions SINTEF and NTNU, and one elected person representing the three companies that contribute less than 1 MNOK per year. The Board meets twice a year and is headed by the representative of Norcem AS. All decisions of the Board are to be made in consensus.

The director of the centre is employed at SINTEF. The project managers in the day-to-day operations support him.
The three Technical Advisory Committees meet also twice a year each and are headed by the director of the centre.

The overall performance of the management and governance structure seems to be very satisfactory, although the dominance of companies in the Board is obvious. This should not be a problem as long as the scientific output of the centre is of the highest quality and the influence of the Board on the research program does not lead solely to projects where incremental research is done for the company partners' short-term needs.

Organisation and communication within the centre. This has been established in a communication plan, which is reviewed annually by the Board. This plan has 5 levels of content, from scientific level (publications) to CI- issues level (Logo, layout); the details of the plan are plausible.

New project ideas presently are coming up from all partners. The idea must be fit to a set of (industry minded) selection criteria, concerning innovation, scientific and organisation issues. The responding Technical Advisory Committee confirms that the idea fits to the selection criteria and the Board approve the execution.

Participation of researchers from the host institution and university in the centre's research. Presently 4 senior scientists are affiliated to NTNU and 8 seniors to SINTEF. The average fulltime equivalent in the group of senior scientists amounts to 25 %; the director of the centre is engaged with 60 % of his working time. Most of the 10 people of the technical and administrative staff are employed at SINTEF (8), two of them at NTNU.

Influence on research activities of host institution and university. There is a very close collaboration between NTNU and the host institution. The scientific leadership in all eight projects is held by NTNU scientists, and the project manager s of two projects also come from NTNU. COIN has a quite high number of PhD students, of which most of them are located at NTNU departments. Periodical joint arrangements of COIN workshops over various themes would certainly be helpful in order to ensure that the centre and the scientific institutions NTNU and SINTEF raise their national and international reputations.

7 User partners and other innovation aspects

Involvement of user partners and other innovation aspects. COIN has nine user partners, all from the concrete and construction industries. Consultants can be associated with COIN as subcontractors to the companies. The partner representatives present at the evaluation showed strong involvement in the research and gave tangible examples of how COIN research has been of benefit to them. Thus, for one company research at COIN had contributed to bringing Norwegian research on a topic of essential importance to them to an international level. In other cases research at COIN had increased the company's own research activities substantially. The competences at COIN had had been an important factor influencing the decision by to the large international company Mapei to establish their own research facilities in Norway. The strong involvement of COIN partners was also clearly verified during the student interviews, which showed that most of the PhD students had contacts with industrial partners, directly or through their supervisors.

Partner participation in project generation and implementation, relevance of knowledge basis. The reorganisation in 2009 of the COIN research program into three focus areas, each with a Technical Advisory Committee (TAC) with members from the partners, has created an effective organisation for obtaining input and advice on the selection of relevant projects and monitoring of their progress by the COIN partners. Project ideas appear to be almost exclusively generated by the user partners and then pass through TAC:s to the board for decision of whether they should be implemented or not. Decisions are based on strictly defined criteria involving scientific quality

and assessments of industrial relevance and potential for success. The minimum size of projects has been set at 500 000 NOK.

This process is excellent in that it generates projects that have a high probability of generating results of scientific value and relatively immediate use to the industries. The time taken to reach decisions on the projects seems to be several months at a minimum. However, it will also make it difficult or impossible to carry out smaller projects involving higher risk, but with high potential for innovations if successful. We recommend that the Centre consider setting aside a small part of their funds, "seed money", which can be used for rapid funding of pre-projects that may involve higher risks and are based on ideas from both industry and researchers, e.g. PhD students. This may necessitate a change in the Management Board structure to allow and encourage such projects to be identified and supported. The Centre manager should have the authority to take decisions on the implementation of such projects without having to await board meetings.

Potential for social ramifications over and above the partners' participation. There are no immediate social ramifications of research at the Centre. The increased use of lightweight materials and the energy savings that may be the result of innovations implemented by the partners, based on research results from COIN, are of course substantial.

Mutual mobility of personnel and other joint activities. There were several SINTEF employees that after working at SINTEF Byggforsk had decided to engage in research at COIN as PhD students. Some of the students had been in close contact with partners and visited or even worked for some time at partner facilities, Researchers in industry contribute to NTNU teaching and supervision of PhD students and part-time appointment of professors.

Mechanisms for transfer of research results to the partners COIN has commendably established a general communication plan to ensure dissemination of the results achieved in COIN at different levels: Scientific, industrial, public authority, public and domestic. An important mechanism of transfer at the industrial level is the participation of COIN researchers in a large number of international bodies for standardisation. Results are also communicated to industry through workshops and articles in journals for the construction industry. Results are transferred directly to partners through seminars and personal contacts. For example, researchers from partner industries are engaged as supervisors of PhD students. Cooperation with industry in projects is routine at SINTEF and also a long-standing tradition at NTNU.

Innovations or commercialisation of results outside the partner's core areas have so far not been brought to the fore.

8 Gender aspects

Women are well represented in Centre Board, Scientific Advisory Committees, among staff members and among PhD students. This number of women is in line with SINTEF's and NTNU's gender policy. The only exception seems to be MSc students: the 9 MSc theses at COIN in 2010 were all written by males.

9 Financial aspects

The budget of COIN is about 25 MNOK per year for the residual time. This is close to the target planned in the application of 2007.
The contribution of RCN will be about 38 % of the total budget. The scientific partner NTNU and SINTEF will contribute some 23 % and the industrial partner 39 %.

The financial administration is managed by the host (SINTEF).

10 Future activities

The board of COIN has been discussing how COIN activities should be continued when present funding from the RCN ends. Preserving the competence and capacities created though COIN is seen as very important, but a clear strategy for how this should take place has not yet been formulated. For the current level of activity to be maintained, the significant contribution currently provided by the research council will need to be replaced most likely by project grants from RCN and industry and from EU Framework sources. The host institution has an involvement with one existing EU funded project and two further attempts have been made to get EU support over the past three years without success. Possibilities to obtain support through this channel are hampered by the low priority given to construction industry in the present EU call for applications. Given the expertise within the host institution and the international composition of the supporting industrial partners, the preparation of a strong application coordinated and lead by the existing COIN consortium for Framework funds needs to be prioritized.

11 Conclusion and recommendations to the centre

COIN is an efficiently managed and productive SFI, producing research results of scientific value and of use to partners in their development of processes and products. Projects are well planned and reviewed through clearly defined procedures but generally involve little risk-taking.

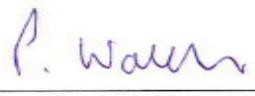
We recommend:

- that COIN consider setting aside a small part of their funds, "seed money", which can be used for rapid funding of pre-projects that may involve higher risks and are based on ideas from both industry and researchers, e.g. PhD students
- that an International Advisory Board be established, consisting of a minimum of three internationally recognized scientists.
- that a separate chairman, preferably from industry, be appointed for each of the Technical Advisory Committees
- that COIN endeavour to hire one or two post-docs with experience in appropriate fields of research
- that a strategy for how COIN activities should continue after 2104 be formulated soon
- that attention be given to developing a bid for EU funding coordinated by the COIN consortium
- that COIN arrange periodical joint workshops over various themes

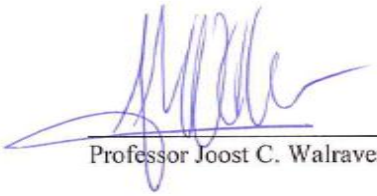
Trondheim, 25 October 2010

Professor Per Stenius

Dr. Erich Fercher



Professor Peter Waldron



Professor Joost C. Walraven

Information Access Disruptions - iAD

Host institution: Fast Search & Transfer ASA, (FAST)

1 Introduction

On October 22, 2010, the evaluation team met with the director, representatives of the host institution (FAST), the partner universities (UiO, UiT, NTNU, BI, Dublin City University, Cornell University), project leaders, students and other partners at iAD. In the morning the discussions centred on the research at iAD. In the afternoon there was a meeting with graduate students as well as discussions on management and organisation of the Centre. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole iAD team for a well-organised meeting as well as open and informative discussions.

2 Research activities

The Centre succeeded in bringing together a number of excellent researchers into a community of interest and making them contribute to a shared vision of disruptive search technologies. Although there were some difficulties at the beginning, the centre leaders were able to hire well-qualified students.

The Centre focuses on personalized search services and interface design to demonstrate new paradigms of a holistic search, and to increase the option for developing search as a new enabler for adaptive information access and management. The Centre is driven by the innovative needs of industrial partners, who bring in problems from daily search practices, and the research interests of participating research groups, who build on well-founded and complementing research experience. Basically this provides an excellent starting point for long-term research, as outlined in the project description.

The work done until today shows a colourful palette of research prototypes in next generation search technology. Highly interesting research questions were addressed by the PhD students and presented in an interactive discussion session and in carefully prepared posters.

The research groups published rather few journal papers but an impressive number of scientific papers on international conferences. Senior iAD scientists have held important positions in organizing and chairing conferences as well as in editorial boards, and have given a respectable number of keynotes and invited talks at conferences. However, these findings cannot hide the fact that iAD as a centre should and could increase its visibility in the scientific community. The groups in most cases publish and participate in their individual roles as members of their hiring organization and only mention iAD as a funding framework. Thus, scientific publications are not identified as iAD publications. This strongly limits international visibility and recognition of iAD. In the same vein, the evaluation team was told that lectures and conference presentations generally do not start by clearly identifying iAD as the source of what is going to be presented. Centre researchers seemed overly cautious with respect to reporting multiple affiliations of authors in publications. University demands are

said to be the reason, but we believe that iAD management could find a way to overcome this obstacle. Similar problems have been easily overcome elsewhere.

The evaluation team has the impression that the Centre still has some way to go in order to constitute a homogeneous group. It seems that the students have established a vivid exchange on the working research level, however, not clear how the other groups, while collaborating, actually contribute to iAD identity. A number of research topics are listed in the research strategy, but the Centre is lacking in a clear research vision not only for the Centre itself but also for several of the presented topics. The evaluation board missed a research roadmap that would ensure collaboration and collective initiative and be valid for the centre as a whole. Individual professors have ideas in mind of how to develop their own research fields, but it is the strong opinion of the evaluators that it is a must to further creatively contribute to and develop a shared research vision for iAD.

The evaluation board also got the impression that the identification with the centre still needs to be improved among the participating groups. Although there are regular meetings at least between PhD students, the centre is considered more like an umbrella with a shared idea of improving search. We note that the neglect to design and maintain an adequate iAD website tends to underline the lack of identity and shared spirit.

The presentation during the evaluation made it difficult to estimate the quality of research behind. In particular, the presenters mentioned no publications, results from evaluations or benchmarks. The evaluators understand that what was presented was work in progress, but it would have been important to relate the presented topics related to publications, published or in progress, i.e. to show key publications together with the topics on the slides.

Part of the review presentations was a rather “isolated” presentation of ongoing research in the area of “disruptive technology” from the Norwegian School of Management. It was not clear how this presentation related to the rest of the projects. A concrete relationship with other research at the Centre was not visible. We recommend that this relationship and the contribution to the overall aims of the centre be further elaborated.

Finally, it is not clear for the evaluation board members how to keep the established student quantity and quality level high until the end of the planned funding period. The Centre is lacking in a perspective for continuously attracting candidates for the next generation of PhD students as no plans have been made for developments after the end of RCN funding in 2014.

3 Internationalisation

In their report the Centre states that internationalization is a key issue for the projects. However, internationalization is only reflected in a close collaboration of the Centre with Cornell University and Dublin City University. Neither of these partners was mentioned in the initial project description of 2007, and none of those mentioned as collaborating with FAST in 2007 are mentioned as partners in projects in the progress reports or plans. At least the Cornell collaboration seems to have been established already before iAD was founded. Joint positions are important and it is good to see that members of any academic level have an opportunity to visit both partner institutions for a certain time. However, although the installed partnerships seem to be very strong, the international research network could be very much improved. We note that research centres that intend to develop leading edge research must be part of a strong and sustainable research network that allows continuous participation

in European consortiums, establishment of internship programs or co-financed projects with organizations that are not justified by personal sharing only.

International Advisory Board. It was argued during the interviews that up to now it was not possible to attract new international collaborators to the Centre but the remaining time will be used to do so. However, clear plans of how this will be done were not presented during the evaluation, or in the progress reports or plans. The evaluators find that it would be important for iAD to look for more hands-on external evaluation of their research efforts and organization in an international perspective on a regular basis. We therefore recommend that iAD as soon as possible establish an International Advisory Board, consisting of a minimum of three internationally recognized scientists. The IAB would visit iAD at regular intervals (e.g. annually), for assessment, discussions and advice on iAD research at all levels (board, senior scientists, PhD students).

4 Researcher training, engagement in education

iAD has a responsibility to achieve a high quality in training their doctoral students in all aspect of scientific research and the transfer of this innovation into real industry projects. Also the iAD Centre should bring transfer its expertise into the education of undergraduate and graduate students of the different academic institutions.

Researcher training: Strong points. The meeting with the doctoral students revealed a positive image of the interaction between them. The students seem to appreciate the Centre and see it as a real advantage to have access to the expertise and the infrastructure of their industrial partners. The informal exchange between the different members of iAD, both personally but also via electronic communication, is important. Although the students work at different locations they have obviously established a forum to communicate and collaborate. The various groups meet regularly for interchanging current state of research. Students give presentations, get feedback and, in many cases, get inspired, since the discussions among them reveal new problems but also provide new ideas. Especially, they profit from the short ways of communication and the findings of the industrial setting within FAST. So they learn about actual search problems, get advice how to use parts of the MS platform, get free licenses to support their research, get insights into search architecture, and may use the rich data sets of MS for their research experiments.

Researcher training. The discussion with both the students and the supervisors revealed that there is not much formal structure that would consolidate a high quality in researcher training – it is mostly achieved through the individual experience and practices of the individual supervisors. The students have their individual monitoring at their home university, but the Centre does not seem to establish a commonly accepted process and quality management of supervising and guiding PhD students. Researcher training is hence done bottom-up but a researcher-training programme on the Centre level is completely missing.

Recommendations: We recommend that iAD establish a formal process of supervising and training PhD students. Such a programme should specify clear timelines and monitoring of the results expected by a doctoral student, e.g.,

- a first research plan should be submitted after a well-defined time and must be acknowledged by at least two supervisors in the Centre
- intermediate reports on the progress should be documented annually within the centre

- colloquia should be organized regularly in which the supervisors and students present and exchanging their results. These should not be pure project reports but training meetings in which the scientific skills of the students are challenged. Cooperation between the supervisors in the Centre should make it clear that individual supervisors maintain Centre-wide standards with respect to training and support of scientific work, competitive publications and development of individual soft skills.

The training strategy for students should be decided by the board and communicated and established throughout the centre.

Engagement in education. Centre senior researchers are supervising both master and PhD students. Individual supervisors teach courses that are related to their research and consequently, are related to the Centre. It remains unclear to what extent the courses are identified by individual supervisors or iAD identity. Courses and talks listed in the communication and dissemination section involve only a few of the members of the centre.

Some senior staff members of the iAD are very active in communicating the research topics of the Centre and are active also in academic education. However, given the huge potential of the Centre in terms of number of senior academic staff, there are few collaborative teaching activities. The education engagement is rather based on the individuals, not on the iAD. We recommend that the educational efforts be strengthened, for example in the following ways:

- Develop a "next generation search" curriculum, can there be local but also virtual courses that would attract students from all over the world to look at the centre and study at one of the locations of the partners?
- Establish a document server for collecting and exchanging teaching material within the Centre and arrange webinars led by supervisors and including invited speakers on the iAD website.
- Consider establishment of a talk series of the Centre in which internal and external talks and presentations are organized, communicated and advertised under one roof
- List talks given in one central document and report or publish relevant ones (such as invited keynote talks) on the website of the centre.

5 Plans for final three-year period

iAD has made a reasonable attempt to look into the future and deliver a plan for the last three years of the project. The report gives an overview of the general goals and methods for the three final years and also shows the expected budget for that period. The different subproject descriptions vary in their level of detail and focus. Some subprojects partly seem to consist of a loose and not very focused set of subtasks, some of which are not really related to iAD. The progress plan is mostly just continuing the different tasks. Clear results and concrete milestones are missing. The "progress plans with milestones" section is actually not really defining milestones.

6 Organisation and Management of the Centre

While the overall impression of the research being performed at the centre and the involvement of PhD students in its activities is positive, the evaluation team identified problems with respect to the organisation and the management of the centre that leave room

for improvement. Indeed, we strongly recommend that the centre work on its organisational structure and its management routines.

Visibility and identity of the centre. iAD is different from the other centres in the SFI scheme as it is hosted by an enterprise. Also, it is run as a virtual centre, i.e. with partners that do not co-locate. With this background, it is absolutely necessary that the Centre has an own identity and is visible to the outside world. The team of evaluators was very surprised that the presentation that had been prepared for the midterm evaluation did not contain information on the vision, the mission or the organisation of the centre. Rather, it was composed of apparently unrelated (yet interesting) presentations of the centre's partners.

Thus, with the support of the host institution, the research as well as the corporate partners should strongly enhance activities to build a joint identity. We suggest the following lines of action:

- The iAD Board should produce a strategy how to build identity and visibility (target group, aims, milestones etc.) and assign responsibilities for the implementation of the strategy.
- Use the website as a means of communication and explore the possibilities to use newsletters, e-mailings etc
- Ensure the visibility of iAD in conference presentations and lectures given by iAD researchers by developing a set of slides with basic and introductory information about the centre (vision, aim, partners, organisation, topics etc.)
- Consider ways how iAD can be more visible in publications and conference presentations (as noted above, currently the centre does not occur in the affiliation of the authors)
- Making visible iAD in the CVs of the staff working with the centre.

Performance of the Board and Management. The team of evaluators considers that the way the Board and the management operate the Centre may be one reason for the lack of vision, identity and visibility. The centre currently seems to be run in a rather bottom-up and organic way. There does not seem to be mechanisms to systematically identify, prioritize, select, set up, integrate and monitor the projects of the Centre. We were not able to identify a systematic description of the tasks of the Board. There is not much information about this in the written documentation, nor was this issue clearly presented and discussed at the meeting with the evaluators. With respect to the performance of the Board and Management we suggest that

- the way the board operates is made more transparent,
- the interaction between the acquisition activities of Accenture (also member of the board) and the board as a representative of the centre is outlined,
- reference groups covering the thematic priorities of the centre are established,
- descriptions of communication and decision channels between the different organisational entities are made available.

Organisation and communication within the centre. One striking characteristic of the presentations given at the midterm evaluation meeting was that the different projects were presented without giving substantial information with respect to how they contribute to the centre's aim and how they interact with each other. We did not get sufficient information how subprojects communicate with each other and how results of one project might complement other projects.

These are tasks of the centre management and the board that need to be better addressed. Centre management and Board are recommended to implement mechanisms aiming at the removal of the above listed deficiencies as a matter of urgency.

Interaction with the host institution and university. We stress that despite the observed deficits with respect to organisation and management, our impressions of the interaction between the host institution and the participating universities, the participation of the researchers from the host institutions and the university in the centre's research and the influence of the research activities of the participating universities were positive. Research groups were very positive with respect to the degree of support they received from the host institution (data, tools etc.). They clearly indicated that the participation in the centre had contributed to the quality and applicability of their research. Also the possibility to interact with industry was considered as rather positive. What is lacking is a better identification of the researchers with goals and strategies of iAD as a whole.

7 User partners and other innovation aspects

Involvement of user partners and other innovation aspects. As noted above, iAD is different from other SFIs in that it is hosted by a company, FAST (owned by Microsoft). The CEO of FAST is also the director of IAD. The involvement of FAST is thus inevitably very strong, but it became clear during the hearing that to a large extent the Centre is able to operate independently, with projects supervised by independent university staff associated with iAD and an apparently free publication policy, although all articles have to be approved for publication by the Director. At start-up of iAD there were two other commercial partners, but one has left due to financial problems. The only one remaining is Accenture. Communication with commercial partners (Accenture, Microsoft) outside FAST or attempts to engage new partner have been limited, but have increased recently (see below).

Partner participation in project generation and implementation. Much of the research has been initiated through brainstorming sessions involving both industrial and research partners, senior scientists and iAD management. It also seems that some of them were driven by specific applications initiated through contacts between FAST and potential users of the technologies involved. Research results were presented at the hearing mainly through demonstration of applications (resulting in the difficulty to assess the quality and novelty of research discussed above). Fast has, together with Accenture and Avanade, established a Fast Innovation Centre that is piggybacking on the iAD lab. Accenture have implemented results from iAD research when developing their platform for information retrieval Thus the road from iAD research via innovation to implementation by member companies is very short and the knowledge basis of iAD is highly relevant to the needs of the two partners.

Potential for social ramifications over and above the partners' participation. The gigantic amount of accessible information accumulating on the Internet is rapidly giving rise to dramatic changes in technology, business, services and social behaviour. The importance of being able to efficiently and easily store and selectively retrieve information on the Internet by easily accessible methods is growing rapidly on all levels and thus research at iAD, such as that on multimedia IR potentially may have considerable impact on social behaviour. An important aspect is also data protection issues that may arise from these activities.

Mutual mobility of personnel and other joint activities. As already noted, communication between the students at iAD is good and there is considerable movement in terms of meetings and longer visits between the five research partners. Joint workshops and meetings are held on a regular basis. Also, all demos are resulting from collaborations within iAD.

Mechanisms for transfer of research results to the partners. Research results are mainly communicated through journals and conference papers (but note the insufficient identification of iAD in these) as well as internal presentations and discussions. Easy transfer of results to the host/partner Fast is given, but the other partner indicates in the written report that direct communication with the centre could be improved. Students did not give evidence of any direct communication with partners outside iAD.

8 Gender aspects

Participation of women in centre administration and research .Currently, there is very little female staff working at iAD. Among the 22 senior staff affiliated with universities and research institutions 2 are female (10 %) and 3 out of 24 of the PhD students (12 %) are female. There is no woman among the current Post Docs.

This reflects the general lack of females in computer science and engineering and the low share of females cannot specifically be attributed to the performance of the Centre. Nevertheless, the evaluators suggest that the centre design and implement measures for increasing the share of females. One way might be to become more visible among bachelor and masters students. These students should get in contact with iAD at a rather early stage, for example through internships or participation in summer schools. This would also contribute to the amelioration of the recruitment situation in general: the rather slow start of the centre has been mainly attributed to the fact that the pool of potential PhD students to select from was too small.

Against this background we recommend that the centre management define a clear recruiting strategy and continuously work on the recruitment situation.

9 Financial aspects

Funding from the host institution and partners. Funding from the host institution and the research and the commercial partners is adequate, but the report does not make a distinction between cash and in kind contributions. It should be noted that the contribution from the RCN to iAD was used exclusively to finance PhD students. Contributions from universities were in kind in the form of senior research staff acting as researchers and student supervisors of iAD projects.

Efforts to attract new partners and securing other external funding. Insufficient funding from commercial partners is listed as a major threat in the SWOT analysis, which thus to enlist more user partners in iAD must been seen as very important for the coming years of iAD activity. In order to make it easier for new partners a system with four grades of access to activities at the Centre has been established, the highest one (”platinum”) giving full access including representation on the board and the three others (“gold”, “silver” and “bronze”) enabling more restricted access. This has resulted in very recent appointment of one silver and two bronze partners.

There are several PhD students working on iAD project that are funded from sources outside iAD. No other external funding was reported.

10 Future activities

No plans for continuation of iAD activities after the end of the 8-year RCN financing period were presented. However, the university research partners seemed to agree that research in the directions defined by work at iAD should be carried on in some way. The organisational issues noted above notwithstanding, it is the opinion of the evaluation team that collaboration through iAD has created an international network for research on information access technology of high quality and importance for the development of this technology in Norway. It would therefore be a great waste if, at the end of the RCN financing, the competencies of this Centre were not preserved, or scattered in a way that would render them less accessible for potential users. We therefore recommend that every effort be taken during the remaining financing period to continue and increase marketing of both the scientific and application aspects of iAD research. Substantially improvement of the national and international visibility of the centre will be of great importance to achieve this goal.

11 Conclusion and recommendations to the centre

The iAD Centre is addressing a topical, relevant and challenging research area. The Centre has brought together a number of highly qualified researchers into a community that contributes significantly to disruptive search technologies. There is some need to improve the organization, long-term strategy, international visibility and common identification with the Centre among its researchers. We recommend

- that the iAD Board develop a clear vision, strategy and research roadmap for iAD during last years of the RCN funding period and beyond the year 2014 that is commonly shared by all those engaged in Centre activities
- that this roadmap include a network plan reflecting the contributions, interchange and transfer of knowledge and results between the groups and mechanisms that describes how to systematically identify, prioritize, select, set up, integrate and monitor the projects of the Centre
- that thematic reference groups be established that would assist in formulation of roadmaps and follow the progress of research
- that a strategy on how to build clear Centre-wide goals and identity be developed
- that every effort be taken to during the remaining financing period increase international and national visibility and promotion of both the scientific and application aspects of iAD research in order to create a solid ground for preservation of iAD competencies
- that the website be extensively developed as a means for active external an internal communication, webinars, distribution of research reports and articles etc.
- that the Centre endeavour to create stronger international cooperation than the one indicated in the three-year plan and extend it beyond the current members of the centre, e.g. through EU projects

- that an International Advisory Board be established for regular internal review of quality and direction of the research program and student work
- that a transparent scheme reflecting the scientific progress be developed, especially relating the publications to international ranking lists of conferences and journals
- that the author's affiliation to iAD be stated in scientific articles and conference papers and that iAD ensure the visibility of the Centre in talks and lectures
- that a strategy to market the Centre in order to attract more industrial partners be developed and the number of user partners be substantially increased
- that in the plan for the final period of RCN funding projects be clearly identified that have the potential of resulting in innovations and further exploitation both in research proposals and in industry cooperation before the end of the iAD funding.
- that the way Subproject 5 contributes to the overall aim and mission of iAD be clarified
- that a structured PhD program targeted at the students at the Centre level be developed
- that the Centre design and implement measures to increase the share of females.

Oslo, 22 October 2010

Professor Per Stenius

Dr. Silke Stahl-Rolf

Professor Dr. Susanne Boll

Professor Andreas Dengel

Innovative Natural Gas Processes and Products - inGAP

Host institution: University of Oslo, Department of Chemistry

1 Introduction

On October 29, 2010, the evaluation team met with the director, representatives of the host institution, UiO, project leaders, students, and representatives of the research and industrial partners of inGAP. In the morning the discussions centred on research at inGAP. In the afternoon there was a meeting with graduate students as well as discussions on management and organisation of the Centre. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole inGAP team for a well-organised meeting as well as open and informative discussions.

2 Research activities

All panel members agreed that both the broader research topic and the partners of inGAP ideally match the requirements of a strong SFI**.** Natural gas is the fossil raw material with the highest hydrogen content and hence environmentally friendly by its nature; moreover, the reserves of natural gas, both at the Norwegian and worldwide level, are huge, so that a safe supply far into the second half of this century is guaranteed. inGAP's partners comprise the two Norwegian universities with the highest research strength, viz. UiO and NTNU, SINTEF as a research institute with a high reputation worldwide and four industrial companies whose activities are closely linked to natural gas, viz. Borealis, Haldor-Topsoe, INEOS and Statoil.

The members have defined four main elements to concentrate their efforts upon. Focusing on a limited number of projects enabled them to get organized and immediately begin recruiting high quality students. The research concentrates on catalysis by which natural gas can be transformed into much higher value-added products in an efficient and environmentally benign manner. This concentration has enabled inGAP to put together a solid, effective team to conduct meaningful research and made it possible to get research work underway in a reasonable time period, which provided a strong basis for interacting with the industrial organizations.

The research and competence profile is ambitious. Without any doubt, inGAP has the critical size required to maintain this profile.

The panel concludes that the long-term industrial research program is appropriate to further strengthen Norway's competitive position. inGAP is aiming at improving processes like gas to liquid fuels (GTL), methanol to olefins (MTO), vinyl chloride monomer production and natural gas to synthesis gas or hydrogen. Improved catalysts and a knowledge-based understanding of the underlying catalytic mechanisms will be key factors of inGAP. Consequently, advanced catalysis research is playing the major role in the research strategy, and it represents the tool of prime importance in their methodology.

The interactions in carrying out the research on methanol to gasoline are outstanding. The work initially involved the University of Oslo and Haldor Topsoe and was subsequently expanded to include the Universities of Turin and Aarhus. Representatives of the groups meet 4-5 times each year and the students meet yearly to make presentations about their work. The participants feel that they collaborate without limitations and this allows much freedom in carrying out the research.

Within the first three years the output of scientific publications in internationally renowned journals was remarkably high (31), and 49 scientific lectures were presented. At this time more than 10 PhD students are working within the frame of inGAP at the two universities. The international visibility of the inGAP scientists is excellent, but it seems that more effort should be made to improve the international profile and visibility of the inGAP Centre and to get inGAP better known within the scientific and engineering communities.

3 Internationalization

The group is now working with several organizations outside of Norway and clearly recognizes the need to expand these interactions.

There are outstanding opportunities for utilization of equipment (especially in- situ spectroscopy) at the industrial organizations (e.g., what has already been accomplished at Haldor Topsoe and what can be done in the future). The panel strongly recommends the expansion of in-situ spectroscopic methods as far as possible, and this will likely require more internationalization. However, within Norway to date the major emphasis has been on bulk instrumental technique, and there is a need for surface sensitive instrumentation. Initiatives are underway to obtain surface sensitive instruments.

It appears that the group is obtaining and/or constructing some sophisticated equipment that should lead to enhanced interactions with other groups.

4 Research training, engagement in education

The PhD students were confident and identified themselves well with inGAP. They get together on a regular basis and communicate personally or via phone, email and in special cases via video conference.

The Centre has plans that all PhD students should spend 6 months in the labs of one of the partners. The students interviewed at the evaluation meeting gave evidence both of close contacts with industry partners and of industrial visits actually taking place, although perhaps not to the planned extent. However, some students indicated that they feel a need to improve the communication with senior scientists and industry partners, as this would be beneficial to rapid completion of research projects.

The Centre has hosted an International Summer School of Catalysis, with the intention to repeat this every second year. It appears that within inGAP significant efforts have been made to effect interactions that enhance the research training of the students.

5 Plans for final three-year period

Apart from changes brought about in the work program by the likely withdrawal of Borealis, no major modifications seem to be required. The panel recommends the following modifications vis-à-vis the original project description:

- A focus should be placed on issuing more patents than in the previous funding period
- The issue of "novel chemistry" for catalytic upgrading of natural gas should be dealt with at an increased intensity. Input from the International Advisory Board would be very helpful here.

Major efforts should be exerted to increase the number of students from Norway in the PhD programs. One industrial partner considers this to be a problem that the departments should tackle rather than inGAP.

There is need to expand the innovative aspects of the research to complement the research directed toward the established processes. It was excellent to learn that the group is aware of this and that during the coming year this will be addressed through monthly presentations by invited speakers and during a group meeting to discuss and plan this initiative.

The group should consider the desirability or not of moving senior personnel between the university and the companies; it appears that they should either downplay this part of the program or provide stronger incentives to cause this to happen.

6 Organisation and management of the Centre

Visibility and identity. The vision of inGAP is value creation in natural-gas processes through rational design of processes and products based on atomistic and mechanistic insight in catalyst and reactor parameters under operative conditions. The Centre seems to have a strong visibility (homepage, annual reports) with a distinctive corporate identity and own homepage (not only using the address of its host institution). The identity of inGAP is clearly separated from that of the host organization or any other partner.

Management. The University of Oslo, Department of Chemistry, hosts inGAP. The Centre Director is highly capable, clearly providing the whole Centre with vision and drive and fostering good cooperation between the two parts of inGAP in Oslo and Trondheim. inGAP personnel and their industrial partners have developed an excellent organization plan.

The management team consists of the Director, the leaders of the five Innovation Areas and the administrator. The management team and the group leaders appear to be very confident and they provide for excellent scientific as well as managing achievement. This was also confirmed by the industry partners (all industrial partners were represented at the evaluation meeting) as a very positive part of the Centre culture.

The governance structure is flat, comprising the Steering Board and Management Team, with support and advice from an International Advisory Board. All industrial partners are represented in the Board. The Chairman is the representative of Statoil. The members of the IAB are internationally leading scientists in the field of catalysis and surface science. The IAB meets annually.

Senior scientists at UiO, NTNU, SINTEF and Statoil head the five scientific working groups. All major issues are prepared by the management group and decided in the Board. The Board meets 4 times a year, so that major decisions are not delayed.

The Director of the Centre is employed at the University of Oslo and spends 100 % of her work time to the Centre. The five group leaders are involved in the inGAP at 10 %.

The composition of the management group implies that both industrial and scientific partners are commendably well integrated into the structure and the daily scientific business of inGAP. This was very evident during the site visit by the evaluation Panel.

Communication within the Centre. The communication within the Centre seems to be of excellent standard. It was obvious to the evaluation team that there was a sense of "togetherness" between all participants in inGAP, overcoming any difficulties that might have occurred because inGAP is located in Oslo as well as in Trondheim.

Scientific communication within inGAP is mainly achieved through 1-2 internal seminars for exchange of experiences and research results, as well as project meetings 4-6 times per year. Regular meetings of the management group is held every month. The panel commends the goal that all PhD students should spend 6 months in the labs of one of the partners as an excellent way to improve contacts between industry and the research partners.

7 User partners and other innovation aspects

Partners participation in project generation and implementation. The matrix organization of inGAP, in which each project is allocated to one of the Innovation Areas led by an area manager, is well designed to facilitate project generation and a well-defined way to ensure the viability and strategic importance of projects. New project ideas are initiated by industries participating in the projects, discussed by the management team formed by the area managers and the Director and then presented for decision to the Steering Board. This process is enhanced through the "Restricted Technology Areas" (RTA) for each user partner. Projects outside the RTA, mainly focusing on development of methods and model materials, are of interest to all Centre partners, while those defined by each partner within their RTA come close to their key technologies. For such projects the partner is given priority IPR.

In their presentations the industrial participations indicated that they were very satisfied with the progress made to date and rated the interactions and contributions to their organizations very highly.

The representative from INEOS indicated that inGAP has delivered and it remains for them to transfer the findings to the plants. One indication of this is that one of the three series reactors is now filled with a catalyst based on the findings of the inGAP studies. The understanding developed in inGAP of the relationship of the promoters in the catalyst led to replacement of the commercial catalyst. Apart from the financial aspects of the project taking too much time, the industrial representative was very positive about the progress of the work.

Statoil has completed testing of Fischer-Tropsch catalysts and their process at the 1,000 bbl/day reactor scale. Now their need is to keep up with advances and the interactions with inGAP significantly contributes to this effort. One potential problem is intellectual property and how to handle this needs to be better defined.

One of the initial partners of inGAP, Borealis, will be leaving the Centre in 2012, but the reason for this is that Borealis has left Norway and thus is not at all related to inGAP activities.

Mechanisms for transfer of research results to the partners. The most important way of transferring research results to the partner is trough industry-initiated projects. All projects have participating scientists from both industry partners and research partners. The industry scientists are often co-supervisors for PhD students working in the project area. Project meetings, at which results are presented and exchange of ideas takes place are arranged several times per year. In addition annual inGAP seminars as well as more specialised workshops are arranged.

All partner companies represented at the evaluation meeting voiced great satisfaction with inGAP leadership, research and transfer of results. Examples were given of how results from inGAP have already been implemented in innovations of substantial importance in full-scale industrial processes.

In addition to this close collaboration in projects, all industry partners also meet at the Steering Board meetings, which take place four times a year.

The evaluation board finds that this organization appears to be very well designed to ensure the influence of user partners and transfer of results and ideas to them at all levels in the commendably flat Centre organization. This was corroborated by the industrial representatives present at the evaluation meeting.

Mutual mobility of personnel and other joint activities. inGAP research is located at UiO in Oslo and NTNU in Trondheim, and also utilises experimental facilities at the multipurpose beamline in Grenoble. Communication between these sites seems to be working smoothly, through biannual meetings between the NTNU and UiO groups, through students doing part of their research in Grenoble and through many more informal contacts and meetings, facilitated by advanced telecommunication such as the excellent video contact with Trondheim during the evaluation meeting.

Potential for social ramifications over and above the partners' participation. The research at inGAP is of importance for the increasing use of natural gas and other carbon sources as energy sources and raw materials as the availability of crude oil dwindles. Development of efficient catalysts contributes to reducing energy consumption and increasing selectivity in many industrial processes. Both developments are of importance for overcoming the present challenges offered by energy shortage and pollution.

Attempts to commercialise results that fall outside user partners' core areas. Rules for transfer of research results that the owning partners are not interested in for commercialization by others are set down in the consortium agreement. To facilitate such transfer inGAP cooperates with the Technology Transfer Office of UiO.

8 Gender aspects

The Centre Director is a woman. There are no women on the inGAP board. However, both among senior staff members engaged in inGAP, postdoc and PhD students 30 % or more are

female. Thus there is a good representation of women in inGAP and although the fraction of females could still be increased the gender issue need not be of great concern to inGAP

9 Financial aspects

The budget of inGAP for the residual time is decreasing from about 39 MNOK in 2011 to 24 MNOK in 2014. This is in line to the target values planned in the application of 2007. The financial contribution of RCN will be about 36 % of the total annual budget in 2011 and 38 % in 2014. The scientific partners will contribute some 47 % in 2011 and 36 % in 2014, whereas the industrial partners contribute 18 % in 2011 and 26 % of the total annual budget in 2014. It is noteworthy, that 40 % of the contributions from industry have been used for development of advanced characterisation methods.

inGAP is organised in the Department of Chemistry of the University of Oslo, under the umbrella of the Centre for Material Science and Nanotechnology (SMN). inGAP has its own administrative head that interacts with the administration of the SMN and with the administration of the Department of Chemistry. SMN organizes the administration of personnel, while the Department handles economic matters and study administration.

10 Future activities

In a long-range perspective, as pointed out in the SWOT analysis by inGAP, possibilities to sustain a research programme that centres on natural gas processes and products will depend on the societal attitude to utilization of natural gas as a raw material, and on strategy changes at the industries that presently take an interest in inGAP research. Both factors are riddled with uncertainties. Hence, it is very difficult to formulate a long-term strategy for how one should prevent that the skills and resources of the strong research group created by inGAP become dissipated when the RCN funding ends in 2014. Nevertheless, in view of the high quality of the research at inGAP and the considerable potential for implementation of the research results in industrial innovations, the evaluation team can only recommend that the Centre as soon as possible start planning for how to ensure preservation of cooperation, skills and resources after 2014. A compilation of different ongoing efforts to develop research tools and university teaching in areas related to inGAP research was presented during the evaluation. This seems to give a good background for developing a plan for future inGAP activities.

11 Conclusion and recommendations to the centre

inGAP has very successfully developed research on natural gas processing in the international frontline and maintains excellent contacts and technology transfer with partner industries. The Centre is led by a dynamic managing director in a way that resulted in excellent cooperation between those involved in inGAP research. The evaluation team concludes that it is highly likely that this excellent development will continue during coming years. In some aspects there is room for improvement and we recommend:

- that measures be taken to improve the international visibility of inGAP as a Centre
- that the Centre endeavour to expand the facilities for in-situ spectroscopic investigations

- that the issue of "novel chemistry" for catalytic upgrading of natural gas be dealt with at an increased intensity
- that in coming activities the Centre pay more attention to patenting than presently
- that the possibilities of PhD students to discuss their research with senior scientists be increased
- that the mobility of senior personnel between the university and the companies and vice versa be either strongly stimulated or wholly downplayed
- that the Centre as soon as possible start planning of how to ensure preservation of cooperation, skills and resources after 2014.

Oslo, 29 October 2010

Professor Per Stenius (sign.)	Dr. Erich Fercher (sign.)
Professor Burt Davis (sign.)	Professor Jens Weitkamp (sign.)

Medical Imaging Laboratory for Innovative Future Healthcare - MI Lab

Host institution: Norwegian University for Science and Technology (NTNU), Trondheim

1 Introduction

On October 12, 2010, the evaluation team met with the director, representatives of the host institution, the Norwegian University for Science and Technology (NTNU), St Olav's Hospital, project leaders, students and other partners at MI Lab. In the morning the discussions centred on the research at MI Lab. In the afternoon there was a meeting with graduate students as well as discussions on management and organisation of MI Lab. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole MI Lab team for a well organised meeting as well as open and informative discussions.

2 Research activities

Research activities including competence profile, critical size, and research program. The current and proposed research activities of the MI lab are excellent and cover very well the current medical needs of improvement in ultrasound imaging, MRI and image guided therapy. Novel opportunities are being picked up, such as nano-particle based imaging and drug delivery.

The competence of the involved partners is at a very high profile and suitable for the research tasks. The sizes of the research tasks are not clearly defined because the research mainly depends on PhD student projects and a small number of post docs. The way the research tasks are organized below the MI Lab leader is not transparent enough. New research subjects seem to be selected from an opportunistic view point and via the recruitment of good PhD Students and influenced by their interest. New ideas are not managed in a structured manner.

Neither students nor MI lab partners could identify a process of idea management but were confident that new ideas could be established if good enough. Selection criteria such as clinical benefit, market opportunity, competition, strategic fit for MI lab and resources available have not been outlined.

Long-term industrial research in the field outlined in the project description. MI lab has a large number of industrial collaborators. A very long-term collaboration with GE Vingmed has resulted in a very successful new medical device, the hand held ultrasound system VScan, which was presented to the public by the GE CEO in person.

The presented new SURF technology is already part of a spin off and MULDO and the 8 times faster acquisition of US images have the potential to reveal biomechanical aspects of i.e. heart valves. These developments are very interesting, in particular for heart valve prosthesis and repair procedures. The consortium is currently not pursuing this new and

interesting field although it would fit to the "image guided therapy" research task. It is therefore recommended to assess the ultrasound image guided structural heart disease treatment opportunity and to address the novel US imaging techniques for valve prosthesis research.

Scientific publications and papers at recognised international conferences. MI Lab has an excellent publication profile with more than 50% level II publications for MR. For the area of ultrasound the percentage of level II publications is lower, one reason being the lack of relevant level II journals. Oral presentations are done at well recognized international conferences such as IEEE, MEDICA and RSNA. MI Lab staff has also presented research results at the following international scientific conferences: IEEE International Ultrasonics Symposium, EuroEcho, ISMRM, WMIC and Society of Neuroscience. A process for assessment of publication impact factors, citation indexes and number of citations should be put in practice.

Research profile and international visibility. Though the MI Lab has an excellent research profile it is not very visible in an international context. The MI Lab is not mentioned as the host organisation of the research presented in published papers and articles but only on posters. The well designed MI Lab brochure and other marketing materials such as a roll up and flyers are not presented as international conferences, such as IEEE, MEDICA, RSNA, etc. It is strongly recommended that the MI Lab be mentioned as part of the address of the authors of papers reporting research results from MI Lab.

It is recommended that MRI Lab should organize at least one large international Symposium on advanced imaging technologies.

3 Internationalisation

MI lab has during its rather short lifetime obtained an impressive international network that includes several prominent individual scientific partners from Belgium, USA, Germany, Denmark and others. International collaboration takes place on both clinical ant technological aspects of medical imaging.

MI lab has during its existence had many visiting foreign researchers. In 2010 there were six visiting guest professors. Out of the 22 PhD students and 12 post docs 12 are from foreign countries.

The scientific advisory committee is exclusively composed of foreigners. MI Lab partners have during 2007-2010 been involved in research activities closely related to MI Lab in several projects within the EU 7th Framework Programme.

While this level of international activity and visibility must be considered very satisfactory, the evaluators note that there are significant opportunities for MI Lab to increase its cooperation with medical device researchers and companies.

4 Researcher training, engagement in education

MI lab has decided to use as much possible of the available funding to finance PhD students. This has resulted in an impressive total number of 34 PhD students and post docs. The students constitute an interesting interdisciplinary mix of engineers, physicists,

mathematicians and physicians that has the potential to lead to a very fruitful innovative environment.

Resources for student supervision, however, seem to be meagre and slightly disorganised. This is to some extent offset by the high quality of the students, at least in the sample that met with the reviewers. The reviewers are of the opinion that student supervision should be strengthened and that a system for periodic student evaluation should be put in place.

Participation in training programs at the master's level is low. However, the director is leader of the recently funded "Norwegian Research School in Medical Imaging".

5 Plans for final three-year period

The headline research plan for the Centre's final three-year period is well laid out and based on the high competence established and the great achievements so far in the field of MRI, ultrasound and image guided therapy. The focus on ultrasound hardware and new transducer is good.

New activities are named, such as research in the field of nanoparticles for drug delivery, which is a strongly recognized new research field and therefore important to be covered. MI Lab should, however, look into other areas of application of imaging i.e. structural heart disease and valve repair. It also recommended that the different teams of the research task should establish networking activities to identify synergistic research e.g. in the field of MR and Ultrasound guided procedures. MRI is of increasing clinical value and therefore an important research field.

6 Organisation and Management of the Centre

Visibility and identity of the centre. The Centre has a clear identity that is shared by the immediate partners. This identity has been communicated via well prepared publicity materials such as the recent annual reports. The effective and informal/low threshold collaboration of excellence in academic science focussed on ultrasound, clinical pull, enthusiasm to evaluate, and business as a route to international markets form the core of this identity.

The Centre must now ensure that this branding is reinforced and becomes more visible internationally. This is important to ensure that the Centre's offering remains competitive within an international market for research. It is also an important part of its process for securing further funding by participation in for example European programmes.

Performance of the Board and Management. The Board is clearly effective and engaged in the processes of the Centre. It is also clear that the Chairman and Director have a good working relationship. The Board have influenced and endorsed, in the early days, the decision to focus on PhD student activities and, more recently, the strategy of defining four areas of focus and the allocation of resources to these. Management processes are centred on the Director, his relationships with the key stakeholders and his ability for consensus forming.

Organisation and communication within the centre. The Director, is the "heart" of the activity and his primary way of working is informal. The Centre is hosted within a "showpiece"

facility within St Olav's. It is justly proud of this facility. The facility also houses some of the activities of key industrial partners and therefore very effectively integrates these. The co-location of researchers, business within the clinical environment of the hospital is perhaps the best method of giving the opportunity for the necessary informal communication between all stakeholders.

While we recognise that the industrial partners and other stakeholders value the informal and low threshold way of working, the Centre should carefully consider using some more formal and transparent processes for research portfolio management, including mechanisms for project choice, stopping projects, student allocation and research topic prioritisation. Also, as noted above, there is no clearly defined process of idea management but partners were confident that new ideas could be established and subsequently exploited if good enough. A somewhat more formalised way of working that would ensure awareness and recognition throughout the Centre of the ways the research portfolio and new ideas are managed is recommended.

Discussions with the students in the Centre also identified some opportunities to increase the interactions between the three cultures (academic, business and clinical) of the centre – particularly student exposure to industry. Some management attention should be paid to reviewing how this could be increased. For example, it would be useful for the students to be in personal contact with personnel at industries that take an interest in their research for feedback on their results, and industry could present their interests to students by visits at MI Lab. Such measures would enhance transfer of results, and would also enhance the students' profile in terms of their acquisition of industrial experience with subsequent plans for employment in mind.

Interaction with the host institution and university. NTNU is the host institution with excellent facilities concentrated to one floor at St Olav. The Centre is a key component of St Olav's strategy as a healthcare provider. This is reflected in the decision to site it in the hospital. The importance of the interactions of the Centre with the hospital cannot be over-emphasised. The industrial partners recognise these as the key advantage that the Centre has when compared with its international competition.

Participation of researchers from the host institution and university in the Centre's research. The enthusiastic participation of hospital clinicians from St Olav in the Centre was clear. This ranged from the junior to the most senior. University researchers in technology are also clearly engaged.

Influence on research activities of host institution and university. The University has taken the strategic approach of creating an integrated facility – this is to be applauded and should be recognised as a benchmark for others. The Centre has increased the level of industry facing research within the university.

7 User partners and other innovation aspects

Involvement of user partners and other innovation aspects. A number of user partners are engaged in the Centre, GE Vingmed being the largest, the others being SME's. One of the users partners in the original consortium, FAST, is in the process of withdrawing, following acquisition by Microsoft. Two new SME partners have been subsequently added to the

consortium. These SMEs where identified and targeted by the Centre because their fields of endeavour where complementary to the other partners.

The Centre aims to act as a melting pot that is both multidisciplinary and, importantly, bridges academia, the clinic and business. This approach is critical to product innovation in the medical technology area – co-location of the three in a single facility is distinctive.

The innovation approach of the centre is to create a knowledge and people pool in which the industrialists fish, where the industrial partners influence the research topics that form the pool. This approach is demonstrably effective and valued but may not be scalable. As already noted, there is little explicit management of the research portfolio and the exploration pipeline that precedes exploitation in the industrial environment.

As indicated above, discussion at the evaluation identified that the Centre should carefully consider installing an ISO compliant quality management system. This would ensure regulatory compliance, for example with the medical device approval required for trials, and speed the transition of products to the industrial partners reducing the amount of rework required by the partners. The Centre should also consider improving its understanding of reimbursement.

Partner participation in project generation and implementation; relevance of knowledge basis. Relevant knowledge is created for the partners. Partners participate in project generation primarily via ad hoc processes and via the Centre board. Participation in implementation is again somewhat ad hoc and varies from project to project.

Potential for social ramifications over and above the partners' participation. The Centre, as a consequence of its medical diagnostic focus, gives both health, wealth generation and by business growth and retention delivers jobs.

Mutual mobility of personnel and other joint activities. Co-location supports mutual mobility. Significantly, GE Vingmed have recruited two of the PhD graduates.

Mechanisms for transfer of research results to the partners. Processes for results transfer where somewhat ad hoc and varied by project and dependant on the project partner. Biannual seminars have been organised for wider dissemination. The network of the Director and others is critical to identifying opportunities for technology transfer.

Attempts to commercialise results that fall outside user partners' core areas. This has not been necessary to date. It was noted that there are activities parallel to the Centre that allow working with other partners where there may be a conflict of interest with Centre partners.

8 Gender aspects

Women are well represented on the board; there are several women among the staff members at NTNU and St Olav that are engaged in MI Lab activities and about one third of the PhD students are female. Thus, women are reasonably well represented in MI Lab personnel, but there is room for improvement. This is clearly recognised by the management. Of particular interest is the initiation of the Norwegian research School in Medical Imaging, which is thought to be attractive for female students.

9 Financial aspects

Funding from the host institutions and partners are mainly in kind, with cash contributions from only three of the ten partners. Two new partners have been accepted from 2010.There is also a considerable amount of activities within MI Lab that are financed by sources other than those allocated directly to the centre. This makes it difficult to assess the actual volume of research and other activities within MI Lab and for the future a comprehensive assessment of the total funds related to MI Lab research would be useful. Most of the cash is used to finance PhD students. While this is certainly one way to ensure long-term dedication to the selected projects, it may also imply a somewhat inflexible allocation of resources

10 Future activities

The Centre manager presented an extensive list of measures to be taken to ensure a sustainable development of MI Lab activities beyond the present funding period. The measures included establishment medical imaging as a whole as an internationally recognized research activity at NTNU and St Olav Hospital. This will imply very substantial needs for external funding. Thus, MI Lab will have to search for increased industrial partnership. Also, possibilities to obtain funding from EU framework programmes and other international sources need to be utilized. We strongly recommend that in order to achieve success in these efforts to increase international awareness of the MI Lab concept be pursued vigorously and internationally recognised metrics of scientific quality be given increased attention.

11 Conclusion and recommendations to the centre

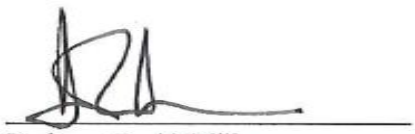
MI Lab started up rapidly and efficiently and now produces results of world class quality that are bound to result in important innovations in medical imaging. Plans for the final years of RNC funding are in place and the measures to ensure the future of the Centre after the RCN funding ends have been discussed. Procedures at the Centre need to be better formalised in order to ensure transparent project management and smooth transfer of results into application. We recommend:

- that establishment of a quality management system be carefully considered
- that a more formalised, transparent way of managing the research portfolio, taking decisions on starting or discontinuation of projects and handling of new ideas be organised
- that efforts to increase international awareness of the MI Lab concept be pursued vigorously and internationally recognised metrics of scientific quality be given increased attention
- that MI lab look for additional opportunities to collaborate with medical device companies and researchers
- that the management staff of MI Lab be increased to facilitate the implementation of quality management, international fund raising and more extensive marketing of the MI Lab brand.
- that student supervision be strengthened and that a system for periodic student evaluation be put in place

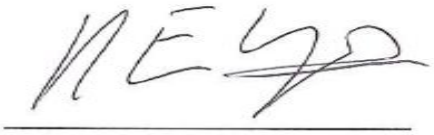
- that the ultrasound image-guided structural heart disease treatment opportunity be assessed and the novel US imaging techniques to valve prosthesis research be addressed .
- that the MI Lab be mentioned as part of the address of the authors of papers reporting research results from MI Lab.
- that MI Lab organize at least one large international Symposium on advanced imaging technologies.
- that MI Lab management endeavour to increase student interaction with industry
- that all contributions in cash and in kind by the host institution to MI Lab-related research that are not funded directly through the MI Lab budget be reported in a transparent and comprehensive way.

Trondheim, 13 October 2010

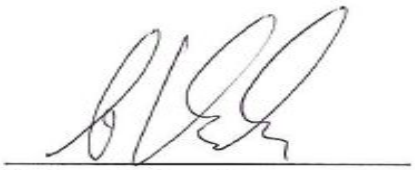
Professor Per Stenius



Professor David Williams



Professor emeritus Håkan Elmqvist



Professor Andreas Melzer

Norwegian Manufacturing Future - NORMAN

Host institution: SINTEF Technology and Society, Trondheim

1 Introduction

On October 15, 2010, the evaluation team met with the director of NORMAN, the chairman of the Board, the director of the host institution, SINTEF Technology and Society, faculty from the Norwegian University of Science and Technology (NTNU), project leaders, students, and representatives of the industrial partners of NORMAN and of RCN. In the morning the discussions centred on the research at NORMAN. In the afternoon there was a meeting with graduate students as well as discussions on management and organisation of NORMAN. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole NORMAN team for a well organised meeting as well as open and informative discussions.

2 Research activities

Long-term industrial research in the field outlined in the project description.

Research activities and research program. The research areas of NORMAN address issues relevant to the Factory of the Future both in a national and international context. The program is in line with the content of the European program Manufuture and is similar to other manufacturing research approaches. NORMAN addresses a range of different topics including innovation culture, lean product development, customized, reconfigurable and adaptive manufacturing, demand driven and transparent manufacturing value chains, and robust and additive manufacturing processes.

Thus, the NORMAN program covers a broad spectrum of disciplines and aspects, such as robotics, production processes, automation, production planning and control, organizational culture and change processes. These aspects are necessarily embedded in industrial companies, but are traditionally not researched in a single location in universities. The NORMAN program importantly takes a holistic approach to manufacturing, but this also represents a challenge for researchers as it requires the integration of disciplines.

To form a coherent program for such research that satisfies many stakeholders is a major challenge. This has been successfully realized by NORMAN. Initial State-of-the-Art studies were combined with mapping of industrial interests and led to the formation of five research projects.

In particular two elements of the NORMAN program show the holistic approach. First, research in the Norwegian Manufacturing Model (NORM) project cuts across the four other research projects. The activities of the project on innovation culture also involve several projects and industrial companies. Second, the demonstrators aim to integrate several research projects in close cooperation with industrial partners. The five demonstrators, two physical and three “soft” or “software” in nature, seek to bridge long-term research objectives and industrial application.

The research activities in NORMAN are to some extent integrated with the research ongoing at NTNU and SINTEF. A key characteristic of the NORMAN program is the cooperation between NTNU, SINTEF and industrial partners. This has resulted in a good mixture of PhD students, senior researchers and industrialists.

Research profile. Because most industrialised countries are in a similar situation with respect to manufacturing their analyses and manufacturing forecasts become similar. Thus many universities and research groups around the globe are dealing with topics related to the Factory of the Future similar to those we find in NORMAN. To become internationally positioned NORMAN needs to capture and express its unique contribution to the international community more explicitly. Thus an important question for the next period of NORMAN is to clearly define the aim of a sustainable activity of importance to the partners. This should resolve whether the aim of the NORMAN is to increase research capacity, generate research capability, and/or to focus on specific distinctive differentiated niches where it leads internationally; or, of course, a strategic blend of the three.

Long-term industrial research in the field outlined in the project description. It is impossible to solve all the identified industrial problems outlined in the project description during the time NORMAN is an active research programme. Questions and problems will remain, only the prerequisites to solve them will change. It is important to develop long-range planning of research, including a well-defined competence profile and assessment of critical size. Today NORMAN consists of five research projects. The management should consider whether the number of projects could be reduced, or structured in an another way to increase the focus of the research and also increase the distinctive profile and thereby the visibility and impact of NORMAN.

Current plans for the demonstrators focus on demonstration of technical feasibility and include significant system building components. Such demonstrators, in our view, may have significant additionality for industrial partners and other industrial companies, for researchers and for graduate students. Exploiting this will require development of exercises and social simulations during which participants can be actively involved in experiencing the functioning of the demonstrator, be it a production cell or a production management system. Not only would this represent a novel learning mode for graduate engineering students, but demonstrators may provide a method of researching the organizational process of planning and implementing new technology. Also it would be able to show industrialists not only the enabling technology at work, but also the potential for value creation in their own company. However, demonstrators should be carefully designed to explore the solution of the *core* of a industry relevant research problem at a realistic complexity; system building for its own sake is inappropriate. Design of demonstrators should also consider likely suppliers of the ultimate solution and the mechanism for their involvement.

Other research methods employed in the research projects include surveys, case studies, mathematical modelling and action research. It is of real value to apply surveys and case studies to understand how industrial companies operate. However, observation of and reflection on Best Practice do not provide insight into future manufacturing issues. Therefore, the future mix of research methods should include an increased amount of action research elements. The questions of research methods is important and we suggest that NORMAN consider assigning more weight to experimental action research as an alternative to more reflective methods.

Scientific publications and papers at recognised international conferences. In recent years the number of publications in international journals has become a key indicator of performance and

quality of research. This is of course debatable, but publication in journals with high impact factors and other performance indices has become mandatory in the university community.

The number and mix of publications from NORMAN is in our view disappointing. The NORMAN research profile, innovation capability and international visibility are all very important for the sustainability of future research activities. Visibility in the global academic arena is in many respects dependent on publication strategy

We suggest that NORMAN could benefit from developing a strategy for publishing its research results, for example defining: which journals are attractive and why; and which conferences are important and consequently worth the submission of papers.

3 Internationalisation

NORMAN has succeed in becoming the coordinator of two EU research projects, a Nordforsk research project and an interregional project. These are significant achievements in international cooperation.

NORMAN has organized a number of international conferences which has contributed to increased international visibility, this is a very good approach to get new contacts for co-operation and to be visible in the academic arena.

However, for long-term sustainability and development of its research it is important that NORMAN further increase its visibility on the international academic arena. A long list of contacts with the international research community is given in the self-evaluation document, but it is not clear to what extent these contacts represent true cooperation in tangible research activities. So far, two Nordic professors have been appointed to the Advisory Board

In the original proposal, NORMAN indicated that it will also establish an International Advisory Board, but it seems that this has not taken place. We recommend that NORMAN invite internationally renowned persons to such a board. The task of the board would be to visit the Centre to review and discuss, at regular intervals - perhaps annually, its research with management, senior researchers and PhD students.

To become an internationally well-known player in manufacturing research, a more pro-active approach to internationalisation will be necessary with the goal to establish permanent collaboration in the form of exchange of senior researchers, post docs and PhD-students and joint projects. It is proposed that NORMAN identify preferred partners (for example, based on the list of contacts) for each core research area and takes proper action to establish more committing international collaboration.

4 Researcher training, engagement in education

The PhD students seemed to be very active and ambitious in their research. They expressed a keen interest in industrial contacts and the opportunity to relate their work to industrial practice. They have been active in organizing workshops both among themselves and with the companies involved in the research projects. Some PhD students had already started their studies before NORMAN start-up with topics defined by their academic advisors. This may explain why not all PhD projects easily fit into the overall objectives of the Centre.

NORMAN has established a PhD school with its own courses and seminars. In addition, PhD students are asked to take mandatory and integrating courses at the NTNU including a course on manufacturing strategy. Also, they are encouraged to attend PhD workshops organized prior to international conferences, e.g. EurOMA, CIRP and APMS.

There is a great potential for synergy in the NORMAN program because of the PhD students' different educational background, from sociology to pure technology, and the integrated environment of NTNU and SINTEF. This is a great opportunity to find new approaches, new ideas and new ways of working, but it is also a challenge to handle the multidisciplinary environment in the education of the PhD students in joint seminars, workshops etc. We have taken note of the recent efforts to stimulate PhD students to become more active outside their immediate research area, including workshops on writing research papers.

The size of the NORMAN PhD school is perhaps small in view of the broad span of disciplines among the PhD students. It can play an important role in keeping focus on researcher training and organize and give PhD courses of common interest, but it will not be possible to give courses focused on all research areas covered by the PhD students. It is our impression that the management of NORMAN is well aware of this and establishes networks with other PhD training activities in Norway and abroad.

The education on Master level at NTNU already includes some NORMAN research results in different courses, and Master students carry out their thesis work as part of NORMAN projects.

As indicated, development of the demonstrators will represent new learning modes for graduate students that will develop new professional competences needed in industry. This is also a very good opportunity to involve high achieving Masters students in the research and connect/integrate research and education in the Masters programme. For the Masters students it is a very good opportunity to work in a research environment and train for a possible future career as a researcher.

5 Plans for final three-year period

The plan for the final three-year period in the written evaluation report proposes relatively minor improvements under a strategy which is perhaps a combination of "more of the same" and a reflection of the international agenda at the time of submitting the plan. We note that the newly appointed director of NORMAN has initiated a more innovative and pro-active strategy.

We recommend the management of NORMAN to continue its efforts to revise the program. The program aim, strategy and structure together with the experiences gained in the first 3½ years hold significant potential for identifying unique features of NORMAN and developing a focused strategy for the remaining 4½ years, that will lead to internationally recognised research. It would be useful to supplement the bottom-up strategic process that has been carried out recently by adopting a top-down approach, reviewing the original strategic directions, identifying new challenges, and developing a clear vision for the next period. The vision should be presented and discussed with the NORMAN stakeholders

6 Organisation and Management of the Centre

Visibility and identity of the centre. Norman has a good national visibility and a strong identity that is shared by its leadership, the Board and most importantly the researcher/research student

body. It is recognised within key EU fora such as Manufuture. The Centre has an active agenda to formally establish international relationships that will fit with its emerging revised strategy.

Performance of the Board and Management. The Centre has appointed a strong new director who is leading it through a strategy revision process. There is a strong Board that is led by a supportive industrial Chair. There is also a Scientific Advisory Group, under new chairmanship. Centre performance showed a number of significant achievements reflecting good performance since start-up. There was also a shared awareness of the Centre's weaknesses and areas requiring attention, with a clear management focus on these.

Organisation and communication within the centre. The Centre appeared to be effectively organised with good management processes. Organisation and operational processes are a clear part of the strategic review process. An important aim of this review is to increase clarity of the relationships between the high level objectives of the Centre and individual projects.

Interaction with the host institution and university. The interaction with the host institution SINTEF is good, SINTEF making clear contributions Centre and project leadership and to technologically based research in the Centre. The Centre operates on two sites, one located in an industrial park close to industrial partners and the other, its centre of gravity, a SINTEF building in which the technological research of the University is located – this co-location being a very effective mechanism to support working in the Centre. The activity also includes the participation of a number of University departments.

Participation of researchers from the host institution and university in the centre's research. Active participation of both SINTEF and University researchers was clearly evident in the Centre and its broader activity including the geared BIP projects.

Influence on research activities of host institution and university. Norman has significantly contributed to maintaining the research activities of the Centre close to the leading edge of research. Equipment secured via the Norman project has been particularly important to the University in terms of the research it allows. These two in turn have helped the university both recruit students and to be recognised in international league tables for their excellence in industry relevant research.

7 User partners and other innovation aspects

Involvement of user partners and other innovation aspects. There is clear involvement of user partners in both centre leadership and management and in project execution.

The centre has a broad mix of research approaches/methodologies ranging from social science to production technology research each of which is applied to user benefit. The Centre uses a demonstrator mechanism to integrate its key research strands and to carry out work of sufficient scale and complexity (in both hard and soft domains) to convince industry of the value of the work and engage them for results transfer. Centre demonstrators, PhD and Masters projects have clearly spun out significant research ideas and opportunities.

The Centre has formed an effective and successful mechanism for proposal preparation for national and EU programmes – this is particularly valued by industrial partners as this secures them innovation resource and allows technology transfer. Industry also identified the importance of the Centre as a technology translator to enable them to keep up with publications, etc. Centre leadership is clear that people are at the core of its processes and that a key part of their role is to deliver trained people and influence education.

In discussions it was apparent that in its early days the Centre had concentrated on growing capacity in research and that it was now turning to focus on capability building in key areas. As it goes forward it should carefully consider strategically developing niches that deliver to the industrial and other stakeholders and where it can have an internationally differentiated capability – this is likely to be important to long term sustainability. Evidence for such differentiation is inevitably demonstrated by a publication record.

Partners participation in project generation and implementation; ensuring relevance of knowledge basis for the partners. Partners are closely involved in individual research projects, this was confirmed both by project partners and by the researchers themselves. During the start-up of the centre there was also clear user involvement in Centre goal setting including meetings of all the centre stakeholders. Such large stakeholder meetings are now being put in place as the Centre revisits its strategy. There is clear involvement of the Board in strategy formulation.

A knowledge base relevant to the partners is clearly being created. As indicated above this knowledge ranges from the social sciences to the technological. While industrial partners value the action oriented outputs of the social sciences and soft work in the Centre, they are less clear that they are able to employ those with these skills, people with technological skills have more immediate value for them. It is important that an agency such as SINTEF can retain these skills and apply them on industries behalf. The return of some of the first cadre of students to SINTEF on PhD graduation will enable this.

Potential for social ramifications over and above the partners' participation. Results generated via Norman particularly in the area of working practices are likely to be broadly important to the balance of Norwegian industry. The potential increase of research focus on design for the environment will have societal impacts.

Mutual mobility of personnel and other joint activities. There is mutual mobility of personnel by interchange during projects and as indicated above two PhD students are returning to SINTEF. A number of masters students have passed through Norman and subsequently gone to industry, with two being recruited by Norman. There have not yet been any direct hires of Centre PhD graduates by industry.

Mechanisms for transfer of research results to the partners. Norman has established a number of effective mechanisms for results transfer both via its demonstrators, good involvement of students with industry and via the development of successor proposals. Publication weaknesses have been discussed elsewhere.

A number of these are now close to submission that will capture some of the “softer” work of the Centre in necessarily academic style. The Centre should consider funding the capture and communication of these valuable results in a more industry friendly way.

Attempts to commercialise results that fall outside user partners' core areas. There has not yet been an occasion to test the processes for this but in discussion the point was made that any such activity was likely to be via a project parallel to and outside of Norman.

8 Gender aspects

Participation of women in centre administration, research and PhD education. Women are well represented both in the board and among the senior staff members of NORMAN. 50 % of the PhD candidates at NORMAN are women. Thus, gender representation is not a problem, which is very

commendable, in particular in view of manufacturing technology traditionally being a discipline that has tended to attract mainly male students.

9 Financial aspects

Funding from the host institution and partners. Funding from the host institution, SINTEF, is adequate. Of the 16 industries that originally joined the Centre, three have decided to leave it. This has created some concern with regard to funding from NORMAN partners as it will require recruitment of 2-4 new companies from 2011. The board has taken action to improve the situation and have made plans for or opened negotiation with several industries.

Efforts to attract new partners and securing other external funding. The Centre has been actively applying for EU projects and has been quite successful by obtaining support for two projects with participation from in total 8 other European countries. The Centre also has obtained support from national projects funded by RCN. Of particular interest is that several partner industries have obtained additional funding from RCN (BIP-projects) for further developing results from Centre research into innovations. This is a very encouraging development, showing efficient transfer of results developed by NORMAN into industrial application.

10 Future activities

Plans for continuation of centre activities when the SFI status and RCN funding expire. The director of the host department at SINTEF, NTNU faculty and partner representatives all supported that NORMAN should continue its activities after the RCN funding period. The Centre has created a network that is very valuable to SINTEF TS and thus it is thought that every effort must be made to ensure its continuation. However, no plans for how this goal could be achieved were presented.

11 Conclusion and recommendations to the centre

NORMAN is making strong efforts to reorganise its organisation in a way that would ensure a clearer project structure, a more coherent decision making process and well-defined procedures for formulating research strategies and assessing the progress of research projects. Research at the centre is progressing well, researchers are in close contact with industry and in this way and through demonstrators the results are transferred into industry for further development into innovations. The evaluators find that there is every reason to believe that NORMAN will continue to develop successfully during the remaining RCN financing period.

It is important to recognise that Norman has brought together a capable, articulate and passionate group of researchers and students that span the disciplines, have good gender balance and that include several with significant life experience. This is Norman's greatest asset.

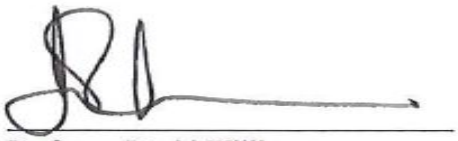
For further improvement of the NORMAN centre we recommend:

- that the centre board and management continue to vigorously pursue the reorganisation of the research programmes along the lines outlined during the evaluation
- that the centre carefully consider strategically developing niches that deliver to the industrial and other stakeholders and where it can have an internationally differentiated capability

- that the centre establish an International Scientific Advisory Board
- that NORMAN identify preferred partners each research area and take proper action to establish more committing international collaboration
- that a strategy for publishing research results be speedily developed
- that the centre undertake planning for continuation of its activity beyond the RCN financing period as soon as possible.

Trondheim, 15 October 2010

Professor Per Stenius



Professor David Williams

Professor Christer Johansson

Professor Jens Ove Riis

Statistics for Innovation – $(sfi)^2$

Host institution: Norsk Regnesentral (NR), Oslo

1 Introduction

On October 20, 2010, the evaluation team met with the Director, project leaders, students, representatives of the host institution, Norsk Regnesentral (NR), and the University of Oslo (UiO), and representatives of the industrial partners of $(sfi)^2$. In the morning, the discussions centred on the research at $(sfi)^2$. In the afternoon there was a meeting with graduate students as well as discussions on management and organisation of $(sfi)^2$. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole $(sfi)^2$ team for a well-organised meeting as well as open and informative discussions.

2 Research activities

Scope of Research Program. Both the core-research and innovation components of the $(sfi)^2$ Centre are critical areas that are worthy of support.

Recent advances in computing and data-measurement technologies have led to an explosion in the amount of data that are being collected in scientific and business organizations. Visualizing, modeling, and analyzing such large datasets present major new research challenges and have been the subjects of considerable emphasis in the research community in recent years. The core research topics of $(sfi)^2$ fit squarely within this increasingly important area.

At the same time, analyzing the data in a timely manner to extract useful information and using it effectively to make decisions are critical to the competitive success of business and industry. Again, this is the focus of many corporations around the world. In fact, there are new terms such as "business analytics" that have been coined to describe precisely these types of competence. Thus, the scope of the innovation in $(sfi)^2$ is consistent with directions in other leading countries. The Centre has chosen to focus in four areas of strategic importance to Norway: Petroleum, Finance, Marine, and Health. These choices are eminently reasonable.

Progress-to-date. The panel found the research progress to be impressive. The program is a balanced mix of core methodologies and novel use of them and other state-of-the-art methods in applications. The work on general approximation theory as an alternative to computationally intensive Bayesian MCMC methods is a very substantial contribution with a great deal of potential impact, given the extensive use of MCMC methods. The panel was pleased to note the development of the INLA software platform for implementing the methods. The work on pairwise copula construction (PCC) was motivated by a problem in risk optimization but is very theoretical in nature. While it is too early to predict the practical usefulness of the work, it is exactly this kind of long-term, and possibly risky, research that $(sfi)^2$ should be including in its portfolio. Another example that impressed the panel was the work on experimental design for graphical models. Again, this was stimulated by a practical problem in oil exploration, but

it is a beautiful research problem, one that, as far as we know, is on the cutting-edge. These are just a few examples of the interesting work.

The research team is successfully expanding its long-standing expertise in the health sciences (survival and longitudinal data analysis) to customer management in insurance. There are many other natural applications in finance and related areas (credit risk modeling, for example), and the panel encourages the centre to exploit this connection more fully.

The presentation by the Director mentioned 10 'innovation' projects that the Centre is currently involved in. These cover a broad spectrum of applications. The breadth of statistical areas covered by these applications is also impressive. A number of these projects are in their early stages, as it is to be expected at the third year. The extent of innovation and potential impact seems to vary quite a bit across projects and partners. This is of course to be expected.

One concern expressed by $(\text{sfi})^2$ staff was that, at times, it is difficult to get access to data to try and validate the ideas more generally (for example, in the case of modeling infectious disease for fish) by groups beyond the immediate partners. Part of this requires more marketing of $(\text{sfi})^2$ by the Centre itself (more on this later) and part of it involves more effort on the part of the Norwegian Research Council to facilitate such things.

We were also pleased to hear that $(\text{sfi})^2$ is terminating, as early as possible, research directions that are not promising.

Suggestions:

a) A considerable part of the core methodological work focuses on modeling, which is one of the strengths of $(\text{sfi})^2$ personnel. Nevertheless, a large part of the research that concerns large datasets deals with unstructured analysis, looking for interesting patterns and using training vs. test data to validate the findings. This area sometime goes under the name of data mining and machine learning. While the early work on the development of semi-automated and scalable algorithms was done in the computer science community, the statistics community has gotten involved extensively in recent years. It would be useful for $(\text{sfi})^2$ to develop expertise in this area and also train graduate students and offer courses as it has become an important approach to statistical inference. One way to get expertise would be to involve others in NR, UiO and NTNU, possibly from the computer science departments. Another way would be to bring in international researchers who are experts in this area. In the US, statistics departments at Stanford, Berkeley, and Carnegie Mellon (not to mention Michigan) have substantial expertise in this area.
b) Related to the above point, some of the research topics, such as FDR, causal models, and model choice, are the subject of considerable research by other statisticians and groups across the world. $(\text{sfi})^2$ should try and involve experts in the research projects rather than trying to find its own niches within these areas.

Critical size. The size of personnel involved in the centre is about right. The key scientists, including the Centre Director, are top-notch researchers with world-class reputation. Statisticians in Norway generally, and in Oslo in particular, are well known internationally for their theoretical and methodological contributions. In application areas, their major strength has been in life sciences. In terms of research in industrial and business statistics, NR has been the primary player, but its focus is short term. The panel believes that $(\text{sfi})^2$ will help to build up critical expertise in industrial and business statistics. If the current pace of development

continues, there is every reason to believe that statisticians in Norway will be major players in this area.

We discuss the participation of PhD students in the section on training.

Publications and Presentations. The annual reports show that the Centre has a very active publications record. For example, there were 27 papers and one book published or accepted in 2010. The papers have appeared in statistical journals as well as applications journals, although there are more in the latter category. We were told that partners are typically co-authors of papers in application journals and that PhD students, post-docs and other junior researchers are co-authors in about 50 % of the papers. The panel hopes that co-authorship by junior researchers increases over the life of $(sfi)^2$. We cannot comment comprehensively on the quality of the applied journals, but the journals that we recognize are in the top or next-to-top tier categories. A number of the statistics papers have also appeared in top-tier journals.

We did not find any information on presentations by $(sfi)^2$ personnel at international conferences and are unable to comment on this.

Suggestions:

> The number of papers in mainstream statistics journals could be higher. This will help the Centre get more visibility in the statistics profession. The proportion of papers in top-tier statistics journals could also be higher.

3 Internationalization

$(sfi)^2$ has a scientific advisory board (SAC) composed of top-notch statisticians. The SAC visited the centre in 2009 for a week and provided good feedback and suggestions. Three internationally known statisticians are involved in the centre research and innovation. They augment the expertise of the local personnel rather well. The centre is involved in several international projects: two on climate change and modeling; three UK consortia on doctoral training. It has also organized several international conferences.

Suggestions: This is clearly one area where $(sfi)^2$ should place more emphasis in the future. The Director mentioned that they have been focusing on building up the centre for the last three years so that they have some credibility before embarking on international co-operation on a large scale. We agree that this was a wise decision. Given the success so far, it makes sense to move more aggressively in establishing partnerships with sister organizations and key research groups overseas. In particular, they should seek more partnerships with institutions and research groups in North America.

In addition to increasing the scope of the research and developing new collaborations, the connection and network would be helpful in finding more places to send PhD students for short-term training, attracting post-docs, short-term visits by senior researchers, and generally developing more visibility for the centre and its work.

4 Researcher training, engagement in education

There are currently 15 PhD's, and we understand that six of them are funded by $(sfi)^2$. We met with 6 current PhD students, 2 post-docs, and 2 junior researchers from NR. Senior staff of

the centre is investing considerable effort to integrate the junior researchers into (sfi)^2 activities. There are, for example, weekly lunches with informal talks, in addition to regular seminars at (sfi)^2, UiO and elsewhere. From our discussions, it appears that the junior researchers are well integrated into the centre and they are getting positive experience from (sfi)^2. Most of them have given presentations at conferences and several have spent or are spending time working with other researchers in international groups. A substantial amount of continued effort directed at making young researchers use the opportunities provided by (sfi)^2 will be needed.

Suggestions: So far, (sfi)^2 seems to have had little impact on undergraduate University teaching. There are some new courses that are being offered, but these are through NR. It appears that UiO is not taking full advantage of the presence of (sfi)^2. We urge the university administrators to take advantage of this valuable resource and integrate it more fully into the educational efforts of the university. This can only help in attracting better and more students, and to make learning more interesting and useful for them.

5 Plans for final three-year period

The report provided by the Centre for mid-way evaluation articulates clearly the plans for the final three years. These include focusing on selected substantial topics: pandemics, climate change and financial risk modelling. Work in the last three years will also emphasize consolidation of research results, technology transfer, and development of infrastructure and future plans. The Centre Director provided a high-level picture of the plans. The panel is in full agreement with these plans. In particular, the panel strongly endorses the development of an international consortium, perhaps at the European Union level, on statistics for innovation. This is a very unique group with considerable potential for leading-edge research and innovation, and we hope that it continues to exist even after the eight-year period of RCN funding.

6 Organisation and Management of the Centre

Performance of the Board and Management. The panel of evaluators had a very good impression of the performance of the board and in particular of the management. The Centre Director is providing dynamic leadership. He is also actively engaged in several of the research areas. He has a deep understanding of the field as well as the possibilities and limitations of what can be done with the human and institutional resources that are available. He also seems skilful in managing people and making them enthusiastic about (sfi)^2 work. The centre management is able to integrate the different perspectives that are pursued in the centre in such a way that it appears as a coherent whole.

The Board plays an important role in shaping the projects of the centre. Some of the board members mentioned that “their” projects are their main interest and that the projects of the other board members are of only secondary importance. We hope that this perception changes and that board members have more interaction and take advantage of opportunities to further exploit the synergistic potential of the various projects. It was also suggested that the smaller commercial partners should have more weight in the discussions and decisions of the board.

Visibility and identity of the centre. As has been outlined in Section 2, (sfi)^2 is quite unique with respect to the topics it covers, the integration of both statistics research and application

and the organizational set-up. There does not seem to be an analogous statistics centre in the world.

In addition, the centre is very clear in how it is different from its host institution –more long term and research-oriented perspective as compared to a short-term and consultancy-like perspective at the host institution NR. This distinction was well understood by the staff of the centre and shared by the representatives of NR. Thus, $(sfi)^2$ has a clear identity and has its own profile that are distinct to the host institution.

However, we got the impression that the current visibility of the centre is not consistent with its research capacity, its unique organizational set-up and its very specific profile. This is partly due to the fact that the centre managements decided to focus on results before it spreads knowledge about the centre and building-up a centre brand. This clearly reflects the high and long-term ambitions of the centre management. For the next years to come, we suggest that more focus be given to the visibility and communication aspect – with respect to the research community (and possible research partners), with respect to industry (and possible commercial partners), and also with respect to public authorities that might use the results of $(sfi)^2$ in order to improve their own policies.

As scientific publications are the outstanding means to increase visibility, $(sfi)^2$ should be mentioned as the affiliation of authors. The centre management should, in close cooperation with the host institution and the (scientific) partners develop a corresponding guideline.

It was mentioned that the resources of the centre do not allow for own public relations activities. As the centre involves a number of departments from the UiO and has the potential to attract highly-qualified international (PhD) students and researchers from which the University of Oslo will certainly profit, we strongly recommend that UiO administrators provide more support in promoting $(sfi)^2$ and publicizing its activities.

Organisation and communication within the centre. The organisation of research at $(sfi)^2$ is characterized by two elements:

- Project orientation
- Division of labour between "key innovators" (being responsible for the different fields of application and bridging between academia and industry) and "key scientists" (contribute to central chapters of modern statistics and data analysis).

The panel finds that this division of labour is one of the success factors of the centre and could be used effectively at other centres within the SFI scheme.

We have been impressed by the relevance and the scope of the projects that are pursued at $(sfi)^2$. The project generation process has been described as a dynamic interaction between the partners involved in $(sfi)^2$. The high quality and relevance of the projects show that this way of interactive decision-making is an efficient way to select and prioritise project.

Communication within the centre seems to be functioning well even though the staff is not co-located in one building. In particular, the PhD students stressed that communication between them is well established – both through seminars/workshops and in more informal ways. Some of the centres within the SFI scheme have introduced "project days/weeks" offering room for an in-depth discussion of all the projects pursued at $(sfi)^2$. $(sfi)^2$management

might consider introducing similar activities as a means of further increasing interaction among people and projects.

Interaction with the host institution and university. The interaction between the host institutions and (sfi)^2 is working very well. This is in particular attributable to the clear profile of (sfi)^2 vis à vis its host institution (see above).

This is also true for Oslo University Hospital where the biomedical research group interacts with (sfi)^2. Due to dramatic technological changes, biomedical research currently faces enormous challenges. Through its interaction with (sfi)^2, Oslo University Hospital was able to develop a generic framework of statistical analysis of genomic information that might be used to meet this challenge.

From the perspective of the departments of the UiO involved in (sfi)^2, the interaction with this project is very crucial: as research funding follows thematic areas, methodological research (in mathematics and statistics) needs to be part of projects in the focused thematic areas if it wants to receive funding – a situation that tends to be difficult to realize. This means that (sfi)^2 offers unique chances to advance methodological research in the context of applications and to receive corresponding funding.

Whereas the advantages to the Mathematics and Statistics Departments at the UiO are evident, there continues to be room for an increased attention for (sfi)^2 among the UiO leadership and administration. With the UiO strategically focusing, among others, on biostatistics and bioinformatics – topics that are also addressed by (sfi)^2 , there is quite some potential to further incorporate (sfi)^2 into the research strategy of the UiO.

7 User partners and other innovation aspects

Involvement of user partners, innovation aspects The innovation partners are strongly involved in each of the four core areas of (sfi)^2 research (petroleum, finance, marine, health). Their direct participation by providing large volumes of data for statistical analysis is of substantial importance for the research projects. The large companies (Statoil, Hydro, DnBNOR, Gjensidige) have all taken strong interest in the statistical analysis resulting from the new statistical methods and models developed by (sfi)^2, with their improved predictive power when compared to current practise. In some cases validation of the predictions is well under way. Two of the SMEs have been able to directly utilise methods developed by (sfi)^2 in the development of their products. The two others see participation in (sfi)^2 as a way of gaining increasing insight into statistical methods for the benefit of development of their business. Overall, research at (sfi)^2 seems to have paved the way for introduction of innovative methods of statistical analysis to with the potential of yielding very substantial savings in costs and increased income.

Partner participation in project generation and implementation, relevance of generated knowledge. The four core areas of (sfi)^2 research have remained the same since the start-up of the Centre. The research projects often span over several of the core areas. The driving forces behind the creation of the project portfolio were both the aims for innovation formulated by the partners, and the scientific areas in which (sfi)^2 researchers felt that they have world-class expertise. Project progress has been carefully monitored and the project portfolio has been consolidated, again based both on partner interests (aims, need for validation) and scientific progress, including even risk analysis. This consolidation process has been formulated

through meetings and seminars, and the board has taken the final decisions. However, it seems that the potential for scientific progress, as judged by senior (sfi)^2 researchers, has been the major factor influencing these decisions. This process has resulted in some changes in the project portfolio, including discontinuation of projects.

Validation of the applicability of statistical models is already under way at several partners. The partners present at the meeting unanimously confirmed the relevance of (sfi)^2 research for their activities.

Potential for social ramifications over and above the partners' participation. The social ramifications of statistical models with reliable predictive power in the four core areas of (sfi)^2, for example climate change, cancer therapy, oil recovery, are obvious and do not need any elaboration.

Mutual mobility of personnel and other joint activities. There has been little mutual mobility of personnel between the partners, who mainly meet through seminars, workshops and similar activities. Some personnel from NR are associated with (sfi)^2 as students or in projects at the end of their current work but were planning to return to their work at NR.

Mechanisms for transfer of research results to the partners. Transfer of research results to partners often is an integrated part of projects, which are based on data supplied by partners and result in statistical models validated by them. Transfer of results also takes place through seminars and workshops and direct contact between PhD students and industry representatives. However, the student interviews indicated that more intense contact with partners with an interest in their project would be welcome, in particular because they felt a need for better feedback on the quality and importance of their results. While this form of interactions may be somewhat time-consuming, it is recommended that personnel at (sfi)^2 partners should pay increased attention to discussion with the students. as an important means of both transfer of results and influencing the progress of projects.

8 Gender aspects

Participation of women in centre administration and research. Whereas the share of females among the PhD students is almost 50 %, it decreases to about 27 % both among the post-doctoral researchers and the senior staff (according to the figures given in the fact sheet). These are quite good figures, especially with respect to the senior staff where the share of females usually tends to be lower. The board has one female member.

Recruitment of women for Master's and PhD education.
As the figures above show, the centre has already been quite successful in increasing the share of females in PhD education. The centre mentioned two points as the reasons:

- The share of females at NR is already considerably high (which might serve as a signal to attract more female researchers and, at the same time, increases the pool of potential female PhDs) and
- females are given priority if they have the same qualification as males. This policy is actively pursued by (sfi)^2.

We encourage (sfi)^{2}to further this path of recruiting females and to actively use their female PhD students as "ambassadors" – for example within the framework of international workshop and conferences.

9 Financial aspects

Funding of (sfi)^2 is satisfactory; in addition to the annual budget financed through the RCN grant as well as host and partner contributions, the Centre has in 2010 secured over 30 MNOK in external funding to spin-off and associated projects. The external funding comes mainly from Norwegian sources, but there are also some contributions from EU and Nordic funds. No new partners have been attached to (sfi)^2 after start-up, and there does not seem to have been any systematic efforts to find such partners.

10 Future activities

The three alternatives for action after the financing of (sfi)^2 by RCN ends were given by the Director as

- successful projects are self-funded, but (sfi)^2 stops,
- (sfi)^2 continues as part of NR/UiO with new funding,
- an international version of (sfi)^2 is founded, somewhere.

No plans for implementation of any of these alternatives were presented. It is the opinion of the evaluation team that (sfi)^2 has been very successful, creating a research portfolio in statistical methodologies of highest international scientific quality and at the same time paving the way for introduction of innovative statistical models to be commercialised or used in partner companies. It would therefore be a great waste if the competencies of (sfi)^2 were not preserved, or scattered in a way that would render them less accessible for partners and other potential users. We recommend that every effort be taken to during the remaining financing period continue and increase marketing of both the scientific and application aspects of (sfi)^2 research so that a solid ground for preservation of (sfi)^2 resources would be laid, whether at NR/UiO or as an international Centre.

11 Conclusion and recommendations to the centre

(sfi)^2 has been very successful and has dynamic leadership. The Centre is performing research in statistical methodologies of highest international scientific quality and is paving the way for the introduction of innovative statistical models to be commercialised or used in partner companies. The panel finds that (sfi)^2 functions in a commendable way, but at the same time we have some suggestions for improvement. We recommend:

- that more focus be given to the visibility and communication of the Centre, with respect to UiO, research community industry and public authorities
- that the Centre endeavour to increase the number of papers in mainstream, top-tier statistics journals
- that the affiliation of authors with (sfi)^2 be mentioned in journal publications
- that cooperation and partnerships with international institutions and groups be increased
- that the efforts to develop an international consortium on statistics for i innovation be pursued vigorously
- that (sfi)^2 partners pay increased attention to discussion and other means of communication with (sfi)^2 students

- that the Centre develop expertise and train graduate students in the areas of data mining and machine learning
- that the resources and results from $(sfi)^2$ be better utilised in undergraduate education at UiO
- that every effort be taken to during the remaining financing period continue and increase marketing of both the scientific and application aspects of$(sfi)^2$ research so that a solid ground for preservation of $(sfi)^2$ resources would be laid.

Oslo, 20 October 2010

Professor Per Stenius

Dr. Silke Stahl-Rolf

Professor Vijayan N. Nair

Professor Holger Rootzén

Structural Impact Laboratory - SIMLab

Host institution: Faculty of engineering Science and Technology, Norwegian University of Science and Technology (NTNU)

1 Introduction

On October 27, 2010, the evaluation team met with the Director, representatives of the host institution and research partners, project leaders, students and corporate partners of SIMLab. In the morning discussions centred on the research at SIMLab. In the afternoon there was a meeting with graduate students as well as discussions on management and organisation of the Centre. This evaluation is based on these meetings as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole SIMLab team for a well-organised meeting as well as open and informative discussions.

2 Research activities

The centre is organized in five groups with dedicated separate research goals. Two major methodological aspects join the groups: material investigation and modelling and solution strategy. In all cases (fairly) high-speed dynamics are in the foreground. This enables the so-called explicit solution strategies to be followed. Thus the common simulation instruments are explicit FE programs into which the researchers are also implementing their developed models. The structures are then specimen chosen for the specific goals of each group.

The originally proposed and planned demonstrator investigations have been proven to be possible for some industrial partners. However, the automotive industry prefers to perform such investigations internally in the own company. This has changed the proposal concerning demonstrator towards – globally said – dedicated preparation of applications in industry such as direct generation of input data/files for the different programs used in the industry. This can be the direct input of material data generated by experiments and validation by simple simulations or dedicated hints for applications/variations of concerning material modelling in structures. Centre management and scientists are currently developing appropriate ways to achieve the original goals in the demonstrator task by other means, which looked very reasonable to the reviewers.

The *competence profile* is well represented by the actors. The dominant material section with three (sub)divisions has three main persons (Hopperstad/Clausen/Lademo) plus T. Borvik specialized for defence applications. The connectors/joints group (Hanssen) through using the materials is focussing on their specifics concerning mainly pointwise connections. The tasks are well separated but have shown very good overlap in that the groups have common competences but also show their specific competences in the research field. The director M. Langseth takes the role of a generalist by interacting in a very close manner with all groups down to a very detailed level. The complete competence profile - single persons as well as a group - shows up in clear and very good manner in the publications and in the comments of the partners to the SIMLab operations up to now.

The five groups have strong activities in their program areas and have well assigned PhD-students such that they clearly *have a good size*. However by the ideas, new tasks and activities generated in the first three years the enhancement of the personnel by three more faculty persons – as promised by the university heads - will allow to distribute the load generated by the success to more shoulders.

Concerning *the research program* in all five designated fields research activities are of high interest for science and industry. The investigations contain basic research on materials, including testing and simulations on micro-level. They also fulfil the requirements of industry to provide models, which can be implemented in standard programs and are applied in practical problems. Overall it can be stated that the models take the current level of research very well into account and develop enhancements /improvements based on experiments with the materials with special interest for the partners. A strong focus is on validation, which is of dominant interest in direct subsequent applications. A very good example is the full through process simulation with subsequent loading to find out the necessity of such investigations for industrial purposes.

The operations of the centre concerning *scientific publications* are impressive. The publications – 91 in refereed journals - cover a wide range of aspects from material testing, material processing, material modelling of various levels and applications as well as structural aspects, such as in the connection/joining program or the energy absorption and protection program. The contributions address science in material mechanics and solid mechanics, including computational mechanics, as well as practical engineering. Concerning *recognized international conferences* the focus of the participation was apparently in the last three years preferentially on conferences with more application oriented topics and participants with clear practical as well as on specialized well-recognized conferences (Polymers, high speed loading – impact dynamics). This goes fully along with the goals of the centre to gain interest and public appearance for industry. However, it is expected that the focus may shift back to more general theoretical/computational mechanics conferences as well.

Concerning the *research profile and international visibility* the achievements are obvious. The large number of refereed publications, the appearance in conferences, the actions of the centre with industry, the presentation of a good website as well as personal actions – in particular of the Centre Director as e.g. editor of an international journal - regarding the representation and personal involvement in contacts have really given the centre a great visibility. This is reflected by keynote invitations, by assigning co-editorship of international journals to two further members in the SIMLab and also an honorary doctorate in France (University of Valenciennes) for M. Langseth.

The high number of well-cited publications in international journals also indicates the international standing of the group. Thus two members of the core team have an H-index above 20.

In addition the *own conference in 2008 in Trondheim* on “Impact Loading on Lightweight Structures” with a broad international attendance has certainly enhanced and strengthened the international visibility of the SIMLab. Further the interest of others in the institution is reflected by the marked increase in the number of international guests. In particular, the activity with the high level industrial partners (Renault, AUDI, BMW, Hydro Aluminium) and the success in projects has driven further interest in industry.

The research profile with the five dedicated programs is very distinct and unique – from the point of the reviewers worldwide. The centre personnel were also able to fill the profile with high level scientific and industrial contents as proposed and, in particular, the programs appear also to bear long-term ideas and to create the basis for practical innovations.

Finally, the close cooperation of the Centre with SINTEF allows SIMLab to fulfil also the desire of the industrial partners concerning the direct transport of scientific results into FE programs and helps in industrial applications due to experienced and highly qualified SINTEF personnel.

3 Internationalisation

The centre has established a Scientific Advisory Board, which contains a number of the strongest researchers internationally in the area. They have annual meetings with this group, where they get discussions and advice on the highest level. Furthermore, one of these strong researchers, Benallal, has spent extensive research visits in Trondheim, and has published articles together with some of the centre participants.

It was stated during the presentations that the centre has created much international interest. Thus, several researchers have come on shorter visits to see the laboratories, and to hear about the results obtained.

Several of the Ph.D. students come from foreign countries, including France, Denmark, Malaysia, Vietnam, Germany and Russia. This adds to the international atmosphere. In addition, some of the Ph.D. students have spent part of their time abroad, at Karlsruhe University, at Audi, at LMT-Cachan in France, or at Renault. This results in publications joint with these international participants in the project.

Also, there are currently two postdocs employed in the centre, both coming from abroad, from France and Syria. They have been employed because they have expertise from previous Ph.D. studies, which will be of significant value in relation to the collaboration with external partners.

The report from the centre includes a list of publications for 2010, where the names of the co-authors show a number of examples of international collaboration. This includes both University faculty and employees of external partners.

4 Researcher training, engagement in education

Researcher training is performed on Master's and PhD levels in various ways. The first is by courses within the NTNU's diploma programs, which provide the necessary background concerning mathematics, mechanics and computational issues. In addition there are three more specific courses on the Master's level for the specific thematic of the Centre: "Nonlinear FE analysis for large deformation problems", "Impact Dynamics and Energy Absorption" and a new one in "Mechanics of Materials". On the Master's level this is accompanied by recruiting many students for a master thesis on the centre – the number of 59 is a clear indication that the centre faculty members are very much engaged in education and training. In the PhD program the topic "Theory of Plasticity" is taught on a high level accompanied by internal seminars of the PhD students and lectures of visiting scientists and experts.

According to their own statements, a well-organized supervision of each student – also controlled by the Centre management – is giving the PhD students a good backing, support and perspective for their work.

The involvement of the PhD students in active research is also reflected in their contributions and co-authorship in publications and conference contributions. We also note that the close cooperation with SINTEF leads to a very beneficial involvement of the SINTEF personnel in the support and training of the PhD and Master's students.

From an overall perspective the researcher training and education involvement of the SIMLab personnel appears to be really well functioning and attractive.

The future goals of the centre to train practical engineers on site at the partners institutions on the applications in simulation concerning the own enhancements and developments will certainly a good next step for a nearly complete image concerning education and training.

5 Plans for final three-year period

There is no change of the Centre Objective or of the research areas for the final three years. Thus, the research will still be focused on advances within the research areas *Materials, Solution Techniques, Structures* coupled with *Demonstrator activity*. It is stated that also the user partners are satisfied with the defined research programmes, which link the basic research areas and thus form the basis for the annual work plans.

In *Fracture and Crack Propagation* three research tasks are planned for the last three years: Ductile fracture in rolled, extruded and cast aluminium alloys, uncoupled/coupled damage models and fracture criteria will be investigated. For crack propagation three approaches will be considered, FEM with element erosion, FEM with node splitting, and X-FEM.

In *Optimal Energy Absorption and Protection* four research tasks are planned: Blast loading using FEM;. New numerical techniques for lightweight protective structures; Impact loading of high-strength steel components in crash simulations; Impact against pipelines, incl. sub-sea pipelines in fishing areas.

For *Polymers* three research tasks are planned for the last three years; Damage and fracture. Thermo-mechanical coupling; Viscoelasticity and brittle polymers.

Within *Multiscale Modelling of Metallic Materials* seven research tasks are planned: They relate to crystal plasticity FEM and to through process modelling.

Regarding *Demonstrators*: The SIMLab models and associated support tools will be run in order to facilitate their industrial implementation.

It is the impression of the evaluating committee that this is a reasonable plan that will keep up the high level of the work performed until now in the centre.

6 Organisation and Management of the Centre

Visibility and identity. The Centre management has very well promoted the visibility and identity of SIMLab. Researchers, industrial partners and PhD students seemed to identify well with the Centre. The website of the SIMLab appears as a part of the NTNU webpage. Its contents give adequate background information about the needs and goals for the research, about the structure, results and contacts.

As discussed above, in view of the few years of activity of the Centre, SIMLab has also achieved excellent international visibility. The evaluators conclude that the identity and visibility of SIMLab has been well communicated at all levels.

Board and Management. SIMLab is hosted by the Department of Structural Engineering at NTNU with the Department of Materials Technology, NTNU and SINTEF Materials and Chemistry as research partners. There are seven user partners. All research and user partners are represented on the Board, which is the main governance body, The Board meets once a year and makes decisions about strategic targets, work plans, budgets, new memberships and other critical issues. Because all partners are very well embedded in daily program work it has not been deemed necessary for the Board to meet more often than annually. A core team of scientists and the heads of the research programs assist the Centre Director, who is of remarkable scientific and professional management quality. Furthermore a scientific advisory board of international experts provides scientific and strategic support to the Centre. The Department Head of the host institution acts as chairman of the Board, which maybe is a point that could be optimized by appointing someone representing one of the user partners.

Communication within the centre. The Director meets weekly with programme heads and core team members in order to coordinate activities and follow up on the progress of projects. There are also specific project meetings, supplemented by telephone conferences with international partners. Centre seminars at which Centre scientists, including PhD students present research topics, are held every other week.

Further, an annual seminar involving all partners and the Scientific Advisory Board is arranged. These seminars, very commendably, have been hosted by one of the partner companies and have been located outside Norway (Munich, Paris, Neckarsulm).

New project ideas which may come up from both scientific and industrial partners must be fit to a set of success criteria, concerning innovation, scientific and organisation issues. The core team confirms that the idea fits to selection criteria and the Board finally approves the realisation of the project. Project reviews are regularly performed in the core team.

Participation of researchers. Presently 9 scientists are affiliated to SINTEF, 23 to NTNU and 3 to other collaborating scientific institutions. The average fulltime equivalent in the group of scientists spending more than 10 % of their time on work with SIMLab is ≈ 30 %. The Director of the centre is engaged 90 % of his working time, assisted by a coordinator and administrative staff at NTNU. The scientists present at the evaluation meeting showed strong commitment to SIMLab.

7 User partners and other innovation aspects

Partner involvement, innovations. All 5 programs in the centre show *direct industry relations* – also valid for the Norwegian defence estates agency (NDEA) and the Norwegian public roads administration – which do not only satisfy current but also long term needs. The current actions following the original proposal appear to have even heightened the interest of the partners for further subjects, either by going more into detail (e.g. polymer materials) or by increasing the number of tasks – as stated e.g. directly in the audit by the NDEA.

SIMLab partners participate by direct research or by providing researchers, part-time work of students at the companies, supervisors and/or funding of PhD students in the programmes. These have been the main ways of partner involvement in research activities so far. The strategy of the Centre is to transfer results from the programs to innovation by the partners by way of demonstrators that will be developed in close cooperation with them. This work has now started and will be an important activity during the final three years of SIMLab work. In all, we find that many Centre partners are strongly involved in SIMLab research in a way that is well planned for transfer of results that can be implemented in innovations by the partners.

Partner's participation in project generation and implementation. Partners take an active part in initiation of projects and formulation of the annual work plans and follow up on project progress through workshops, personal discussions with the director and project leaders and meetings with the Board, on which all partners are represented. Apart from the Board decisions this is an informal way of working that is obviously efficient but also somewhat sensitive in that it is highly dependent on personal contacts.

Potential for social ramifications over and above the partners' participation. Environmental impact, safety and structural reliability are issues of great concern in society. These concerns are often the driving forces for innovations by partners that may result from Centre research.

Mutual mobility of personnel and other joint activities. Three of the partners have engaged PhD candidates that spend about 50% of their time in the Centre and 50% at the industrial partner. A scientist from NDEA is working permanently at the Centre and Hydro Aluminium is financing three Professors II at NTNU who are active in the Centre. Discussion with the students also showed that not only those who have actually spent time working at partner companies have close contacts with industry or at least are well aware of industrial interest in their work.

Mechanisms for transfer of research results to the partners. Direct involvement of partners in research projects and mobility of researchers are clearly very effective ways of transferring research results directly to those in the industries with the most immediate interest in them. These are mechanisms that appear to function unusually well in SIMLab. Other ways of transmitting results are the customary ones: through scientific papers, seminars, and condensed project reports. Some concern was voiced during the evaluation meeting with regard to the difficulty to implement the methods developed by the Centre in industry, due to lack of understanding of how they should be used. This is something that will become a matter of increasing concern when more work is focused on the development of demonstrators. The problem could be alleviated for example by giving seminars and short courses specifically designed for individual partners.

8 Gender aspects

Participation of women in centre administration and research. The Centre Board is wholly male. However, the management team has one female member. Only one of the 18 senior staff members listed as spending more than 10 % of their time working in the Centre is female. Of the five persons in the administrative and technical staff, three are female. This is far from target at NTNU, which is 30 % women at all levels. The evaluators recognize the difficulties with recruiting female staff at the senior researcher level in the core technical research area of the Centre. We note that the Centre is clearly aware that this situation needs to be improved.

Recruitment of women for Master's and PhD education. All MSc students that have done their Masters projects in 2010 so far are male. Four of the 16 PhD students are female. Thus there is a need to increase the number of female students. We note that NTNU and SIMLab are strongly endeavouring to alleviate the situation.

9 Financial aspects

The budget of SIMLab is about 28 MNOK per year for the residual time. This is close to the target planned in the application of 2007. The financial contribution of RCN will be about 38 % of the total budget. The scientific partners will contribute some 23 % and the industrial partners 39 %.

In connection with the recent financial crisis two member companies withdrew from the Centre in 2009. On the other hand, SIMLAB was able to engage three new partners from 2008 and three more will be added in 2011. Thus, presently, industrial funding does not seem to be a pressing problem, although the Centre SWOT analysis lists business changes and loss of partners as threats.

The SIMLab deploys NTNU´s system for economic, legal and administrational issues. Administrative staff at SINTEF and NTNU supports the Director of the Centre in terms of meetings and economy management.

10 Future activities

Very commendably, SIMLab has already formulated a wind-up strategy and plan for the measures to be taken due to the fact that current financing from RCN will come to an end in 2014. This plan gives a list of measures to be taken if SIMLab is discontinued after 2014, but the main strategy is to find ways to carry on the activity in one way or another. This also received strong support from the industries present at the evaluation. Participation in EU programmes and projects funded jointly by industries are thought to offer the best possibilities. In view of the high quality of the research at SIMLab and the considerable potential for implementation of the research results in industrial innovations the evaluation team can only recommend that the Centre vigorously continue their efforts to ensure continuation after 2014.

11 Conclusion and recommendations to the centre

SIMLab is characterized by excellent research conducted under dynamic leadership by a group of students and senior scientists that seem to cooperate well both internally and with user partners, from which they receive strong support. The evaluation team encourages the Centre to continue its work along the lines presented in the written report and during the presentation. We recommend:

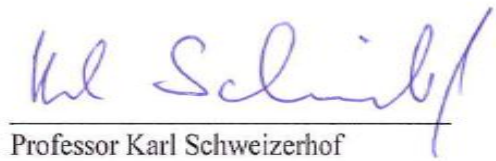
- that the transfer of results for application in partner industries be enhanced by arranging courses specifically designed for individual partners
- that the Centre vigorously continue its efforts to ensure continuation after 2014
- that strong efforts be pursued to engage more women as senior researchers and students in SIMLab activities
- that the Centre pay some attention to the fact that the present rather informal way of management is effective, but highly dependent on personal contacts

Trondheim, 27 October 2010

Professor Per Stenius

Dr. Erich Fercher

Professor Viggo Tvergaard



Professor Karl Schweizerhof

The Michelsen Centre for Industrial Measurement Science and Technology - MIMT

Host institution: Christian Michelsen Research AS (CMR), Bergen

1 Introduction

On October 12, 2010, the evaluation team met with the director of MIMT, representatives of the host institutions Christian Michelsen Research (CMR) and University of Bergen (UiB), project leaders, students and industry representatives at MIMT. In the morning the discussions centred on the research at MIMT, including a short tour of some laboratories. In the afternoon there was a meeting with graduate students as well as discussions on management and organisation of MIMT. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the MIMT team for a well-organised meeting as well as open and informative discussions.

2 Research activities

Competence profile, critical size and research program. MIMT demonstrated an impressive competence profile in the historical core areas of the partners: Acoustics, Electromagnetics and Tomography.

The initial research programme was focused on one key project per industrial partner. This has been very successful in initiating the Centre, and also very good in terms of building commitment from the industrial partners. However, this approach is limiting in terms of building long-term scientific excellence. MIMT has identified this limitation and the need for extending core competence as part of the centre-building activities.

MIMT has enough staff, funding and projects to achieve critical mass, but linking needs to be stronger at the technical level.

Long-term industrial research in the field outlined in the project description. Long-term industrial research is at the very early stage. The mechanism of project selection has engaged the consortia of industrial partners successfully, through discussion of generic industrial needs and consensus of priorities. The drive to introduce optics and nanotechnology is ambitious, and if successful will establish new core competence that is specific to MIMT. The challenge is to grow this competence without losing the industrial commitment.

Scientific publications and papers at recognised international conferences. MIMT is to be commended for its enthusiasm to publish its results, both in peer-reviewed international journals and at key national and international conferences. However, many publications have been in pre-existing competence areas. The newer research, during the last three years, and in particular that of the PhD students should also be published with the same vigour.
The industrial partners view some of the conference papers in particular targeted conferences as significant promotion of the research.

Research profile and international visibility. The research profile of MIMT is known principally through the component core competency reputation of the research partners. Every opportunity should be taken to bring the MIMT name to the fore in the international arena. There is clear opportunity to promote the MIMT name through successful consolidation of the new competency areas, which should strive for internationally acknowledged excellence.

3 Internationalisation

MIMT are strongly encouraged to build further on their initial progress in the development of international research cooperation by developing a coherent plan for further international collaboration and creating an International Scientific Advisory board that would evaluate and give advice on the scientific content of the research programme on a regular basis

MIMT are to be commended for their uptake of students and staff from international backgrounds.

4 Researcher training, engagement in education

Researcher training. MIMT are commended for the high quality of the PhD students. They had a clear understanding of the fundamental remit of MIMT, and of the value of their research from both the academic and industrial application viewpoints.

However, the students are rather dispersed geographically and it would be helpful if there were a stronger team-centred ethos amongst them. Plans to encourage more centralisation of their experience would be appropriate.

Some students seemed to have limited interaction with the industry partners, where they simply met biannually at workshops or infrequently at progress meetings. In this respect a significant opportunity is being missed, where the students could play a much more significant role as technical mediators between the industrial and research partners. For example, the students should visit the industries that take an interest in their research to present their results and industry should present their interests to students by visits at the laboratories of MIMT. Such measures would enhance transfer of results, give the students feedback on the industrial relevance of their research and also enhance the students' profile in terms of their acquisition of industrial experience and subsequent employability.

The initiation of the researcher only "mingling" event was popular with the students, but has only occurred once. In all, there seemed to be surprisingly little interactions between the PhD students as a group.

The students seemed not to have received focussed and planned training to support them in projects that are frequently interdisciplinary. However, supervision has been applied effectively to ensure a balanced understanding of their projects.

The use of one-year MSc projects as initiators of research is to be encouraged.

5 Plans for final three-year period

The review team supports the objectives for the final three years. Specifically, the move to focus more on precompetitive research involving multiple partners is seen as sensible evolution from the applications-driven initial project portfolio.

The specific project titles fall well into the specified thematic areas, and will augment their establishment in the longer term. The move to introduce associated partners is to be encouraged. However, it was not clear from the work plan how this additional membership will impact upon the overall programme budget.

6 Organisation and Management of the Centre

Visibility and identity of the centre. The Centre remains committed to its original vision and has used this, supported by the SFI mechanism, to draw together CMR, UiB and the industrial partners into a coherent whole with a shared strategy. Centre identity builds upon significant track record from CMR and UiB, the SFI mechanism allowing this to be applied to industrial collaborators needs for fundamental upstream research that complements and precedes their own more product led activity. Industry partners strongly endorsed the mission and activity of the centre.

Performance of the Board and Management. The review identified that the Board were used to working together and had a shared view of both direction and successful ways of working. The Board and all its stakeholders had taken a clear decision to migrate from early strongly single partner industrially driven projects to projects with multiple partners and to concentrate on future capability development. Management processes appeared effective. A change of leadership was noted following the movement of the first manager to industry.

There are however some issues within the management of the Centre. Stronger and more effective project management with an industrial and deliverable driven style should be applied. It can be difficult to distinguish between the broader activities of CMR and the Centre. This is perhaps not assisted by the role of Centre chair being held from CMR, and appointment of a Chairman of the Board from industry is an option that should be considered by the Centre. Resource committed to projects both in terms of financial and people resource from all collaborating partners was not as clear as it could be.

Organisation and communication within the Centre. The Centre works well as a unit at its highest level. Probing deeper into the organisation suggests that communication at a researcher level could be improved both between individual academic researchers and between academic researchers and industry peers.

The centre has clearly formed a broad community of stakeholders and others via workshops and a General Assembly. There are opportunities to build on this valued activity particularly by increasing the number of interactions between businesses.

Interaction with the host institution and university. There is a tradition of interaction between CMR and UiB that continues and has grown with the Centre.

Participation of researchers from the host institution and university in the centre's research. The university contributes to the work of the Centre in a number of ways. There are a

significant number of university funded studentships associated with the Centre and several senior and junior faculty are involved, a number of the latter including new appointments. CMR contributes Centre and project management and to some practical components of the work.

Influence on research activities of host institution and university. The Centre has increased both the volume and rate of growth of work in CMR and the University. It has also increased the scope of the work by addressing the generation of new technological capabilities within the partnership for example in the nanotechnology and optics areas. The Centre has contributed to the formation of the Bergen School of Measurement.

7 User partners and other innovation aspects

Involvement of user partners. User partners are well engaged in the centre. An additional user partner, Hydro Oil & Energy (later due to merger replaced by Statoil), joined the consortium as a significant financial sponsor during the first year of operation. Restrictions within the collaboration agreement may make it difficult for further users to join the Centre. Other users are involved in related projects both within CMR and the University. The industrial partners have particularly valued the focus on fundamental and high-risk work with the potential for radical technology change. The value of the SFI funding mechanism in enabling this was particularly endorsed.

Partners have clearly participated in individual project generation, both in the first round of single partner projects and in the change of focus that led to the second round of projects with multiple partners. Participation in project implementation by other means than efforts directly applied by postdoctoral researchers and PhD students was less clear.

Social ramifications over and above the partners' participation. The Centre contributes to the Bergen region and its Sub-Sea cluster by its work with local businesses and with multinational companies. This will support the retention of jobs locally.

Mutual mobility of personnel and other joint activities. The Centre identifies that this is an important issue that remains to be addressed.

Mechanisms for transfer of research results to the partners. These are not yet clear and must be considered with mutual mobility above. The bulk of the actual work is carried out by students who in many cases have a relatively small interaction with their industrial customers. During discussions the point was made by the Centre team that user engagement was critical in the planning stage of projects to ensure subsequent uptake and that this was an explicit part of the planning of the second round projects.

Attempts to commercialise results that fall outside user partners' core areas. According to the documents supplied to the evaluators appropriate mechanisms are in place for this. They have not yet been tested.

8 Gender aspects

The number of women involved in MIMT is quite low, clearly as a consequence of the traditionally low fraction of women engaged in the disciplines related to the MIMT areas of

research. Both the University of Bergen and CMR have set goals to increase the percentage of women in their staff and the number of female students.

9 Financial aspects

The contribution to SFI funding from the RCN is appropriately matched by cash and in kind contributions from CMR and UiB, a cash contribution from Statoil and in kind contributions from all other partners.

A substantial number of PhD students engaged in MIMT projects are not financed through MIMT. The annual report states that in 2009 290 MNOK projects applications facilitated and supported by MIMT were granted. However, neither the accounting of costs in 2009 or the budget for 2010 make any mention of these funds, which makes it difficult to assess the actual volume of research and other activities within MIMT. We recommend that budgeting and accounting in the future reflect the total involvement of host partners MIMT projects in a comprehensive way.

The work plan for 2010 states that efforts will be made to attract new partners and associate partners in MIMT. However, response to questions during the evaluation indicated that not much has actually been undertaken in this respect. In view of the on-going extension to a larger number of more generic centre-building activities it will be very important to pay more attention to attracting new partners that would actively participate in the new projects.

10 Future activities

The Centre has formulated a strategy for the second period of funding. Continuing the MIMT activities after the present funding period was seen as very important, but so far direct measures to ensure this have not been taken. The evaluators recommend that the Centre pay attention to this issue as soon as possible. In particular, attracting new partners is likely to be of vital importance for the continuation of centre activities beyond the present funding period.

11 Conclusion and recommendations to the centre

MIMT builds on the strong and well-renowned research in measurement science and technology at CMR and UiB and initially set up a research program with projects that were strongly application-oriented and engaged industries with long-standing relationships with the host institutions. During its third year the Centre research program was re-organised to reflect the main research areas with reference groups for each area and a stronger emphasis on generic research projects. In all, MIMT has become a well-organised Centre with great potential to produce results that give rise to industrial innovations.

On the other hand, we found that in several aspects there is room for improvement and we recommend the following:

- that MIMT endeavour to improve its identity as a research unit by developing a distinct internationally recognized scientific and technological knowledge basis of its own, over and above that of the host institutions, that will ensure long-term industrial support and interest

- that care be taken that the new more generic projects do not result in a weakening of the mechanism of working as network between industries, institute and academia, which is a key factor in the success of MIMT
- that MIMT create an International Scientific Advisory board
- that the contacts between students and industry be substantially improved, for example by extended visits to industries and regular contacts with researchers in industry for personal discussions on the progress and importance to industrial needs of their work.
- that measures be taken to create closer contacts between the PhD students
- that MIMT endeavour to increase networking between partner industries, as this will be an important requisite for long-term support to the Centre
- that communication of research to the scientific community be pursued more actively, in particular that research done by the PhD students be published more vigorously
- that the number of industrial partners be increased and in order to facilitate this more flexible ways of contributing in cash and in kind be developed
- that all contributions in cash and in kind by the host institution to MIMT-related research that are not funded directly through the MIMT budget be reported in a transparent and comprehensive way.

Bergen, 12 October 2010

Professor Per Stenius

Professor David Williams

Professor Peter Fielden
(sign.)

Dr. Andrew Hunt
(sign.)

The Multiphase Flow Assurance Innovation Centre - FACE

Host institution: Institute for Energy Technology (IFE), Kjeller

1 Introduction

On October 21, 2010, the evaluation team met with the centre manager, board and reference group members, representatives of the host institution, research partners, enterprise partners, and master/PhD students at FACE. In the morning the discussions centred on the research at FACE. In the afternoon there was a meeting with master and PhD students as well as discussions on management and organisation of FACE. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole FACE team for a well organised meeting as well as open and informative discussions.

2 Research activities

The research activities address some of the most important and fundamental problems facing the oil and many other industries and are entirely appropriate given the original intent of the centre. It must also be recognized that the problems in this general area are very large and research activity on them has been going on for decades worldwide. One would have expected the demonstration of a clearer awareness of this state of affairs in the written report of the centre. This shortcoming has been remedied in the course of the presentations during the meeting with the review panel. The project leaders showed themselves well aware of the current state of the art. On the basis of the available evidence the panel was favorably impressed by the competence of the centre's members and of the PhD students and post-docs. This impression is generally shared by the industrial partners. Furthermore, some of the centre's members certainly have an international profile.

The original research plan for the centre was probably overly ambitious given the available resources and the magnitude of the problems. This plan has been made more realistic and focuses now on three important areas: suspensions, transport and separation. Although more limited than the original, these three areas are still large and will require a prioritization of the activities which should insure a critical size for the projects. A good start has been made by the development of cost-time resource sheets for the period 2010-2012. The advantages of the new research structure is that it is now topic-oriented, rather than skills-based leading to a better integration of the activities of the participating institutions.

Beyond the specific impact of the centre's research on the chosen areas, it is important for Norway to maintain and enhance her competence in this area in which the country already has a significant commercial presence, e.g. with the OLGA code. In this sense, the centre has therefore an important role to play in the long-term industrial activities of the country.

The usefulness of the centre in combining an industrial participation with an educational component is apparent by the access that the doctoral students have to major industrial facilities well beyond the scale of a university department.

The panel was not overly impressed by the scientific output of the centre to date. The panel was however heartened by the fact that the new management of the centre shares this view and has taken measures to rectify the situation. The paucity of results to date seems to be due to the slow beginning of the recruitment of doctoral and master's students and to the difficult situation created by the disagreements among the members of both the Reference Group and the Board which resulted in a significant delay in start of research projects. The panel has been told that about 15-20 papers will be produced in the coming year. If this is achieved the centre's output will have attained an appropriate level. A good sign of a positive change in this regard are 4 papers submitted in the summer of 2010 at an important international conference and several reprints or preprints made available to the panel.

Among the major achievements of the centre to date is the development of reference fluids, which mimic the properties of crude oil, and for which a patent application has been filed. The availability of such fluids can have a large world-wide impact on oil processing research and indeed has already elicited considerable industrial interest.

3 Internationalisation

Currently the centre supports 3 PhD students abroad (The Netherlands, the UK, and the USA) and one post-doctoral fellow in France. The motivation is to promote more quickly the development of specific research results by utilizing expertise existing elsewhere and, in the process, to enhance the centre's own competence. While the panel recognizes these positive aspects, it cannot fail to wonder whether this is the most effective use of research funds as the expertise developed in this way remains largely outside Norway. It might be more fruitful to use resources to permit a short- to medium-term stay of the centre's members and doctoral students at established research laboratories and groups abroad. In this manner the two-way collaboration between Norwegian and foreign groups would be more efficiently enhanced. The team of evaluators acknowledges that this might be difficult with respect to the tight budget. Nevertheless, we are encouraging the centre management to explore ways of how the presence of these persons in Norway can be increased.

In spite of our reservations about support for PhD students abroad, the policy is a clear manifestation of the centre's good international contacts. The centre is in active contact with many of the leading international researchers in this area, and the project leaders are abreast of international developments.

The centre's personnel includes a large number of foreign-born researchers, both at the level of doctoral students and post-doctoral fellows and that of senior members. This openness is very positive and has benefitted the centre by permitting the acquisition of talented participants. It would be positive for Norway if these researchers can be encouraged to remain in the country.

4 Researcher training, engagement in education

The educational component of the centre's activity, together with some of the more basic research, has been united in the FACE Academy located at NTNU. The Academy has provided some short courses and additional ones are planned. This is a useful activity not only for the

students, but potentially for senior researchers as well. Furthermore, NTNU offers courses to the doctoral students.

Another excellent activity of the centre are bi-annual status meetings with about 50 participants, which include not only the actual members of the centre, but also other personnel of the industrial partners. These are precious opportunities to establish personal contacts, promote the circulation of ideas and foster responsibility and effective communication.

The panel was very favorably impressed by the perceived quality of the doctoral students who seemed bright and engaged not only in their work, but also in the centre itself. In particular, several of them remarked on the possibility opened up by the centre to use industrial facilities which would have otherwise been precluded to them.

A missed opportunity for the centre has been an inadequate attention paid to the recruitment of doctoral and master's students in the early years of activity. So far only one PhD student has defended her dissertation and a second one will be defended in December. As of now, there are 4 doctoral students supported by the centre in Norway and 3 abroad. There was only 1 master's student who carried out a summer project. Plans are to hire 5 more doctoral students before the end of the centre's life. The scarcity of students has been alleviated by the hiring of 2-3 post-doctoral fellows. The centre should be more aggressive in recruiting students by placing ads in appropriate publications and web resources and exploiting personal contacts with researchers both in Norway and abroad. Especially from an industrial perspective it would be particularly useful to attract master's students who are more numerous and constitute an attractive potential talent pool for industry.

5 Plans for final three-year period

Of the three topics mentioned before, namely suspensions, separation and transport, only the last two will be continued past 2012 as a result of the participants' prioritization. The last period of the centre's activity will therefore focus on two topics, separation and transport. The plan appears to be useful and feasible, also in consideration of the research progress to date. The panel is confident that some good work will be produced in this final period, especially as many of the management issues which have hampered the centre's productivity in the early period seem to have been overcome. An important feature of the centre's plans for the final period of activity is that the knowledge acquired will be applied to industrial needs.

6 Organisation and Management of the Centre

Visibility and identity of the centre. During the first years of its operation, the centre mainly struggled with the definition of a joint work plan. Thus, only limited attention was given to questions of visibility.

The evaluation board, however, is convinced that now a good foundation has been laid on the basis of which communication activities of the centre can be further expanded:

First of all it is very encouraging that the centre has been able to define its aims and ambitions and – by doing so – is discernible from the host and partner institutions: whereas the host and the research partners rather focus on contract research for industry, FACE has a more long-term perspective. It aims at building a knowledge base that can (and probably will) be exploited by its company partners in the years to come.

We strongly encourage the centre management to communicate this profile to the general public and in particular to the target groups of the centre – i.e. the potential new partners of the centre. We have been assured that the host institution and the other research partners have PR resources available that can be used for communication activities of the centre as well. Therefore we recommend developing a communication plan (target groups, instruments, aims) as soon as possible and implementing it from 2011 onwards.

In addition, we recommend to better use publications as a means of communicating excellence. Therefore, the centre management might not only push efforts to produce more publications but also to increase the visibility of the centre in the publications. One way of doing so is not only to mention FACE in the acknowledgements but also in the affiliation (together with the name of the partner institution).

Performance of the Board and Management. The first years of operation of the centre have been characterized by challenges especially with respect to the formulation of a coherent work programme. This has mainly been due to the fact that the decision procedures have been rather complex and involved an enormous number of partners. As a result, FACE was operational later than most of the other centres, the centre management changed three times and the chairperson of the reference group was exchanged as well.

The group of evaluators has a very positive impression of both the new personnel (centre management, chairpersons of board and reference group) and the organisational changes that have already been approved by the organisational bodies or are in the process of being discussed. In particular, we think that the suggested procedure of how projects and sub-projects are identified, prioritized and agreed upon will greatly facilitate the work of FACE in the coming years. It will greatly facilitate the work of the centre if the board approves these new procedures.

Organisation and communication within the centre. The centre also differs from other centres with respect to its organisational set-up as it is rather "virtual" and does not co-locate at the same place (see also section 7). Some of the PhDs and Post Docs are permanently located outside Norway (France, Britain). Given this background, particular attention should be paid to communication and interaction within the centre. Especially from our session with the PhD students we got the impression that communication and interaction is well functioning. One reason for this is that from the beginning of the centre there have been horizontal work packages ("Making FACE a centre", "FACE Academy") that were aiming at enhancing communication and cooperation between projects and locations.

Interaction with the host institution and university. Participation of researchers from the host institution and university in the centre's research. Influence on research activities of host institution and university. The team of evaluators is very positive about the current degree of interaction with the host institution and university. The key researchers of the centre all have an affiliation either with the host institution, a research institution or an university. Thus, there is strong participation of researchers from the host institutions and university in the centre's research. In particular the researchers affiliated with the research institutions (IFE, SINTEF) expressed that they received new impulses for their work that, at the "home" institutions, usually is more application oriented. Thus, the participation in FACE contributes to a further extension of the knowledge base of these institutions.

7 User partners and other innovation aspects

Involvement of user partners and other innovation aspects. The partner landscape of the FACE currently consists of three scientific (SINTEF, IFE, NTNU) and seven industry partners (Statoil,

Shell, ConocoPhillips, CD-adapco, FMC Technologies, SPT Group and GE Oil&Gas). ConocoPhillips will leave by the end of 2010.

All partners are active in the centre´s bodies "Board" and the "Reference Group", as well as in research projects. Both centre bodies are chaired by representatives of the industrial partners. Furthermore, the centre has a strong project related affiliation to 6 additional international scientific institutions, which supports the centres academic network.

How partners participate in project generation and implementation and whether a knowledge basis relevant for the partners is created. The project related involvement of the partners follows the rules of a virtual centre, so that the scientific work is generated at the location of the scientific partner as well as at those of the industrial partners. Some scientific work is performed at the affiliated scientific partners in the US, NL, England, Switzerland and France. The reasons for choosing the adequate locations are multiple, e.g. specialised existing knowledge, testing facilities, human resources. It is obvious, that project generation at FACE is a process, which is started by the centre´s staff. Ideas are collected and presented to the centre's management group. Decisions whether a project will be started or not are discussed in the Reference Group and the approval therefore is given by the Board. So all partners are involved in the process of project generation and implementation. This procedure guarantees a certain knowledge basis for every partner, but takes plenty of time.

Potential for social ramifications over and above the partners' participation. The results of the projects are expected also to have sustainable impact on offshore and onshore environmental aspects. The advanced knowledge about flow mechanism in pipelines can contribute to further increase their safety.

Mutual mobility of personnel and other joint activities. The centre management has established a mobility program, which is aimed at stimulating and supporting mobility of researchers across borders, projects, institutes and cultures.

Mechanisms for transfer of research results to the partners. Knowledge transfer between the centre and the user partner usually is managed through project meetings. It is obvious, that some industrial partners are satisfied by the existing mechanisms of knowledge transfer and others see room for improvement. This fact should be reflected in order to equal distribution of information.

Attempts to commercialise results that fall outside user partners' core areas. Achievements with respect to the commercialization of results beyond the user partners' core areas cannot be assessed by now. The centre's manager, however, is already working on a respective plan.

As the SFI-program is a long term program, comments to innovation aspects cannot be made at the moment.

8 Gender aspects

Currently, both in the FACE Board and the FACE Reference Group no females are represented. November 1 Lisa C. Paulsson replaces Davoud Tayebi as representative from Shell in the FACE Board. Among the senior staff there is one female (who devotes 10 % of her work time to FACE). Currently, none of the PhD students and Post Docs is female. However, it should be stated that the first PhD student that successfully completed her PhD dissertation was female. Among the administrative and technical staff the share of females is 50 %.

The group of evaluators is aware of the fact that it will be rather difficult in a topic like that of FACE to attract a substantial number of female staff, Master and PhD students. However, we think there might be ways to attract further potential female participants: currently, knowledge about PhD positions is mainly spread through word of mouth. We think that it might be a good idea to more actively approach suitable PhD students, especially from emerging economies (BRIC countries), for example by directly contacting university departments in these countries and asking them for suitable candidates. Usually, the share of female students in technical disciplines in these countries is considerably higher than in Europe or the US.

9 Financial aspects

Funding from the host institution and partners. Overall, the budget of FACE is relatively small as compared to other centres in the SFI programme. One reason for this situation is that the host institution (IFE) and the research partner SINTEF have only limited basic funding and largely rely on income from contract research. Accordingly, their contribution to the budget is very limited.

This results in a situation in which contributions to the budget come (with about the same shares) from RCN and the industry partners.

Apart from the fact that the funding is rather limited as compared to the ambitions of the centre, the team of evaluators was surprised to learn that the share of contributions of the industry partners in cash and in kind are not agreed upon before a budgetary year starts. Moreover, it has happened that in-kind contributions have been postponed at very short notice. This leaves the centre with some degree of uncertainty concerning the budget that is actually available. We recommend that this situation be changed, by requiring the partners to indicate the shares of their contributions in cash and in kind before the start of a budgetary year.

Efforts to attract new partners and securing other external funding. One possibility to improve the financial situation (and also to extend the outreach of the centre) is to attract further corporate partners. This is of particular importance as two corporate partners already left the centre and are not contributing to the budget any longer. Up to now it was not possible to find new corporate partners that would be able to fill the gap.

The team of evaluators is convinced that the new centre management both has a good overview over the pool of potential new partners and is able to "sell" the advantages of being a partner of the centre.

One issue that was raised both in the meeting with FACE and the written documents that were made available to the evaluators was whether a model with different forms of partnership might be desirable. In such a model full partnership would be complemented by a partnership status limited to specific sub-projects. The team of evaluators shares the concern that this might cause problems with the existing partners and lead to new frictions in the consortium, especially when the funding of the new partner is earmarked for the sub-project to which the partner is attached. We strongly support a model that has been suggested by the centre management: this model builds on full partnership only but, at the same time, offers the possibility that a partner takes more ownership for certain parts of the work programme.

One precondition for the acquisition of new partners might be the improvement of existing standards for quality assurance; particularly with respect to the usual standards of the industry partners. The team of evaluators suggests that this issue receive increased attention by the centre management.

10 Future activities

Plans for continuation of centre activities when the SFI status and RCN funding expire. Some ideas regarding continuation of the centre activities after 2014 were presented by the centre's manager, but a clear strategy for the time after SFI status is still to be developed.

11 Conclusion and recommendations to the centre

The team of evaluators has met a centre that struggled hard to find appropriate structures to pursue very ambitious research that has high relevance to the Norwegian economy. From the written documentation that was made available to the evaluators before the meeting some questions could not be entirely answered and there was need for further information. The meeting with the centre's representatives was very clarifying and, at the same time, convincing. The team of evaluators is positive that the implementation of the envisaged changes will bring the centre on a good path with respect to both scientific and innovative outcome.

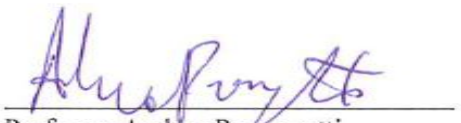
To further pursue the already envisaged improvement of the centre's structure and activities, we recommend:

- that the publication activity be increased and that publications be used as a means to increase the visibility of the centre,
- that suitable master and PhD students be more actively searched for and, by doing so, that the share of females be increased,
- that the share of PhD students working at facilities in Norway be increased and that PhD students abroad be encouraged to spend a substantial amount of time at the facilities in Norway,
- that researchers with an international background be motivated to remain in the country,
- that a communication plan (target groups, instruments, aims) be developed as soon as possible and implemented from 2011 onwards,
- that the proposed changes for the identification, prioritization and selection of projects be implemented,
- that the proposed measures to attract further partners be implemented,
- that the quality assurance mechanisms be further developed in order to serve the (corporate) partners' needs and expectations,
- that measures be developed that contribute to a greater predictability of the respective shares of in-kind and in-cash contributions of the partners,
- that mechanisms outlining how the acquired knowledge will find industrial application be developed for the centre's final period.

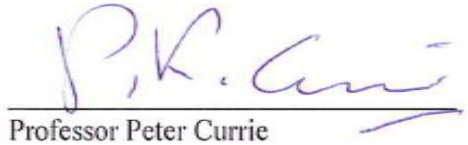
Kjeller, 21 October 2010

Dr. Silke Stahl-Rolf

Dr. Erich Fercher



Professor Andrea Prosperetti



Professor Peter Currie

Tromsø Telemedicine Laboratory - TTL

Host institution: Norwegian Centre for Integrated Care and Telemedicine (NST), University Hospital of North Norway (UNN)

1 Introduction

On October 19, 2010, the evaluation team met with the director, representatives of the host institution, NST, and the University of Tromsø (UiT), project leaders, students, and representatives of the industrial partners of TTL. In the morning discussions centred on the research at TTL. In the afternoon there was a meeting with graduate students as well as discussions on management and organisation of TTL. This evaluation is based on these interviews as well as on the extensive written report and self-assessments supplied to us beforehand. We thank the whole TTL team for a well-organised meeting as well as open and informative discussions.

2 Research activities

Research program and competence profile. The research program of TTL is multidisciplinary. However, it appears that there is some need for greater awareness of the path of development of this type of research into innovation and product, to ensure that the IP generated has value when the work has matured. Specifically, full awareness of quality and regulatory requirements is needed, as the investigators in addition to their pure research perspective should also take into account the mandate of an SFI to pave the way for innovations by the user partners. The new administrative manager of TTL appears to realize this and endeavours to improve this issue.

The research areas are appropriate with exception of "computer aided diagnoses" which is inconsistent with the overall stated theme of TTL. The projects in this area are not chronic disease focused and would be more appropriate in a computer science or biomedical engineering research department. The possible exception would be the image analysis of skin lesions, which could have a primary care eHealth application.

There is mention of business students collaborating with TTL, but this has been limited and not universally applied. Researchers and students in health services research are also greatly needed. The strong evaluation process that is necessary in order to determine the practical viability of the research is apparently not present at TTL. We recommend that a plan for systematic determination of priority and evaluation of projects, that should include a health economics evaluation, be developed.

We suggest that for each project there should be a mentor clinician and a mentor from the member companies. This will establish buy-in from important TTL constituents and will check the viability of the project in absence of a formal external peer-review process. Research leading to clinical trials and a subsequent commercialization by user partners can be better facilitated with such mentorship. These mentors should have a degree of ownership in the project and be involved in the student supervision.

The TTL - Lifestyle team is now involved in "Renewing Health", their first RCT. This appears to be the one project that has received the most traction. This has occurred despite little support from obvious partners. The level of clinical involvement in this project and the COPD project is at the level needed for the research at TTL to efficiently foster innovation by partners. Clinical interaction is needed to fully realize these innovations. However, this project is vulnerable. The technology itself is dated and in risk of obsolescence. Private sector support in defining the direction of this work is needed in order for this project to be continually viable. However, the partner participation here is weak, despite their declared interest in the project.

Research at TTL and NST. The evaluators found it somewhat difficult to make a clear distinction between the Centre host, NST and TTL. The only immediately apparent distinction seemed to be their funding mechanism. During the evaluation it become clear that NST research is more concerned with direct applications and contract research, but this was not immediately discernible from the way the two organizations were presented.

TTL describe themselves as a technology development group, which is distinct from NST that is more oriented towards clinical applications and direct development of innovations. However, whatever the content of research that is in line with declared TTL strategy, it is imperative that in the planning and implementation of research projects and the interpretation of the results clinical aspects and viability in view of possible applications be taken into account.

Scientific publications and papers at recognised international conferences. TTL has exceeded its targets for number of publications. However, the impact factor of these publications is low, even from the perspective of informatics journals. A number of the articles are in conference-related publications with no impact factor. Publications in clinical journals are necessary to demonstrate the relevancy of the application aspects of the work. The Centre should also consider higher impact health sciences and clinical journals to improve the situation. TTL leadership appears to be aware of this and have begun to target higher impact journals.

The affiliation of authors to TTL is not identified as in scientific publications, which greatly limits international TTL visibility and runs contrary to the vision that TTL become internationally recognized. Centre researchers seemed overly cautious with respect to reporting multiple affiliations of authors in publications. University demands are said to be the reason for this, but we believe that TTL Management could find a way to overcome this obstacle so TTL can be made more visible in journal publications. Similar problems have been easily overcome elsewhere.

Long-term industrial research in the TTL research field, TTL should be unconcerned about patents in most areas of their work. Most of it is not patentable. However, for TTL research to have true relevancy with regard to its mandate as a SFI it must be market conscious and be ahead of developments in the private sector. The Centre should avoid developing technology that already exists readily in the commercial space.

The question of how projects are generated and then become incorporated in the organisational structure of the centre is closely interlinked with this question. We see room for a more systematic and continuous screening of project ideas in which all centre staff (including PhD students) should be involved. Such a systematic screening would be based on

the specific centre profile and at the same time contribute to its further development. We recommend that the evaluation plan suggested above contain a section on this systematic project development and consolidation process.

3 Internationalization

International contacts. TTL have managed to create a number of international contacts and collaborations and to extend and consolidate them throughout the course of period. TTL is, commendably, a partner in several European projects, but has no project leadership. The international partnerships are manifested in a fair number of co-authorships.

On the other hand, the number of visitors is rather low: 3 out of 4 medium length (a week) foreign senior researcher visits took place in 2010.

1/3 of the current PhD students have had a long-term visit at a relevant institution abroad. The sites are reasonably distributed worldwide. Given the fact that the age profile of the PhD-students is unusually broad, this number is a success. On the other hand, the number of senior long-term trips could have been larger.

International Advisory Board. The number of publications, impact factors, citation indexes etc. give indications of the international level of research at TTL. Participation in international projects (EU) is also to some extent a measure of the international visibility of TTL research. However, the evaluators find that it would be important for TTL to look for more hands-on external evaluation of their research efforts and organization in an international perspective on a regular basis. We therefore recommend that TTL as soon as possible establish an International Advisory Board, consisting of a minimum of three internationally recognized scientists. The IAB would visit TTL at regular intervals (e.g. annually), for assessment, discussions and advice on TTL research at all levels (board, senior scientists, PhD students).

4 Researcher training, engagement in education

The PhD students come from an impressive, diverse background including nursing, psychology, radiation therapy, computer science, and engineering. We were impressed by the scope of the PhD related activities. Our meeting with the PhD students showed that they consider themselves to be active and vital parts of TTL. Moreover, there is a considerable degree of interaction between the PhD students. This is the more remarkable as the PhD students have rather diverse academic backgrounds and work on projects that are relatively distant from each other. Their only criticism was that the level of cooperation and communication was not entirely emulated with other researchers and TTL partners. We strongly encourage the centre to improve this situation and to consider not only the exchange between PhD students but also to explore ways how interaction between the different groups within the centre could be developed in a more systematic way. The expertise and maturity they bring to their work is obvious. It would be appropriate that TTL would emulate this diversity in backgrounds in their faculty, by including professors from the health and social sciences. TTL has done a good job at recruiting these students.

Some student work does not align well with the research strategy of TTL, i.e. radiation treatment planning, MRI image processing. This research could be conducted in many other

institutions and where there are other sources of funding. This situation is of some concern as there does not seem to be any user partner interested in engaging in this work.

The PhD School is a good initiative, but there seems to be a lack of emphasis on MSc students. Thus, the number of PhD students at TTL is considerably higher than the number of master students in the field.

The education of masters in eHealth has just started at UiT. In order to secure the pool of young talents (i.e. Masters students) for the Telemedicine activities at the University Hospital of North Norway it might be helpful to systematically develop the Masters course in eHealth and to attract more students to this course. Industry can likely absorb more Masters level students. An emphasis on recruiting MSc students should be a priority, as it may be untenable for more PhD students to find appropriate placements locally.

5 Plans for final three-year period

The TTL research plan for the total period (2007-2014) was supplied with a presentation of the 2010 status, stating budget, deliverables and list of to which categories results belonged. There were no new details in the 2011-2014 plans, except remarks on research management issues. In parallel a new planned initiative NICE (Norwegian Integrated Care Environment) was introduced.

The management issues were, based on a SWOT analyses:

- to improve the acknowledged weakness of the current research conditions,
- to avoid the existing defragmentation by improving the collaboration between partners,
- to allocate more time by leading researchers and facilitate a better joining of different (research) cultures.
- to introduce an improved new quality process for project reviews/status/milestones for on-going projects and new suggested projects.

The NICE initiative signals a shift toward a more clinical approach. However, it is our view that there are no barriers to initiate elements of this now, and that it is the expectation of an innovation agenda to have clinically-engaged research in order to design, test, and iterate innovations.

6 Organisations and Management of the Centre

Structure of the research program. There is not a clear distinction between research groups and their definition appears somewhat arbitrary. There has been an attempt to distinguish them based on the methods used in conducting the research. The research groups have been renamed into traditional names as “Medical Informatics”, “Mathematics and Statistics”, and “Information System”, instead of using a subset of the research areas names. Unfortunately this signals a more conventional research methodology split than innovation.

No mapping of projects to the research groups or to the research areas was presented. The multidisciplinary nature of the work precluded this, which is understood and accepted. Nevertheless, we recommend that the number, the thematic focus and the labelling of the three thematic research groups be reconsidered. A clearer structure of the research groups

would enhance the specific profile of the centre. The greater diversity in faculty engaged in each project suggested above would enhance this restructuring.

Visibility and identity of the centre. The building up of visibility of TTL is considered as an important task of the centre management. Accordingly, a considerable part of the resources available is used for communication activities and the centre also relies on the communication services of NST. Both print as well as online media (including web 2.0) have been used in order to disseminate information about and results of TTL. This has resulted in considerable media coverage, exceeding the public attention of the average centre in the SFI programme.

However, the board of evaluators also sees potential for improvement with respect to the visibility and in particular the identity of the centre. There is a need to further work on the profile of the centre with respect to its particular task and role in the innovation system. This refers in particular to the specific profile of TTL relative to NST mentioned above. A clear definition and dissemination of the specific role of TTL is needed – both with respect to internal and external communication.

Performance of the Board and Management. The evaluators found that both the Board and the Management of the centre are well functioning and that their interaction is efficient and result oriented. The division of tasks between the Research Manager and the Administrative Manager is clear. They contribute from to different but complementary perspectives both to daily and medium- to long-term decision making processes.

Organisation and communication within the centre. The centre organisation is characterized by

- three thematic research groups,
- projects that are attributed to one (or more) of the research groups and
- horizontal activities, i.e. activities aiming at the exchange of information and building linkages between the different research groups and topics.

Interaction with the host institution and university. The University Hospital of North Norway – Norwegian Centre of Integrated Care and Telemedicine (NST) acts as the host institution of the centre. As mentioned before, there are close ties between NST and TTL. As noted above there is a need to more closely interact with clinical research – i.e. even closer ties with the university hospital.

Interaction with university. UiT finance several PhD students at TTL and state that maintaining TTL research is a vital part of Medical informatics as a strategic research area. Several TTL staff members are professors at the UiT and also a considerable number of PhD students are financed via UiT. Thus there is strong participation of UiT in TTL but a stronger emphasis on education of Masters student seems to be desirable.

7 User partners and other innovation aspects

Partner participation in project generation and implementation, relevance of results. Industrial partners present at the evaluation expressed strong commitment to TTL and had been involved in the planning and follow-up of the work of several PhD students. In all, funding from TTL partners has risen considerably (from 20 to 28 MNOK/a) over that envisaged at start-up in 2007.

There is clear, active collaboration with TTL and DIPS. The partner appears very active in TTL projects and is directly working with a number of students. This relationship is great example of how the collaboration should work and the intent of the funding. It should be held as a model. Unfortunately, there are no other obvious examples of private sector partner engagement, despite some obvious opportunities. In particular, it disappointing that IBM is not more involved and Telenor is not more active in the mobility disease management projects.

Cooperation with the research partner Norut has been focused on the MyHealthService activity. The Helse Nord organisation states that their own research has been enhanced by the contacts with TTL. However, they apparently have not been directly cooperating with TTL in research projects. IBM, also listed as a research partner, state that it has not been possible to participate in joint research with TTL due to the terms and conditions in the SFI agreement.

The Centre has developed 22 prototypes (artefacts) and filed one patent application in collaboration with one of the partners. Several examples of devices developed at TTL and now on their way to commercialization were presented. This is commendable and verifies efficient transfer of results and technology from TTL to innovations in partner organisations.

Potential for social ramifications over and above the partners' participation. For a Centre working with telemedicine and eHealth applications the social ramifications with respect to healthcare and clinical applications are self-evident.

Mutual mobility of personnel and other joint activities. Several partners are located close to TTL facilities, which are actually joined with those of NST. This creates excellent conditions for mutual mobility and daily contacts. It also became evident during the student interviews that they had good contacts with other partners, some of which were partially funding their research. Joint activities, both on a scientific and a social level within the Centre appear to be commendably frequent.

Mechanisms for transfer of research results to the partners. Results are transferred to and discussed with partners through "TTL project marathons" in which all researchers and PhD students present their work, through research group based meetings and seminars and through personal contacts. This activity seems to be pursued vigorously in a commendable way.

Commercialisation of results that fall outside user partners' core areas. This has not been necessary to date. Should the need occur, a mechanism for handling this is defined in the consortium agreement.

8 Gender aspects

Participation of women in centre administration and research. According to the fact sheet provided by TTL, 3 of the 17 senior staff members are female. Among the 19 PhD students 8 are female while all of the Post Doc students are male. Also the Board of Directors is entirely composed of males. We encourage TTL to actively look for female post docs and female board members.

Recruitment of women for Master's and PhD education. We recommend that female students are encouraged to participate in the Masters course in eHealth that is being developed at the

University of Tromsø. With respect to female PhD students we think that TTL is already on a good way that should be followed in the future.

9 Financial aspects

Funding from the host institution and partners. Funding of the Centre so far has been adequate and has been further eased trough help from NST and UiT who have picked up some administrative costs and made the facilities at the Research Park in Breivika available to TTL.

Efforts to attract new partners and securing other external funding. No new industrial partners have been added to the centre since its start and it does not seem that any strong incentives to do so have occurred. There are advanced plans on including Oslo University Hospital as a partner, which would be a very valuable addition. It was also pointed out that the present consortium agreement makes it somewhat difficult for new industrial partners to join. However, some revision or amendment to the agreement that would facilitate the appointment of new partners should not be considered an insurmountable obstacle.

The Centre has been quite successful in obtaining funding as partners in three EU projects. Two of these partnerships are based on earlier connections to other European universities, but one is a new contact due to a research paper of TTL that attracted the attention of the coordinator of the project. This is a good indication that TTL research is receiving international recognition.

10 Future activities

Numerous ideas about the potential further development of the centre have been repeatedly discussed (e.g. integration of clinical research, changing the perspective from artefacts to services, from projects to innovation or from a rather closed IPR model to a model reflecting open innovation). As there seems to be a general consensus that the consortium agreement and the centre operations should be further developed, we recommend that corresponding activities start soon. We suggest that a corresponding action plan is developed that outlines how and when the changes that are currently being discussed can be implemented. The aim should be to give the centre further momentum for the second funding period. This might contribute to an increased involvement of existing partners (namely IBM) in the centre and would contribute to the opening-up of the centre to further (research and commercial) partners.

The TTL board have initiated plans for establishing a Norwegian Integrated Care Environment (NICE) for research and development of Telemedicine and eHealth applications an also including a living-lab activity. This venture is expected start up in 2011 and to absorb the core activities of TTL after the RCN funding ends. It was not evident to what extent and in which way NICE would also involve the present industrial and research partners of TTL, but the research partners all state that they are supporting this initiative.

11 Conclusion and recommendations to the centre

TTL has got off to a good start in terms of number of projects, researchers engaged, productivity in research and international contacts. It would be important to create a more

distinct structure and evaluation process of the research programme and to create a stronger identity of TTL. We recommend:

- that the number, the thematic focus and the labelling of the three thematic research groups be reconsidered and the allocation of projects between be these groups be clearly defined
- that in the planning and implementation of research projects, the interpretation of the results clinical aspects be taken into account
- that in order to determine the viability and potential for innovation by user partners of projects, a plan for systematic prioritization and evaluation of projects be developed
- that for each project there be one clinician and one researcher from the member companies that would act as advisors and/or student supervisors
- that TTL establish an International Advisory Board
- that recruitment and education of MSc students be a priority
- that definition and dissemination of the specific role of TTL in relation to NST be improved, both with respect ct to internal and external communication
- that TTL be made more visible in journal publications
- that ways of developing interactions between the different groups within the centre in a more systematic way be explored
- that the appointment of new partners be facilitated by appropriate revision of the consortium agreement
- that TTL actively look for female post docs and female board members

Tromsø, 19 October 2010

Professor Per Stenius

Dr. Silke Stahl-Rolf

Professor Joseph Cafazzo

Professor Stig Kjær Andersen

Appendix A

Midway Evaluation of Centres for Research-based Innovation (SFI)

Terms of Reference

1. Framework for the evaluation

1.1 Introduction

A paramount objective for the *Centres for Research-based Innovation (SFI)* is to enhance the capability of business and industry to innovate. The focus is on long-term research and close alliances between enterprises which are active in research and prominent research groups.
The SFI scheme will:

- Encourage enterprises to innovate by placing stronger emphasis on long-term research and by making it attractive for enterprises that work on the international arena to establish R&D activities in Norway.
- Facilitate active alliances between innovative enterprises and prominent research groups.
- Promote the development of industrial research groups that are on the cutting edge of international research and are part of strong international networks.
- Stimulate researcher training in fields of importance to the business community, and encourage the transfer of research-based knowledge and technology.

The SFI scheme features a higher level of ambition, a longer term perspective and a more intense concentration of efforts than any of the Research Council's other innovation-related instruments. The initiative specifically addresses the most research-active parts of Norwegian business and industry. The SFI scheme offers enterprises the opportunity to take a longer term perspective, ensure a continuum and reduce the risk associated with research initiatives. The SFI-scheme may also promote quality and efficiency in the public sector.

For research-performing institutions, the SFI scheme offers opportunities for long-term competence development by engaging in research of a high international standard in close collaboration with industry.

The SFI scheme is administered by the Research Council of Norway, Division for Innovation and funded by the Fund for Research and Innovation. Each of the centres may receive funding for maximum eight years; five years plus a final three year period provided a positive outcome of a midway evaluation.

1.2 Background for the evaluation

The midway evaluation is outlined in the document "SFI Requirements and guidelines". Under the auspices of the Research Council, roughly 3 1/2 years after the centres are established; there will be an evaluation of each centre. The evaluation will be based on a uniform scheme involving the Research Council's governing bodies. The elements to which the evaluation will devote special attention are listed in the enclosure: Success criteria for 'Centres for Research-based Innovation'. In particular, the evaluation will assess the scientific results the centres have achieved relative to the original project description, and consider whether the scientific results achieved and the competence accrued have helped corroborate the vision that the centre's activities will lead to innovation, value creation and additional emphasis on long-term research in the participating

business enterprises and ventures. Further, the evaluation is to assess the plans for the centre's activities in the potential final three-year period. In addition to this evaluation, the Research Council of Norway will evaluate the administrative conditions at each centre.

1.3 Purpose of the evaluation

The evaluation has two main purposes:

1. It will form the basis for a decision about whether to continue the individual centre for the remainder of the overall eight-year term, or to wind it up after five years. The Executive Board of the Research Council of Norway, or a party authorised by the Executive Board, make the decision based on recommendations made by the Board for the Division for Innovation, or a party authorised by the Board for the Division for Innovation.
2. The evaluation will give advice to the centres on aspects of their activity that should be improved.

1.4 The evaluation team

Each Centre will be evaluated by a team of international experts:

- Two of the experts in the team will have the competence and the task to evaluate the Centre from a scientific point of view.
- Two 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.

This means that the scientific experts will participate in the evaluation of one specific Centre while the "generalist" experts will participate in the evaluation of several centres. Each Centre may suggest up to 5 suitable scientific experts. The Research Council will decide whom to invite.

1.5 Organisation of the evaluation

The evaluation team itself decides on the distribution of work among its members. The composition of the evaluation team will differ from day to day since the scientific experts are to evaluate a specific Centre. The basic documentation, in principle the Centre report to the evaluation team, from the Centres to RCN, will be distributed by RCN to all members of the evaluation team not later than one month prior to the evaluation. The evaluation of the 14 Centres will be carried out during the period October 2010 - December 2010.

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

During the site visit the evaluation team should meet:
- The Centre Leader
- The Chairman of the Centre Board
- Representatives from the industrial and/or public partners
- Representatives from collaborating research institutions
- Host institution staff incl. representatives from the top management
- Research leaders active within the Centre
- Doctoral students.

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

Each evaluation session will be divided into two sessions, one where the scientific experts meet parties from the Centres and one session where the "generalist" experts together with the scientific experts meet parties from the Centres. During lunch, i.e. between these to sessions, the evaluation team will also meet with up to 10 PhD students in the Centre.

1.6 Basis for the evaluation assignment

The evaluation will review progress of scientific and industrial efforts, recognising it is early to expect conclusive results. The evaluators will form an opinion concerning the approach and measures taken so far by individual Centres to judge the potential for their long-term development towards a successful SFI. Evaluators may offer suggestions for remedial action to enhance the prospects for Centre success.

The basic reference for the evaluation is provided for by the criteria on which the centres were originally selected:

- Scientific quality,
- The potential for innovation and value creation,
- Relevance with a view to the call for proposals, including relationship to the host institution's research strategy.

RCN has formulated a number of success criteria for SFI (Appendix 1). These criteria are the main basis for the evaluation report.

1.7 Background material for the evaluation

The following written material will form the background for the evaluation:

- *Present project description*
- *Budget tables from RCN project data base*
- *Annual reports 2007, 2008 and 2009 from the centres*
- *Work plan for 2010 including detailed tables for funding and cost*
- *The Centres for Research-based Innovation Scheme.* The Research Council of Norway, Oslo 2005.
- *The Centres for Research-based Innovation - Requirements and guidelines.*
- *The Centres for Research-based Innovation. Information to applicants.*
- *Report from Centres* according to a standardised outline, from the individual centre featuring relevant information, including:
  A) A self-evaluation of the centre including sections on research accomplishments, important industrial or social results and potential for innovation, internationalisation, recruitment, financial aspects and organisation.
  B) Fact sheets according template including CV for management team, data for the staff working in the centre, list of publications, PhD candidates, financial data and selected indicators.
  C) A short report and self-evaluation from the host institution.
  D) A short report and self-evaluation from each of the partners.
  E) Project description for final three-year period, including a plan for the winding-up.

2. Mandate for the Evaluation Panel

2.1 The task of the evaluators

The evaluation team will make the evaluation in the context of the success criteria (Appendix 1). The evaluations of the individual centres are to emphasise the following elements:

The scientific experts on the evaluation team will have the prime role in reviewing:

1) Research activities performed including competence profile and critical size, and research program. The scientific achievements and activities will be compared to that presented in the research plan; however, well-founded adjustments in the plans will be accepted.
   The success criteria to be considered are:

- Long-term industrial research of at a high international level in the field outlined in the project description,
- Scientific publications and papers at recognised international conferences
- A distinct research profile and successful at the international level,
- Researchers from the host institution and partners participate actively in the centre's research
- The centre's user partners have increased their research activities

2) The plans for research activities for the centres' final three-year period. The assessment will include the plans for the centres when their SFI status and RCN funding expire.
3) Internationalisation
   - The centre is successful in international research cooperation,
   - The centre engages in active collaboration with international research groups
   - The centre attracts good foreign senior researchers, postdocs and ph d students
4) Recruitment
   - The centre attends to researcher training effectively
   - The centre is actively engaged in education, especially at the master's level, with emphasis on increased recruitment of women.

The "generalist" experts on the evaluation team will review the following aspects:

5) Involvement of user partners and other innovation aspects
   - Partners are active in projects and a knowledge basis for innovation related to the partners business areas is created
   - Expectations to social ramifications over and above the partners' participation
   - Mutual mobility of personnel and other joint activities
   - Research results are effectively transferred to the partners.
   - Results that fall outside user partners' core areas are attempted commercialised
6) Organisation and Management of the Centre
   - The centre has good visibility and a strong identity
   - The centre is organised in a way that fits well into the host institution's organisation.
   - The centre has a Board and management that ensure that the plans are followed up.
   - The centre has an administration with high professional and administrative skills
7) Financial aspects
   - The host institution and partners increase their funding
   - Active efforts are made to attract new partners
   - The centre has been successful in securing other external funding

The evaluation team will also comment on the self evaluation report and the site visit. Although the individual Centres will be the main focus, the evaluators should also comment on the organisation of SFI-scheme and the role of RCN.

To avoid giving a premature indication of the Council's decisions to prolong individual Centres, the Evaluation Committee is asked not to comment specifically on this issue.

Each evaluation report should be written as a joint task by the evaluation team and sent to RCN.

The centres will be given an opportunity to comment the factual content of the report before it is finalised.

The final report will be openly circulated to all Centres, host institutions, relevant ministries and to any other agency or person who have expressed interest for this kind of information.

Appendix 1

Centres for Research-based Innovation
The Research Council of Norway 2005

Success criteria for 'Centres for Research-based Innovation' (SFI)

Other than fulfilling the formal requirements posed, a successful Centre for Research-based Innovation will be characterised by the following:

The research
- The centre engages in long-term industrial research of a high international calibre in the field outlined in the project description, and demonstrates its high quality through its production of doctorates, scientific publications, papers for presentation at recognised international conferences and other forms of scientific merit.
- The centre has a distinct research profile and has been successful at the international level (e.g. when researchers win prizes or are invited to be keynote speakers at international conferences).
- Researchers from the host institution and partners participate actively in the centre's research.
- The centre's user partners have increased their research activities both through participation in the centre's activities and their own R&D activities on topics of relevance to the centre.

Innovation and value creation
- The centre's research has engendered or is expected to engender possibilities for innovation and enhanced competitiveness among user partners and expectations about social ramifications over and above the partners' direct participation in the centre's activities.
- The centre has achieved mutual mobility of personnel between the centre and the user partners. Researchers from partners work at the centre and research fellows and researchers from the host institution are seconded to the user partners for periods of time.
- The centre has conducted projects to ensure that the competence and results achieved by the research are effectively transferred to and utilised by the partners.
- The centre paves the way for results that fall outside user partners' core areas to be commercialised by other means, e.g. through establishing new research-based enterprises.

Internationalisation
- The centre is successful in international research cooperation, e.g. as a player in the EU's framework programme.
- The centre engages in active collaboration with international research groups and has also in other ways contributed to the internationalisation of Norwegian research and industry.
- The centre attracts outstanding foreign researchers, including research fellows and senior staff as visiting foreign researchers.

Researcher training and recruitment
- The centre attends to researcher training effectively, and helps to train highly skilled personnel in the centre's special fields.
- The centre is actively engaged in education, especially at the masters level, and helps improve recruitment to the centre's subject areas with particular emphasis on increased recruitment of women.

Partners and funding
- The centre receives long-term funding from the host institution and partners, and they increase their funding to exceed the minimum requirements.
- Active efforts are made to attract new partners and the centre's partners also include small and medium-sized enterprises with a high technology and innovation profile.

- The centre has been successful in securing other external funding.

Organisation
- The centre has good visibility and a strong identity and has successful collaboration with the partners.
- The centre is organised in a manner that allows it to fit into the host institution's organisation.
- The centre has a Board of Directors and management that help ensure that the intentions and the plan underlying the establishment of the centre are followed up.
- The centre has a common administration with a high degree of professional and administrative autonomy.

Appendix B

Schedule for evaluation panels meetings with Centres for Research-based Innovation (SFI)

October 2010

The Michelsen Centre for Industrial Measurement Science and Technology - MIMT

Evaluation panel:

- Professor Per Stenius, Sweden (generalist – panel leader)
- Professor David Williams, Loughborough University, UK (generalist)
- Professor Peter Fielden, University of Manchester, UK (scientific expert)
- Dr. Andrew Hunt, Tomoflow Ltd., UK (scientific expert)

Monday 11. October, Bergen (hotel)
2000 - 2200 Introductory meeting (by RCN) for the MIMT Evaluation panel

Tuesday 12. October, Christian Michelsen Research (CMR), Bergen
0900 - 1000 Preparatory meeting for the MIMT Evaluation panel
1000 - 1200 MIMT Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 1900 (2000) Work session for MIMT evaluation panel (writing draft report)
(2010 Flight transportation for generalists to Trondheim)

Medical Imaging Laboratory for Innovative Future Healthcare – MI Lab

Evaluation panel:

- Professor Per Stenius, Finland/Sweden (generalist – panel leader)
- Professor David Williams, Loughborough University, UK (generalist)
- Professor emeritus Håkan Elmquist, Sweden (scientific expert)
- Professor Andreas Melzer, University of Dundee, UK (scientific expert)

Tuesday 12. October, Trondheim (hotel)
2000 - 2200 Introductory meeting (by RCN) for the MILab Evaluation panel

Wednesday 13. October, Norwegian University of Science and Technology (NTNU), Trondheim
0900 - 1000 Preparatory meeting for the MI Lab Evaluation panel
1000 - 1200 MI Lab Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for MI Lab Evaluation panel (writing draft report)

SFI in Aquaculture Technology - CREATE

Evaluation panel:

- Professor Per Stenius, Finland/Sweden (generalist – panel leader)
- Professor David Williams, Loughborough University, UK (generalist)
- Dr. Daniel Benetti, University of Miami, USA (scientific expert)
- Dr. Per-Olov Larsson, Sweden (scientific expert)

Wednesday 13. October, Trondheim (hotel)
2000 - 2200 Introductory meeting (by RCN) for the CREATE Evaluation panel

Thursday 14. October, SINTEF Fishery and Aquaculture, Trondheim
0900 - 1000 Preparatory meeting for the CREATE Evaluation panel
1000 - 1200 CREATE Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for CREATE Evaluation panel (writing draft report)

Norwegian Manufacturing Future - NORMAN

Evaluation panel:
- Professor Per Stenius, Finland/Sweden (generalist – panel leader)
- Professor David Williams, Loughborough University, UK (generalist)
- Professor Christer Johansson, Mälardalen University, Sweden (scientific expert)
- Professor Jens Ove Riis, Aalborg University, Denmark (scientific expert)

Thursday 14. October, Trondheim (hotel)
2000 - 2200 Introductory meeting (by RCN) for the NORMAN Evaluation panel

Friday 15. October, SINTEF, Trondheim
0900 - 1000 Preparatory meeting for the NORMAN Evaluation panel
1000 - 1200 NORMAN Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for NORMAN Evaluation panel (writing draft report)

Marine bioactives & drug discovery - MabCent

Evaluation panel:
- Professor Per Stenius, Finland/Sweden (panel leader - generalist)
- Dr. Silke Stahl-Rolf, VDI, Germany (generalist)
- Professor Bo Mattiasson, Lund University, Sweden (scientific expert)
- Professor Helena Danielson, Uppsala University, Sweden (scientific expert)

Sunday 17. October, Tromsø (hotel)
2000 - 2200 Introductory meeting (by RCN) for the MabCent Evaluation panel

Monday 18. October, Forskningsparken, Tromsø
0900 - 1000 Preparatory meeting for the MabCent Evaluation panel
1000 - 1200 MabCent Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for MabCent Evaluation panel (writing draft report)

Tromsø Telemedicine Laboratory - TTL

Evaluation panel:
- Professor Per Stenius, Finland/Sweden (panel leader - generalist)
- Dr. Silke Stahl-Rolf, VDI, Germany (generalist)
- Professor Joseph Cafazzo, University of Toronto, Canada (scientific expert)
- Professor Stig Kjær Andersen, Aalborg University, Denmark (scientific expert)

Monday 18. October, Tromsø (hotel)
2000 - 2200 Introductory meeting (by RCN) for the TTL Evaluation panel

Tuesday 19. October, Forskningsparken, Tromsø
0900 - 1000 Preparatory meeting for the TTL Evaluation panel
1000 - 1200 TTL Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for TTL Evaluation panel (writing draft report)
(2055 Flight transportation for generalists to Oslo)

Statistics for Innovation - $(sfi)^2$

Evaluation panel:
- Professor Per Stenius, Finland/Sweden (panel leader - generalist)
- Dr. Silke Stahl-Rolf, VDI, Germany (generalist)
- Professor Vijay Nair, University of Michigan, USA (scientific expert)
- Professor Holger Rootzen, Chalmers University of Technology, Sweden (scientific expert)

Tuesday 19. October, Oslo (hotel)
2000 - 2200 Introductory meeting (by RCN) for the $(sfi)^2$ Evaluation panel

Wednesday 20. October, Norwegian Computing Center (NR), Oslo
0900 - 1000 Preparatory meeting for the $(sfi)^2$ Evaluation panel
1000 - 1200 $(sfi)^2$ Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for $(sfi)^2$ Evaluation panel (writing draft report)

Multiphase Flow Assurance Innovation Centre - FACE

Evaluation panel:
- Dr. Silke Stahl-Rolf, VDI, Germany (panel leader - generalist)
- Dr. techn. Erich Fercher, Grossebersdorff, Austria (generalist)
- Professor Andrea Prosperetti, John Hopkins University, USA (scientific expert)
- Professor Peter Currie, Delft University of Technology, The Netherlands (scientific expert)

Wednesday 20. October (hotel – Oslo Airport)
2000 - 2200 Introductory meeting (by RCN) for the FACE Evaluation panel

Thursday 21. October, Institute for Energy Research (IFE), Kjeller
0900 - 1000 Preparatory meeting for the FACE Evaluation panel
1000 - 1200 FACE Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for FACE Evaluation panel (writing draft report)

Information Access Disruption - iAD

Evaluation panel:

- Professor Per Stenius, Finland/Sweden (panel leader - generalist)
- Dr. Silke Stahl-Rolf, VDI, Germany (generalist)
- Professor Susanne Boll, Oldenburg University, Germany (scientific expert)
- Professor Andreas Dengel, German Research Center for Artificial Intelligence, Germany (scientific expert)

Thursday 21. October, Oslo (hotel)
2000 - 2200 Introductory meeting (by RCN) for the iAD Evaluation panel

Friday 22. October, FAST, Oslo
0900 - 1000 Preparatory meeting for the iAD Evaluation panel
1000 - 1200 iAD Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for iAD Evaluation panel (writing draft report)

Concrete Innovation Centre - COIN

Evaluation panel:

- Professor Per Stenius, Finland/Sweden (panel leader - generalist)
- Dr. techn. Erich Fercher, Grossebersdorff, Austria (generalist)
- Professor Peter Waldron, University of Sheffield, UK (scientific expert)
- Professor Joost C. Walraven, Delft University of Technology, The Netherlands (scientific expert)

Sunday 24. October, Trondheim (hotel)
2000 - 2200 Introductory meeting (by RCN) for the COIN Evaluation panel

Monday 25. October, SINTEF, Trondheim
0900 - 1000 Preparatory meeting for the COIN Evaluation panel
1000 - 1200 COIN Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for COIN Evaluation panel (writing draft report)

Center for Integrated Operations in the Petroleum Industry - IO-Center

Evaluation panel:

- Professor Per Stenius, Finland/Sweden (panel leader - generalist)
- Dr. techn. Erich Fercher, Grossebersdorff, Austria (generalist)
- Professor David Davies, Heriot-Watt University, Edinburgh, Scotland (scientific expert)
- Professor Okko H. Bosgra, Delft University of Technology, The Netherlands (scientific expert)

Monday 25. October, Trondheim (hotel)
2000 - 2200 Introductory meeting (by RCN) for the IO-Center Evaluation panel

Tuesday 26. October, NTNU, Trondheim
0900 - 1000 Preparatory meeting for the IO-Center Evaluation panel
1000 - 1200 IO-Center Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for IO-Center Evaluation panel (writing draft report)

Structural Impact Laboratory - SIMLab -

Evaluation panel:

- Professor Per Stenius, Finland/Sweden (panel leader - generalist)
- Dr. techn. Erich Fercher, Grossebersdorff, Austria (generalist)
- Professor Viggo Tvergaard, Technical University of Denmark (scientific expert)
- Professor Karl Schweizerhof, Karlsruhe Institute of Technology, Germany (scientific expert)

Tuesday 26. October, Trondheim (hotel)
2000 - 2200 Introductory meeting (by RCN) for the SIMLab Evaluation panel

Wednesday 27. October, NTNU, Trondheim
0900 - 1000 Preparatory meeting for the SIMLab Evaluation panel
1000 - 1200 SIMLab Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 1830 (2000) Work session for SIMLab Evaluation panel (writing draft report)

Stem Cell Based Tumor Therapy - CAST

Evaluation panel:

- Professor Per Stenius, Finland/Sweden (panel leader - generalist)
- Dr. techn. Erich Fercher, Grossebersdorff, Austria (generalist)
- Professor Elena Cattaneo, University of Milan, Italy (scientific expert)
- Dr. Thorarinn Gudjonsson, Landspitali-University Hospital, Island (scientific expert)

Wednesday 27. October, Oslo (hotel)
2000 - 2200 Introductory meeting (by RCN) for the CAST Evaluation panel

Thursday 28. October, Oslo University Hospital
0900 - 1000 Preparatory meeting for the CAST Evaluation panel
1000 - 1200 CAST Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Lunch meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for CAST Evaluation panel (writing draft report)

Innovative Natural Gas Processes and Products - INGAP

Evaluation panel:

- Professor Per Stenius, Finland/Sweden (panel leader - generalist)
- Dr. techn. Erich Fercher, Grossebersdorff, Austria (generalist)
- Professor Burt Davis, University of Kentucky, USA (scientific expert)
- Professor Jens Weitkamp, University of Stuttgart, Germany (scientific expert)

Thursday 28. October, Oslo (hotel)
2000 - 2200 Introductory meeting (by RCN) for the INGAP Evaluation panel

Friday 29. October, University of Oslo
0900 - 1000 Preparatory meeting for the INGAP Evaluation panel
1000 - 1200 INGAP Scientific Experts Evaluation session
1200 - 1300 Lunch meeting for the Evaluation panel
1300 - 1400 Lunch meeting with PhD students
1400 - 1600 Generalists Evaluation session
1600 - 2000 Work session for INGAP Evaluation panel (writing draft report)

Appendix C

Written material as background for the evaluation

- Present project description
- Budget tables from RCN project data base
- Work plan for 2010 including detailed tables for funding and cost
- Report from Centres according to a standardised outline:
  A) A self-evaluation of the centre
  B) Fact sheets according template including CV
  C) A short report and self-evaluation from the host institution.
  D) A short report and self-evaluation from each of the partners.
  E) Project description for final three-year period, including a plan for the winding-up.

- Annual reports 2007, 2008 and 2009 from the centres

Templates

The Research Council of Norway
Division for Innovation

Midway Evaluation of the Centres for Research-based Innovation (SFI)

A - The Centre Self-evaluation

……
(Name of centre)

……..
(Project number)

To be prepared by the centre and signed by the Centre director and Chairman of the Board.
*Maximum length **12** A4 pages. Word format, Times New Roman,*
12 pitch font, single line spacing

Background

This Self-evaluation should devote special attention to the items listed in "Success criteria for 'Centres for Research-based Innovation". The main sections below are the same as in this document. In addition to the Self-evaluation for the centre each of the partners should submit a report.

Brief summary (max. ½ page)
Progress of the centre, highlights, breakthroughs etc.

Write here….

..

1. Objectives

Primary and secondary objectives of the centre.

Write here….

..

2. Research (max. 2 pages)

- *Research achievements*
- *Core competence of the research team*
- *Research facilities of the centre*
- *Comment on new types of collaboration since establishing the centre (within core group and between host institution and research/user partners)*
- *Comment on the centre wrt critical size*
- *Provide an overview of the research program*

Write here….

..

3. Innovation and relation to Centre user partners (max. 3 pages)

For the centre as a whole describe:

- *The way key issues are identified by partners*
- *Measures for establishing links and integration between research institutions and user partners and between the different user partners*
- *The participation of user partners in research projects*
- *Describe expectations of value of the centre for society at large over and above the partners' participation in the centre's activities.*
- *To what extent have the centre mutual mobility of personnel between the centre and the user partners.*

- *How has the centre ensured that the competence and results achieved by the research are effectively transferred to and utilised by the partners.*
- *Are efforts made to secure that results that user partners' are not interested to implement are commercialised by other means?*
- *Has the centre research generated additional concurrent R&D projects between research institutions and companies?*

Write here….

..

4. **Internationalisation** (max. 1 page)

- *Describe how international research cooperation is attended including if the partners based on research projects in the centre have engaged in the EU's framework programme.*
- *Describe collaboration with international research groups and other ways of international collaboration both with academic researchers and industry.*
- *Describe international exchange of researchers, both centre staff going abroad and visiting foreign researchers, including post docs, research fellows and senior scientific staff from other institutions.*

Write here….

..

5. **Recruitment** (max. 1 page)

- *Describe how the centre have organised researcher training at PhD level.*
- *Describe how the centre has engaged in education, especially at the master's level. Examples are researchers taking part in teaching, thesis of master students related to the research topics in the centre and summer jobs for students on projects in the centre.*
- *In particular how is increased recruitment of women is given attention.*

Write here….

..

6. **Funding** (max. 1 page)

- *Discuss concerns regarding financial matters. Note that numbers are to be submitted by RCN (budget tables).*
- *What have been done to attract new partners including small and medium-sized enterprises? (It is realised that some centres from the start have a rather complete set of partners, while others have a greater potential to attract additional partners.)*
- *Has the centre been able to obtain other external funding?*

- *Describe sources of non-centre funding supporting related research.*

Write here….

..

7. **Organisation** (max. 2 pages)

- *Describe role and activities of the:*
    - *Board*
    - *Centre director*
    - *Management team*
    - *International Scientific Advisory Board (if relevant)*
- *Comment on the scientific leadership of the centre.*
- *Describe the process of idea generation, project selection, project planning and project review.*
- *What steps are taken to stimulate innovation processes?*
- *Describe steps taken to stimulate mutual personnel mobility between user partners and research institutions.*
- *Describe status and role of the Centre in relation to different organisational levels of the host institution.*

Write here….

..

8. **Communication** (max. 1 page)

- *Link to centre home page*
- *Communication activities*

Write here….

..

9. SWOT analysis

Based on the previous self-evaluation of the centre a SWOT analysis should be performed. This is considered to be a useful way to present the highlights of the status of the centre and may constitute a basis for the plans for the final three years of operation for the centre.

This SWOT analysis should include the following steps:

Describing internal factors:
The strengths and weaknesses of the organisation. These are related to organisation's resources (people, knowledge, financial means, and activities). The sources for this are the analyses mentioned above.

Describing external factors:
The opportunities and threats in the environment that have an effect on the organisation. These include changes in the policy domain, technological developments and economic factors. The analysis of the environment provides input for this.

Confronting internal factors (strengths, weaknesses) with external factors (opportunities, threats):
It is important to weigh the strengths, weaknesses, opportunities and threats by using a point system or a qualitative specification.

Developing ideas on strategic options:
Strategy development often occurs on the basis of a matrix in which the factors are presented in four cells based on strengths, weaknesses, opportunities and threats.

Example of SWOT table:

Strengths • Advanced knowledge development; • The research is demand driven; • The partners are closely involved; • The activities have a clear effect; • A wide and active network, both nationally and internationally.	**Opportunities** • Extra attention and resources from public agencies for innovation in the sector; • New technological breakthroughs in strategically important fields; • Opportunities of interaction with innovation programmes • Position to attract funding from EU framework programme
Weaknesses • Transfer of knowledge not adequately addressed • Resources are not prioritised well • Number of partner companies too low	**Threats** • The partner companies is under pressure by the economic crisis; • The end of centre funding will come before company partners are ready to implement results

Signatures

Place and date

……..	…….
Centre director (Signature and name in print)	Chairman of the board (Signature and name in print)
……..	…….

The Research Council of Norway
Division for Innovation

Midway Evaluation of the Centres for Research-based Innovation (SFI)

B - Fact sheet for the centre

……
(Name of centre)

……..
(Project number)

To be prepared by the centre and signed by the centre director.
*Maximum length **5** A4 pages. Word format, Times New Roman,*
12 pitch font, single line spacing

Contents

d. List M.Sc thesis in centre in 2010 (name, title of thesis, sex, adviser, institution granting degree).

Signatures

Place and date

……..

Centre director
(Signature and name in print)

……..

Enclosures

1. Selected CVs for the core team of the Centre (max. 10 pages for the whole team).
2. Publications 2010

The Research Council of Norway
Division for Innovation

Midway Evaluation of the Centres for Research-based Innovation (SFI)

C – Host institution assessment

Please return the completed assessment directly to Dagrun Pedersen, The Research Council of Norway (dp@rcn.no) as an attachment to an E-mail
Deadline 31. August 2010

……
(Name of host institution)

……
(Name of centre)

……..
(Project number)

To be prepared by the host institution and signed by the Project administrator
*Maximum length **4** A4 pages. Word format, Times New Roman,*
12 pitch font, single line spacing

Contents

1. *What is the total research activity of the host institution in the form of personnel and volume within broad thematic area of the centre?*

Write here….

..

2. *Describe how the thematic area of the centre relates to the research strategy of the host institution*

Write here….

..

3. *How do you evaluate the importance of the centre to realise the research strategy of your institution?*

Write here….

..

4. *How has the centre stimulated collaboration between researchers from different disciplines internally within the host institution and with researchers from research partners?*

Write here….

..

5. *How has the centre stimulated establishing leading national research groups across institutional boarders, i.e. collaboration between university and research institute?*

Write here….

..

6. *How has the centre's activities benefited your international reputation as a research institution?*

Write here….

..

7. *How has the centre strengthened international cooperation?*

Write here….

..

8. *What potential for innovation and value creation do you see in the results from the centre which is not expected to be commercialised by the company partners?*

Write here…. ..

9. *How is the centre organised within your own organisation?*

Write here…. ..

10. How are the administrative and economic matters handled?

Write here…. ..

11. Are there any other topics you want to report?

Write here…. ..

Host institution

……

Place and date

……..

Signature and name in print of project administrator

……..

The Research Council of Norway
Division for Innovation

Midway Evaluation of the Centres for Research-based Innovation (SFI)

D1 – Corporate partner assessment

……
(Name of partner)

Please return the completed assessment directly to Dagrun Pedersen, The Research Council of Norway (dp@rcn.no) as an attachment to an E-mail
Deadline 31. August 2010

……
(Name of centre)

……..
(Project number)

To be prepared by the partner and signed by the contact person of the partner
*Maximum length **2** A4 pages. Word format, Times New Roman,*
12 pitch font, single line spacing

Outline

1. *Describe the focus of own R&D in thematic area of the centre, within and outside the centre (strategic platform)*

Write here…. ..

2. *What is total volume of R&D within company in thematic area of the centre.*

Write here…. ..

3. *How has the participation in the centre influenced the R&D activity of your company?*

Write here…. ..

4. *How has the partner interacted with the centre?*

	Yes	No
Membership in board		
Participation in workshops for project plans and idea generation		
Participation in research projects in the centre		
Mechanisms for technology transfer		
Mobility of personnel		

5. *What opportunities have been created that would not have existed without the centre?*

Write here…. ..

6. *Has the centre contributed to specific innovations within your company?*

	Yes	No
Patents		
New products		
New processes		
New services		

7. *Can you give any estimate of potential for increased income or reduced cost in net present value as a result of being a partner in the centre?*

Write here…. ..

8. *On a scale from 1 (Low) to 6 (High), please give your score for each of the following questions:*

	Score
Has the participation in the centre influenced the R&D and Innovation strategy of your company?	
How do you evaluate the centre wrt:	---------
Level of competency of centre staff	
Project management of centre	
Communication between centre and partners	
The usefulness of research activities as seen from the company	
How has the centre's activities benefited the partner?	---------
Ideas for new products, processes and/or services?	
New or improved methods/models developed by the centre	
Improvement of products, processes and/or services	
Strengthened knowledge base of the company	
Improved access to competent personnel and knowledge institutions	
Recruitment of qualified personnel	
Improved network to other partners	

Company partner

Place and date

……..

Signature and name in print of reporting person from partner

……..

The Research Council of Norway
Division for Innovation

Midway Evaluation of the Centres for Research-based Innovation (SFI)

D2 – Research partner assessment

……
(Name of partner)

Please return the completed assessment directly to Dagrun Pedersen, The Research Council of Norway (dp@rcn.no) as an attachment to an E-mail
Deadline 31. August 2010

……
(Name of centre)

……..
(Project number)

To be prepared by the research partner
*Maximum length **2** A4 pages. Word format, Times New Roman,*
12 pitch font, single line spacing

Contents

1. *What is the total research activity of your institution in the form of personnel and volume within broad thematic area of the centre?*

Write here….

..

2. *Describe how the thematic area of the centre relates to the research strategy of the your institution*

Write here….

..

3. *How do you evaluate the importance of the centre to realise the research strategy of your institution?*

Write here….

..

4. *How has the centre stimulated collaboration between researchers from your institution and from the host institution and other partners?*

Write here….

..

5. *How has the centre stimulated establishing leading national research groups across institutional boarders, i.e. collaboration university and research institute?*

Write here….

..

6. *How has the centre strengthened international cooperation?*

Write here….

..

7. *What potential for innovation and value creation do you see in the results from the centre which is not expected to be commercialised by the company partners?*

Write here….

..

8. Has the centre contributed to investment in research infrastructure?

Write here….

..

9. Has the centre contributed to improvement in study programmes at Master level (only relevant for universities)?

Write here….

..

10. Has the centre contributed to improvement in doctoral education (only relevant for universities)?

Write here….

..

11. Are there any other topics you want to report?

Write here….

..

Name of Research partner

…….

Place and date

……..

Signature and name in print of contact person

……..

The Research Council of Norway
Division for Innovation

Midway Evaluation of the Centres for Research-based Innovation (SFI)

D3 – Public partner assessment

Please return the completed assessment directly to Dagrun Pedersen, The Research Council of Norway (dp@rcn.no) as an attachment to an E-mail
Deadline 31. August 2010

……
(Name of partner)

……
(Name of centre)

……..
(Project number)

To be prepared by the partner and signed by the contact person
*Maximum length **2** A4 pages. Word format, Times New Roman,*
12 pitch font, single line spacing

Outline

1. *Describe the focus of own R&D in thematic area of the centre, within and outside the centre (strategic platform)*

Write here…. ..

2. *What is total volume of R&D within your organisation in thematic area of the centre.*

Write here…. ..

3. *How has the participation in the centre influenced the R&D activity of your organisation?*

Write here…. ..

4. *How has the partner interacted with the centre?*

	Yes	No
Membership in board		
Participation in workshops for project plans and idea generation		
Participation in research projects in the centre		
Mechanisms for technology transfer		
Mobility of personnel		

5. *What opportunities have been created that would not have existed without the centre?*

Write here…. ..

6. *Has the centre contributed to specific innovations within your organisation?*

	Yes	No
New services		
Other		

7. *Can you give any estimate of potential for increased income or reduced cost in net present value as a result of being a partner in the centre?*

Write here…. ..

8. *On a scale from 1 (Low) to 6 (High), please give your score for each of the following questions:*

	Score
Has the participation in the centre influenced the R&D and Innovation strategy of your organisation?	
How do you evaluate the centre wrt:	---------
Level of competency of centre staff	
Project management of centre	
Communication between centre and partners	
The usefulness of research activities as seen from the organisation	
How has the centre's activities benefited the partner?	
Ideas for new products, processes and/or services?	
New or improved methods/models developed by the centre	
Improvement of products, processes and/or services	
Strengthened knowledge base of the organisation	
Improved access to competent personnel and knowledge institutions	
Recruitment of qualified personnel	
Improved network to other partners	

Name of public partner

…….

Place and date

……..

Signature and name in print of reporting person from partner

…….

The Research Council of Norway
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Cover design: Design et cetera AS
Printing: Allkopi
Number of copies: 300

Oslo, December 2010

ISBN 978-82-12-02865-4 (printed version)
ISBN 978-82-12-02866-1 (pdf)