

Midway evaluation of seven Centres for Research-based Innovation (SFI-II)

Evaluation
Division for Innovation

 **S f I** Centre for
Research-based
Innovation

Preface

The first funding announcement for the SFI-scheme was issued in June 2005 and fourteen centres began their activities in 2007 (SFI-I). A second funding announcement was issued in 2010, and seven additional centres were selected and began their activities during 2011 (SFI-II). This evaluation report presents the midway evaluation of the seven centres that were started in 2011.

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 enterprises, host institutions and the Research Council. Enterprises participate actively in a centre's governance, funding and research. The main criterion for selecting centres is their potential for innovation and value creation. The scientific quality of the research has to be of a high international standard. When the centres are established, they are given a contract for five years. Based on a successful midway evaluation, the contract may be extended for another three years.

In this midway evaluation of SFI-II, 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 Research 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. Particular thanks go to Professor Alison McKay and Professor David Williams for their 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 SFI-scheme administration.



Arvid Hallén
Director General

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Overall report from generalist evaluators

1 Introduction

The seven Centres for Research-Based Innovation (SFI) supported by the Research Council of Norway (RCN) were evaluated by one-day site visits from Tuesday, March 10 to Thursday, March 26, 2015, approximately 3,5 years after they were started and about midway through the planned eight-year program. The evaluation had two main purposes:

- To form the basis for a decision by RCN whether to continue financing of each individual Centre for the final three years of the eight-year term
- To comment upon and give advice to the Centres on their activity and how it should be improved in the form of recommendations.

Each Centre was evaluated by a team of four experts. Two were experts with 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 on an international level. 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 mainly addressed research at the Centre. After lunch, there was a one-hour meeting with graduate students and post-docs followed by a two-hour discussion on management and organisation of the Centre. The reports of the evaluation teams are based on these interviews as well as on the extensive written reports 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. Our particular thanks go to Liv Jorunn Jenssen, who represented RCN at all of the evaluations, for her quiet and efficient management 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 the progress, strengths and weaknesses of the Centres and the SFI program as a whole. We felt that the evaluation process was well designed to enable us to provide feedback, advice and recommendations to both the individual Centres and to the RCN.

2 Over all Impressions and Recommendations for the SFI Scheme

The evaluation team saw some world leading science and excellent industry-academia collaborations that were delivering significant impact to the organisations involved and to wider society. It was clear that Centre funding is also supporting the development of some excellent and promising early career research leaders (successors) whose future performance could be improved by leadership training facilitated by RCN.

In a small number of Centres there was a lack of clarity regarding scientific contributions and/or detail on innovations that had already been delivered. This was usually resolved in discussion. The overall structure of the self-evaluation documents was excellent and supported the evaluation team in drawing comparisons between Centres.

However, in some cases, the relationship between Centre activities and reported outputs was unclear and the financial reporting was aggregated at too high a level for the team to distinguish between cash and in-kind support. In addition, it was frequently not possible to judge the scale of associated projects resulting from Centre activities from the self-evaluation reports.

3 Visibility of the SFIs

It is clear that there is excellent science going on in the Centres, it is also clear that much of this science has potential for impact but that the level of impact generated by Centres is variable and in some cases has not been realised as effectively as it should have been.

It is also difficult for outsiders nationally and internationally to distinguish between the work being carried out with specific Centre funding and the work of the host and other stakeholders. While Centre funding contributes to preserving individual brands, this means that there is little distinct visibility of specific Centres (and the SFI brand in particular) internationally.

Consequently RCN should provide leadership and communication training for all Centre directors, ideally within the first 18 months of the Centre funding period. Leadership training should also include consideration of evolving and future business models for Centres post RCN funding and the timing of this future planning in the Centre life cycle.

4 Internationalisation

The original programme vision included industry, research institutes and academia as the three key actors. Centres that are not well balanced between these actors tend to be less impactful. All Centres demonstrated that they are disseminating results to their international academic communities through publications and other appropriate mechanisms. International mobility of academic staff into and from the Centres was more limited and few Centres had a functioning International Scientific Advisory Board (ISAB). As a result the evaluation team concluded that the scientific research programmes had not been exposed to sufficient scientific scrutiny. It is essential that Centres expose their proposed work programmes to their ISABs, especially as Centres progress through the RCN financing period and the need for planning beyond their initial eight years becomes more pressing. Several Centres are partners in EU funded projects. To maximise opportunities for future funding, Centres should be encouraged to use some Centre funding to form EU-wide partnerships that are ready to respond to Horizon 2020 opportunities as they arise.

5 International Scientific Advisory Boards

RCN does not require Centres to have an International Scientific Advisory Board in place from the start of their eight year journey. In cases where no ISAB was in place, we observed a missed opportunity to increase international visibility and to feed in international scientific insight that could have helped the Centre in its development and assisted in building international scientific critical mass through collaborations. Some subject areas are sensitive, as a consequence of IPR issues, with a high level of international competition from both academic and industrial perspectives which works against international collaboration. However, these cannot prevent the use of an ISAB to ensure that research plans are directed to reach the highest international standards. ISABs should be put in place where there are none to ensure the long term quality of the research, and also to give a long term opportunity to involve international industry and academia as appropriate.

6 Board and management

As was identified in the 2010 review of Centres, effective and non-conflicted Board and management structures are critical. This review has confirmed that that there is potential for

conflicts of interest, for example by constraining the business model or by not giving work plans and outcomes sufficient scrutiny. RCN should ensure that governance processes are structured so that there is no risk of potential conflicts of interest between the Chair of the Board, the host institution and other partners related to the Centre. It is particularly recommended that the host institution does not chair the Board and that individuals do not have multiple and conflicting roles for example as a both a work package lead and chair or member of the Board.

It was also apparent - within the overall structure for the Centres which brings together partners from academia, intermediate institutes and user communities - that Centres are operated using a range of business models. It was noticeable that Centres which did not balance the integration of the three stakeholders restricted their achievable scale and, consequently, potential impact. This was especially true of Centres that were dominated by intermediate institutes. The cost structure imposed by the underlying intermediate institute funding model appears to restrict Centre scale with consequences on value for money, pace and responsiveness.

The visits showed the commitment of individuals to the work of the Centres. At a number of Centres it was clear that there was an obvious “go to”/ “can do” member of the team, either an administrator or a researcher, whose contribution made a real difference to the Centre and its day to day working. Centres and RCN are encouraged to recognise and further develop these key people.

7 Development of PhDs and early career researchers

The evaluation team met a wide spectrum of enthusiastic and capable PhD students, post-docs and early career academics who were most appreciative of the opportunities they gained from being members of their respective Centres.

The Industrial PhD mechanism is an excellent one and clearly works well with the centre model and the Norwegian system. RCN should provide extra funding, for which Centres and others can compete, to support wider adoption of this mechanism.

Given the relatively small number of PhD students and post-docs in a Centre, especially at any given point in time, they would benefit from being able to meet peers in other Centres. This could be achieved for example, through an annual meeting or conference of Centre PhDs and post-docs.

It was noticeable that the PhD student and post-doc scientific training and experience was outstanding in many cases. However, for their longer term career development, they would benefit from additional transferable skills training and further personal development (including training in leadership, project management, commercialisation and entrepreneurship); in this respect the programme lags current international trends.

8 Planning for the next financing period and beyond

While the reviewers understand that Centres have been focussed on their mid-term review, it was disappointing to see that most Centres had not yet begun to think seriously about what happens after the end of the RCN funding period. We recommend that the Boards of Centres consider this seriously now and that RCN strongly encourages this. We also suggest that they develop and evaluate a small number of alternative future business models, testing these with respect to both their financial viability and fit to the intent of the scheme rather than quickly committing to a single model.

A number of Centres are clearly achieving at the highest level internationally and must aim to continue to perform at this level. Host Organisations for these Centres are encouraged to plan now for the investment required to sustain this level of achievement.

A key part of any successful Centre is its infrastructure. At the interviews, evaluation teams saw several examples of infrastructure that had been established using Centre funding and had high

potential value for specific research communities. However, arrangements for the maintenance and development of such infrastructures beyond the Centre funding period was frequently unclear. Given the scale of investment and their potential value, there is an opportunity for RCN to maintain a register of such infrastructures so that they can support Centres in considering how such infrastructure might be sustained beyond the Centre funding period.

9 Impact and Innovation aspects

It is impressive that the Centres have already delivered impact to their partners, mainly to the industrial collaborators directly involved, after only 3,5 years of operation. However there were concerns that some Centres had not been able to articulate their progress in a focused way and that this had to be established in discussion during the evaluation itself. Centres should therefore define Centre-relevant Key Performance Indicators (KPIs) and evaluate themselves against these. They should also work with RCN to capture and communicate their success stories to demonstrate the added value and impact of both Centre funding and the overall SFI programme.

We also identified several different business models for Centres and again consider that some of these are better adapted to industrial and innovation system needs. Also in some Centres there were large differences between Centre self-evaluations and industrial user evaluations. The panel encourage the Centres to use these evaluations to identify how to improve their impact to all user partners and to make this impact more uniform across partners.

Several associated projects were observed outside the Centre but as a result of Centre activities. This gives important evidence of the added value of having a Centre with a long funding period. Consequently the reporting of associated projects must be improved, both in the form of outcomes and their impact on the overall Centre budget. There is also potential for associated projects to be more strongly linked to the international funding system (see internationalization).

The in kind contribution to Centres from industry partners is in most cases excellent and represents an important indirect key element of impact. This is especially true if the in kind contribution increases over time.

Cash contributions from industry vary from Centre to Centre, with cash contributions very significant in some cases. If cash contributions were secured by more Centres, these contributions could be used more strategically and systematically for Centre development. In particular they increase Centre scale, dynamism and potential for development.

10 Recommendations to RCN

RCN requires all Centres to report on any infrastructure established through the Centre so that they can support Centres in considering how such infrastructure might be sustained beyond the Centre funding period.

1. RCN adds to the reporting templates information related to publications, associated projects and innovations that include the following information:
 - a. for publications: those co-authored with industrialists and international academic partners, an estimated percentage of the work reported that was carried out with Centre funding;
 - b. for associated projects: funding agency, partners, funding from funder and partners;
 - c. for innovations: an estimated percentage of the work contributed by the Centre;
 - d. for partner funding: cash and in-kind;
 - e. success stories: RCN and Centres should work together to capture success stories as evidence of added value and impact.
2. RCN requires all Centres to establish an International Scientific Advisory Board that meets annually and provides a written report of its impressions and recommendations.

3. As was identified in the 2010 review of Centres, RCN ensures that governance processes are structured so that there is no risk of potential conflicts of interest between the Chair of the Board and other board members, the host institution and other partners related to the Centre. This should include the effect of multiple roles that Board members may have.
4. RCN coordinates annual meetings of Centre PhDs and post-docs including transferable skills training and personal development (including leadership, project management, commercialisation and entrepreneurship training, and mentoring) and opportunities for participants to share experiences. RCN should consider more broadly its approach to researcher development.
5. RCN provides leadership and communication training for all Centre directors, ideally within the first 18 months of the Centre funding period.
6. RCN strongly encourages the Boards of current Centres to begin to seriously plan for the end of RCN Centre funding period.
7. RCN ensures that the above recommendations are implemented, where applicable, for the seventeen new Centres that are scheduled to start in 2015.

Loughborough /Leeds/Stockholm, 13 April 2015

Professor David Williams - Chief Generalist Evaluator (week 1)

Professor Alison McKay - Chief Generalist Evaluator (week 2)

Dr. Mattias Lundberg - Generalist Evaluator

Sustainable Arctic Marine and Coastal Technology - SAMCoT

1 Introduction

On March 10, 2015, the evaluation team met with the Director, project leaders, PhD students, post-docs, representatives of the host institution, representatives of the industrial and public partners of SAMCoT and the chair of the SAB. In the morning the discussions centred on the research at SAMCoT. In the afternoon there was a meeting with students and post-docs as well as discussions on management and organisation of SAMCoT. This evaluation is based on these interviews and on the extensive written reports and self-assessments supplied to us beforehand. We thank the whole SAMCoT-team for a well-organised meeting as well as very open and informative discussions.

2 Research activities

The research work is divided into six work packages, focusing on field data (WP1), ice ridges, rubble and frozen soil (WP2), fixed and floating structures (WP3-4), ice management (WP5) and coastal erosion (WP6). The work on ice ridges and rubble is internationally recognized, NTNU is one of the main centres in this field.

Ice management is a wide topic including long-term statistical data analyses, operational management at platforms, and near real-time observation technology. The research plan is well designed and satisfies the needs of science and industry. However, to date large-scale modelling has not yet really started, this will be a critical tool for statistical analyses and forecasting. Most of the work has been focused on iceberg drift, this is an important part of Arctic Ocean ice fields and the results obtained are promising. It would be desirable for the ice management work to develop local methods for recognition of multiple ice types such as ridges, multi-year ice, icebergs and bergy bits. Coastal erosion is planned to examine the influence of waves and sea level variation on the coast and protection of harbours. It was clear that the role of ice in erosion is not yet well scoped in SAMCoT, for example drift of ice, bottom scouring and freezing to the bottom of shallow areas can be major erosive factors. Overall, WP6 has been delayed but the project has been able to solve these problems and restarted this research. The progress in other work packages has been good to very good.

The Centre, including national and international scientific collaborators, is of critical mass. They are strongest in ice ridges and rubble, and ice loads. The ice management component appears to have the smallest effort input and with the modelling work anticipated in future will require more resource to have a useful impact. This will require both senior and PhD student resources. The research programme as a whole is well structured and linked, and although quite broad has a clear goal to satisfy international industrial and societal needs in future Arctic exploration.

The project has produced a good number of conference and journal papers. The number of conference papers is relatively large when compared with journal papers but this is understandable in the initial stages of the project and especially since many young PhD students began their work as the Centre commenced. It is anticipated that as PhD students transition to post-doc roles the number of peer reviewed journal papers will increase during the final three years of the Centre. The team has been well represented in key polar conference series such as POAC (Port and Ocean Engineering under Arctic Conditions), IAHR (International Association of Hydro-Environment Research) Ice Symposia and OMAE (Ocean, Offshore and Arctic Engineering). SAMCoT students have gained student prizes in these conferences.

The research profile of the Centre in ice science and engineering is very high, and the Centre is internationally visible and well recognised.

3 Internationalisation

The Centre has a wide international collaboration. Long-term collaboration with mutual visits is performed with several key ice laboratories including VTT Technical Research Centre of Finland, Aalto University (Finland), Hamburgische Schiffbau-Versuchsanstalt (Germany), University College London (UK), Technical University of Delft (The Netherlands), Moscow State University (Russia), and Krylov Ship Building Research Institute (Russia). This is a relatively large set of collaborations, but scales well with the size of the Centre in Trondheim and gives a firm basis for the research. The collaborations are ongoing, with benefit in productivity. In addition, there has been joint working with several other groups, which are not formal members of the centre, as reflected in the list of publications.

The amount of foreign senior researchers, post-docs and PhD students is about half of the total. This is a good number to provide inflow of new blood and intelligence from other countries but also to keep the Norwegian group in a good level to guarantee national and international output.

4 Researcher training, engagement in education

The Centre has produced 27 MSc's and 7 PhD's since starting (2011). This makes a strong input to academic education and has provided a competitive group for selection of PhD students and post-docs to further continue in the Centre. The education has been provided at NTNU and UNIS. The MSc, PhD and post-docs are well connected to the industrial partners and can be further developed during the final period of the centre, for instance by increased mobility between the academic and industrial partners. The panel also directly experienced that the PhDs and post-docs have a bond as a group, and that there is regular and informal cooperation between different subjects and WPs.

5 Plans for final three-year period

The future plan of the Centre has no major changes in the original overall objectives. WPs 2-4 will progress as planned but for other work packages there will be small changes. As a consequence of the needs of industry more applied research will be done in WP1, in particular involving ocean dynamics. Also WP5 (Ice management) will include more applications as required by the industrial partners. However the plan does not yet include sufficient effort in large-scale modelling and ice forecasting, the impression of the panel and discussions with users at the evaluation confirmed, that this area required more effort. Changes in WP6 have increased its focus on modelling, but it is not yet clear, what is to be modelled in detail. From the presentation and discussion the panel understood, that the work will focus on waves and sea level variations without perhaps sufficiently considering ice effects. Depending on the local situation, mechanical forcing by ice and ice ride-up and pile-up at shore, ice scouring and bottom freezing may become major factors in coastal erosion and must be taken into account.

The work on providing access to harbours at shallow offshore regions has been mentioned in the plan but needs more attention.

6 Organisation and Management of the Centre

The Centre is clearly visible to its peers in the scientific community. This visibility has been secured by publishing in the key journal, Cold Regions and Science and Technology, and in

particular by presentations at international ice conferences. Importantly they are also organising and hosting two key international conferences - POAC 2015 and the IAHR Ice Symposium 2020.

The Centre is well managed with good governance structures including quantified metrics for performance. Governance includes a General Assembly meeting annually, a Board that meets 2-3 times a year and a Core Management Group acting as an executive and meeting frequently. The Exploitation and Innovation Advisory Committee (EIAC), primarily made up from industrialists, had an important role in the start-up of the Centre and is now focussed on ensuring innovation. The Chairman of the Board, the Director and the Chair of EIAC shared a clear vision of the scope of the Centre and its direction in the medium term, i.e. during the 8 year funding period. The Centre has an active Scientific Advisory Committee and its chair attended the evaluation, making a significant contribution by presenting an international perspective on the science and relevance of the work of the Centre and its predecessors.

The Dean of the Faculty of Engineering Science and Technology attended the evaluation and confirmed the strategic importance of the Centre to NTNU, while recognizing that NTNU was involved in a large number of Centres. This importance manifested itself in the support of a significant number of PhD students and post-docs and opportunities for academic employment of those from the Centre. University academics are clearly involved in the leadership of the research.

The Director of the Centre, Sveinung Løset, is drawn from NTNU representing a significant investment of the university's best talent into the Centre. The Director is driven by the value and impact of the problem domain and has a clear vision for the Centre. He shows the skills and behaviours of a highly competent manager as required in an academically dominated setting with the requirements to interface with industrial customers. He is clearly effective and has created both the foundation for the Centre and the Centre itself and is well networked as evidenced by the securing of three additional partners in the last twelve months. He also leads one of the work packages in the Centre and is recognised as one of the world's leading scientists in Arctic technology.

During the presentation on the activities of the Centre to date it became clear, that changes had been required in the focus of Work Package 1 and that there had been a number of issues with Work Package 6 including a requirement for a change of leadership from SINTEF to NTNU (with no changes in resource). This gave evidence of the strength of the leadership and its processes including the role of the Board and Director.

The panel also commends the centre on its success in making all research partners into a truly shared research centre environment.

7 User partners and other innovation aspects

The overall involvement of UP in the centre seems very good. During the day the panel met three user partners (UP) out of 13. The impression gained from those other 10 partners from the written assessments did not wholly convince the panel of the overall benefit of participating in the centre. However the 3 UP that participated in the discussions delivered extremely good evidence of the strategic added value of the centre to their businesses. Consequently the evaluators suggest that the centre follows up the individual UP assessments both as a group and on an individual basis to improve the added value to UPs during the final three years. During those discussions we encourage the centre also to discuss the principles and opportunities for long term relationships.

The role of the EIAC needs to evolve in particular to address a lack of clarity on delivery from and the impact of the Centre in order to better capture its success stories and the different ways it has delivered innovation. It was evident during the day, that there were several "real cases" of

exploitation and innovation directly connected to the centre both in the previous period and forthcoming. Results originating directly from the centre include demonstrators, new products, validation activities, and strategic standardisation implementation. We emphasize and encourage the centre to develop a structure to show the added value created from the centre, for example KPI that permit it to show clear differentiation. Associated projects must be included in this structure. We believe that this effort is of strategic importance in order to make SAMCoT even more visible internationally and for it to be an attractive and differentiated research partner subsequent to the 8 year funding. We also commend the centre for its involvement with the UPs in the development of specific Arctic standards (ISO).

There is evidence of mutual mobility in place in the centre, but we encourage the centre to put more efforts into this during its final phase and add it as a new KPI. In our view this will be essential to delivering the technology transfer that is planned for the last phase of the centre. The Centre should consider using industrial champions as “tough customers” to help with both work package management and to improve student access to technical problem owners in the businesses. This will also improve mobility between SAMCoT actors.

The centre does not yet seem to have any potential spin offs. There appear to be some gaps in the perspective of the centre to intellectual property and its exploitation and there is an opportunity to take a more structured approach to this. The panel would like to see some efforts in the centre in this area especially some educational workshops for the students and post-docs to give them a more commercial perspective.

8 Gender aspects

The centre has a clear goal of equal opportunities. However the gender situation could be improved, especially at senior level and in the board, and the ideas on how to improve are disappointing. The panel encourages the centre management to examine the strategies and processes used by others and to improve equal opportunities.

9 Financial aspects

The centre is commended on their reporting. The centre has an impressive balance of in kind and cash contributions from partners. However the financial reporting would even better reflect the attractiveness of the centre, if the scale of the associated funding was more clearly visualized. Also the panel observed no new projects within H2020 and we encourage the centre to increase its efforts to raise funding here.

10 Future activities

Discussion at the review identified that there was a need for the Centre and its leadership and Board to look forward to the future of the capability at the end of the SFI funding and that the EIAC was an appropriate body to begin the necessary business planning and to gather the evidence of added value. The panel also saw the risk that the centre consisting solely of targets for specific project funding rather than a well-argued plan to sustain the internationally recognised research environment, that has been built by the RCN and partner investment. We therefore strongly recommend that the Chairman of the Board initiates a timely and strategic process for Centre continuity.

11 Conclusion and recommendations to the centre

The centre showed an excellent and relevant internationally recognised research environment. The centre has excellent support from the host institution and its partners. The overall management is good and the different bodies, Board, EIAC, CMG and SAC have clear missions and roles in

relation to each other. The centre also demonstrates the capability to change direction when needed for example the interventions in WP1 and WP6. It was gratifying to see the good cohesion of all research environments despite the number and geographical dispersion of the partners. The panel also observed good financial gearing, that included a combination of in kind and cash contribution from a well-managed partnership with international industrial partners.

Discussions with the student and post-doc community confirmed their enthusiasm for working on the challenging problems of ice and the Arctic environment. The group was extremely supportive and confident, that their work was delivering real value with good consequences for their employability.

Both the evaluators and the Centre recognise the breadth of activity and the need to retain focus to deliver to the scientific and industrial users of its output.

Moving to a difference phase of operation highlights that Centre should:

1. Consider the changing role of the EIAC and that this should be expanded to include value capture and business planning for the Centre after its eight years of funding.
2. With its intent to increase the number of post-docs in the Centre, continue to manage the personal development of these centre critical assets as they move into both the capture and publication of deeper science and as technology moves to demonstration projects.
3. We encourage the more rapid development of a large-scale model for the Barents Sea utilizing the data and important local scale results already obtained and that this should be used for long-term statistical analyses and for ice forecasting and management.
4. We encourage further work on local ice and ocean observation techniques and to connect them to short-term ice forecasting methods.
5. The work of the Centre should take more account of the potential effects of climate change.
6. The work to reshape WP6 should take more account of ice-driven coastal erosion and the development of safe conditions for access of ships to the harbours at the shore given experience at Yamal.

12 Recommendations to RCN

RCN should work with Centres to collect success stories (“impact case studies”) gathering evidence of innovations (outcomes and outputs) with traceable added value to industry and other users.

Consider specific funding mechanisms to i) give researchers more education on innovation and ii) to permit exploitation of innovations by students and post-docs and that allow post-docs to work with other stakeholders to champion their innovations to exploitation.

Trondheim, 10 March 2015

Professor Matti Juhani Leppäranta
Scientific Expert Evaluator

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Generalist Evaluator

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CERTUS - Centre for Software Verification and Validation

1 Introduction

On March 11, 2015, the evaluation team met with the Director, project leaders, PhD students, Post Docs, representatives of the host institution and representatives of the industrial and public partners of CERTUS. In the morning the discussions centred on the research at CERTUS. In the afternoon there was a meeting with students and post-docs as well as discussions on management and organisation of CERTUS. This evaluation is based on these interviews and on the extensive written reports and self-assessments supplied to us beforehand. We thank the whole CERTUS team for a well-organised meeting as well as very open and informative discussions.

2 Research activities

The CERTUS centre is conducting research that focuses on the testing phase of the software and systems engineering process. In an increasingly software-dependent world research on testing, a software quality assurance method, is highly relevant and societally important.

The research pursued by CERTUS addresses the selection of test cases, the optimization of test suites and the adoption of test case generation and selection to various application domains, such as cyber-physical systems, data-intensive systems, evolving systems and product line systems engineering.

In pursuing this research CERTUS focusses on a limited scope out of the vast number of potential research topics in software and systems engineering. In particular testing, the focus of CERTUS, is a late life cycle activity. The research therefore does not fully address the forward engineering techniques that have been developed in the almost 50 years of software engineering research aiming to ensure software quality, such as software requirements engineering, software specification and analysis, software modelling, software refinement, contract-based software engineering, etc.

Even though folklore has it that 80% of the software we are using has never been tested before, software testing is the most frequently used software quality assurance method used in industrial practice. Within this scope, CERTUS pursues a research program that aims at using a portfolio of underlying algorithmic technologies including constraint programming, heuristic search, genetic algorithms and data mining to support the testing process. The Centre possesses excellent expertise and international recognition in applying these methodologies. Other methodologies, however, including state space exploration, symbolic program execution and SMT solving that have been proven practically useful by the research community in supporting the testing process but for which the Centre possesses less expertise, are not being considered.

The research program addressed by the centre is narrow in scope when compared to the original research proposal. In particular, model-based approaches are less emphasized than in the proposal and the certification of critical systems is no longer pursued.

At the time of writing this report the centre employed 6 permanent staff and 4 PhD students. The majority of these researchers have an excellent scientific reputation and possess a publication record commensurate with their career stage. However, it was felt that there should be a higher emphasis on educating PhD students rather than employing permanent research staff since the transient nature of their position supports an influx of new potential into the Centre and an

outflow of knowledge to industry where PhD graduates are likely to be hired. It was also seen as problematic that the Centre is hiring its own PhD graduates and post-docs as permanent researchers since this may lead to an “in-bred” situation.

The total headcount of the Centre is considered insufficient in order to support the scientific breadth necessary to establish CERTUS as one of the top testing technology centres internationally, e.g. compared to primarily Microsoft Research (Redmond, USA), but also SnT (Interdisciplinary Centre for Security, Reliability and Trust) at Luxembourg, Fraunhofer FOKUS, University of Nebraska at Lincoln, Jet Propulsion Lab and NASA Ames. It is the view of the panel that CERTUS should add two or three PhD students and a post doc to their headcount to permit them to extend their portfolio of verification and validation enabling technologies.

The role of the industrial user partners in the Centre is to provide problem formulations and to contribute to the evaluation of the research results by conducting case studies together with the researchers in the Centre.

During the initial period of CERTUS funding, the group have managed to get publications in the top Software Engineering journals (such as IEEE TSE or ACM TOSEM), as well as in more specialized outlets such as SoSyM that are directly connected to the core of their research. CERTUS have also a very strong involvement in top level conferences, which is in the domains of Computer Science and Software Engineering can be as selective, or even more selective, than the best journals. For instance, CERTUS have several publications in ICSE, or ISSTA, ICST, or Models that are considered as key references in the domain.

The overall international visibility of the group has been dramatically affected by the departure of L. Briand who is considered as one of the world leaders in the domain. However the relatively young team that is left is very dynamic, very well engaged in the community, but has still to progress in terms of overall visibility.

3 Internationalisation

The CERTUS group has a truly international flavour: the 6 permanent researchers come from 6 different countries, and the post-docs and PhD students also come from all over the world (only two of them are from Norway). They have developed links to several top level international research groups, including that of Briand at Luxembourg, the former director of CERTUS. However it is not always clear what is the level of cooperation that actually exists with these partners, or what is the strategic goal that is pursued when choosing a specific group over an alternative.

As observed above most of the post-docs employed have secured their PhDs while within CERTUS. It is important to attract post-docs from other places to enrich the overall culture of CERTUS, not only at the research level but also at the research management level. The same holds for permanent positions.

4 Researcher training, engagement in education

The PhD students at CERTUS appear to be very well trained, and well aware of the issues in conducting research at the interface with industry. Considering the importance of the domain, and the potential interest of these kinds of research and research skills to software intensive organisations, the panel are questioning why CERTUS has revised its work plan to reduce the overall number of PhD studentships rather than increasing it.

There is also an opportunity to grow both more of a community amongst Centre researchers both PhDs and Post-docs, for instance via the international summer school to be organised by the Centre, and to also develop them as individuals. It is suggested that each researcher has a personal development plan including skills development for example in project management and this should also take into account opportunities in the international environment.

CERTUS also appears to have very little teaching involvement at the Masters level in neighbouring or partner universities. This is surprising and action should be taken to address this in order to contribute to the development of the next generation of software and systems engineers.

5 Plans for final three-year period

The plan for the final period is focussed on the idea of establishing a CERTUS Testing Laboratory (CT-Lab). This aims to simultaneously be (1) a research-based innovation centre, (2) an expertise centre and (3) a test facility. The business model for CT-Lab is as yet unclear. Since it has to be self-sustaining in the future, this raises concerns about the balance that has to be achieved between income generating activities (e.g. hiring out of the test facility) and the real research required to maintain competences as this is likely to deliver a less direct return on investment. In the long run a pure service based activity is likely to threaten any reputation for excellence of the CT-Lab. The other research activities that are planned are aligned with the current status of CERTUS.

6 Organisation and Management of the Centre

The work of the Centre is clearly visible nationally and internationally, it is however difficult for an outsider to distinguish between CERTUS and Simula. CERTUS has effective technical leadership from its Director and has a Board with representation of the user partners and chaired by a representative of the host, Simula. There are no academic partners, and the host and user partners solely contribute in kind. In combination these constrain the business model of the centre and its size and future options. CERTUS activity forms an important component (40% (~8.5 full time equivalent (FTE) of 21 FTE)) of the software engineering activity within Simula and consequently it is an important part of Simula's software engineering research activity. The panel note that the CERTUS International Scientific Advisory Board is of the same composition as that for the host institution department. The panel view is that the CERTUS International Scientific Advisory Board should have a clear and targeted mission to only give advice to the centre. This also reduces the potential for conflicts of interest.

Board and management processes are professional and thorough with good data collection and monitoring. Two key CERTUS meetings are held during the year with a key planning meeting held in the autumn to prepare plans for the coming year that are subsequently reviewed by the Board. Communication within the Centre is good, PhD students have good interactions with each other and key industry partner experts. While the relationship to Stavanger is good there appear to be limited interactions with other Norwegian universities. The panel encourages CERTUS to seek more strategic connections and real partnerships with Norwegian universities as a matter of urgency.

The panel was also somewhat disappointed by the lack of clarity of the actions to be taken on the recommendations of the current Scientific Advisory Board report. Some of their findings were confirmed by the panel. The centre is therefore asked to take action on Scientific Advisory Board recommendations in addition to those of this panel.

7 User partners and other innovation aspects

The number and types of user partners (UP) is well matched to CERTUS. We commend the centre for securing ABB and CRN as new partners. The centre has engaged and involved UPs. We especially noticed the good connections and relationships between the PhD/post-docs and UPs. We also applaud the centre for its five innovations and their connection to industry.

The panel was however concerned at the absence of adjacent projects, and especially that there does not yet seem to be any plan to increase the number of these in the final three years. We encourage CERTUS to focus on developing adjacent projects that deliver to its UPs.

While the joint evaluation of the research results in an industrial setting is essential to the success of the Centre, the industrial focus seems to encourage the Centre not to pursue research avenues that would be advisable from a longer term scientific perspective. The panel recommend that the Centre to achieves a balance between developing its scientific competences and delivering to industry and seeks synergies between projects and its user partners. Although the financial rules of SFI permit SFI-centres without a cash contribution from partners, the panel were disappointed that CERTUS has not secured such contributions. Additional funding would permit the Centre to strategically build its future in important new areas strategic to all partners. This should be considered for the final period.

As discussed at the evaluation meeting, the user feedback in the evaluation paperwork on the strategic value of CERTUS to the partners is mixed. The evaluators were pleased that the Board had already planned to review this feedback and aimed to be in contact with individual companies to establish how the feedback could be improved by increasing alignment with the user partners.

8 Gender aspects

Taking into account of the structure of equality of opportunity in the software engineering area CERTUS has a good percentage of females. The panel encourages CERTUS to keep up its good work, especially in its further recruitment. CERTUS is commended for its international open environment.

9 Financial aspects

The centre has good control of its resources. However from the written documentation it is difficult to distinguish between the core funded projects and the adjacent projects. It was also observed that adjacent projects supported partners other than the centre UPs. The panel was disappointed that adjacent projects were not leveraged more as a strategy to improve the overall centre capacity for further research in verification and validation. This approach is of special importance to CERTUS sustainability as a collaborative partnership. CERTUS is encouraged to quickly put more focus on detailing the financial and capability consequences of its exit plan including securing further public money to the benefit of its UPs.

10 Future activities

From the documentation the panel was initially impressed by the plan for CERTUS beyond the eight year funding. However presentation of the exit plan showed it was only as yet a first outline. The panel consequently encourages strategic discussion at Board level to realistically develop this. The panel thought there was a danger in solely aiming for a testing service facility without a plan to start adjacent projects to the benefit of the UPs. The potential consequences of this is that the research capacity that has been built up will be transformed to consulting and contract oriented activities alone and reduce the likelihood of being an excellent internationally recognised environment.

11 Conclusion and recommendations to the centre

The evaluation showed that the Centre Director was doing an excellent job of delivering the Centre. It also demonstrated that the Centre was effectively collecting management data, importantly this allows confirmation of the host in kind contribution to the Centre.

The new science being generated by the Centre is excellent (“more than good”) and is being published and disseminated in ways appropriate to the Centre domain. It also builds upon the heritage of the founding Director. Conference attendance is important in this fast moving field where innovations are first presented at very competitive peer-reviewed meetings, and also allows the Centre to keep abreast of “hot topics”.

Discussion with the PhD students and post-docs confirmed their quality and commitment to the field. Importantly it showed that they had good insight into the problems of and approaches necessary to work at the industry research interface.

Simula is to be congratulated for its recognition for working for gender balance.

Moving to a difference phase of operation highlights that Centre should:

1. Recruit post-docs from outside CERTUS and particularly invest in more PhDs to improve capacity in new research fields important for the future of an internationally competitive CERTUS. It should develop its research capacity in a wider portfolio of verification and validation techniques pertinent to testing including model-based research. This may require a reconsideration of the business model including securing additional funding from industry partners.
2. Connect CERTUS to strategic universities in Norway by including them as partners.
3. Start strategic collaborations with key international centres.
4. Re-visit the business model for the future of CERTUS and improve its governance by considering a appointing a chair of the CERTUS board and a Scientific Advisory Board that are independent from the host institution.

12 Recommendations to RCN

As was identified in the 2010 review of Centres, governance processes should be structured so that there is no risk of potential conflict of interest between the Chair and host institution and other bodies in host institution.

The evaluators encourage RCN to increase its investments in industrial PhD students.

Oslo, 11 March 2015

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Centre for Cardiological Innovation, CCI

1 Introduction

On March 12, 2015, the evaluation team met with the Director, project leaders, PhD students, post-docs, representatives of the host institution and representatives of the industrial and public partners of CCI. In the morning the discussions centred on the research at CCI. In the afternoon there was a meeting with students and post-docs as well as discussions on management and organisation of CCI. This evaluation is based on these interviews and on the extensive written report and self-assessments supplied to us beforehand. We thank the whole CCI-team for an extremely well-organised meeting as well as very open and informative discussions.

2 Research activities

The research carried out at CCI covers a broad range of disciplines, which are associated with different competences and scientific cultures - spanning from clinical work and clinical research, ranging over biomedical engineering to numerical simulation and applied mathematics. The integrative approach of CCI aims to exploit these different competences in order to develop the next generation of ultrasound systems, new technologies for CRT, and new techniques for patient specific simulation. CCI is also a benchmark for its integration of academic, business and clinical (known as the “ABC” model) stakeholders in translational research. From a clinical perspective, Sudden Cardiac Death (SCD) and Heart Failure (HF) are the focus.

Research is subdivided into four work-packages (WPs), i.e. SCD risk assessment, image guidance and fusion, multi-modal data acquisition for ischemia, patient specific modelling and simulation, and planning tools for Cardiac Resynchronisation Therapy (CRT). The work packages are designed such that - to a certain extent - they can benefit from each other. WP 4 will benefit directly from WP 3, and partially WP 1, and the results from WP 1 and WP 3 are combined for ARVC (arrhythmogenic right ventricular cardiomyopathy) risk stratification.

The overall profile of the research is therefore clearly based at the interfaces between clinical needs, industrial technology, engineering, and numerical simulation. Internationally, the research both carried out and proposed is clearly at the frontier in this area.

New task 1.3, which aims at the development of clinical indices for heart failure, combines data evaluation methods with solution methods for inverse problems. The new Task 1.4 is also concerned with the detection of risk parameters and will be carried out in cooperation with Padova and Mayo Clinics. Both tasks are precise in their description and are natural consequences of the work carried out in the centre to date. Clearly, these are positive and constructive developments and demonstrate increased focus. This is a population that is well served by using the multi-disciplinary analytical approach.

Task 2.2 has been added, which addresses fast forward electrophysiological simulations aiming to predict changes in the T-wave due to ischemia. The task is described clearly, but more information on the approach and how simulated and measured ECGs will be matched could have been provided.

Task 2.3 aims to detect scar and fibrotic tissue by fusing ultrasound, mechanical, and ECG data. This is a very interesting, again high risk/high gain, however no mention is given of whether new

parameters are going to be incorporated in this model, or if standard Q-wave and ST-abnormalities are going to be used in an artificial intelligence model.

Task 3.1 is now focussing on right ventricular geometric modelling. This is a reduction in scope compared to the originally proposed Task 3.1. However, the re-scoped Task 3.1 is much more realistic and precise than the original Task 3.1, thereby improving the quality of the research plan. However, limitations in imaging the RV are well-known, and some problems have been circumvented by other vendors on the market by using partial measurements fused to a model of the RV. The project is not described in terms of a break-through in coverage of the RV using ultrasound, but aspires to acquire normal reference values from the population.

Task 3.3 has been re-scoped and is now focussing on geometric and functional patterns for identifying abnormalities. This task also now has a clear description and has built upon understanding generated during the first phase of the centre. The work to define the earliest changes of a phenotypic expression of ARVC is daunting, but of great clinical value.

Work Package 4 on lead placement is new and not yet subdivided into tasks. A general description is provided. The topic itself is interesting and the clinical relevance is also very high. Again, the proposed research can be considered high risk/high gain. Finding a (nearly) optimal solution to the problem of lead placement requires a sequence of non-trivial problems to be solved (including PDE-constrained optimization problems in the simulation component). The reviewers encourage the partners to be more detailed and to develop a clear plan for this WP, as it is scientifically and clinically very interesting and important. The need for cooperation with cardiac surgeons was discussed with the project leader.

The work in all of the four work-packages requires strong interaction of clinicians, engineers, mathematicians, and natural scientists. The necessary competences for the research and development work are provided by the different partners in the CCI and it is expected the proposed goals will be achieved.

Clearly these topics require a research unit of critical mass, this is provided by the CCI. The close proximity of clinicians and engineers and the cooperation with the industrial partners seems to work effectively and is well organized.

3 Internationalisation

The Centre is building upon and acting as a concentrator of ideas from the national research community. For instance their research centre builds on previous achievements of the Department of Cardiology at Rikshospitalet. Several of the ideas promoted in the CCI have a previous history, such as the principle of wasted work promoted by Professor Smiseth and the idea of mechanical dispersion by Dr Haugaa. Also, previous scientific work at Arendal hospital has looked at ways of identifying patients with acute coronary occlusions that do not show up as STEMI, and thus are not treated by primary PCI. That said, it is clear that these research topics have continued to be explored in the present organization of CCI and have had an international acceptance.

The Centre cooperates with other deformation imaging centres such as Leuven (dHooge, Belgium) and Pittsburgh (Gorcsan, USA). Previous work has shed some doubt on the use of 3D in strain imaging and the CCI could possibly benefit from formal cooperation with Barcelona (Bijnens) and Leuven (dHooge) unless this is addressed by GE in direct contact with those centres. In ARVC, there is extensive cooperation within the Nordic ARVC registry and some cooperation also with the Mayo clinic. It should be borne in mind that the ARVC field is rapidly advancing and there are other registries that could be partners such as the Swiss registry and the US registry. Dr Haugaa is the cardiac genetic specialist in this project, however it is unclear

whether she can also cover genetic analytical details or if additional external competence should be added to the project. The panel commend the new initiative by Kristina Herman Haugaa to connect CCI work with the US and Canada.

Some of the successful PhD's of this group have performed post-doc studies abroad, but relatively few people from abroad have been accepted into the programme in Oslo. Furthermore, no one of the PhD students that were interviewed had plans to perform part of their PhD work in other research groups abroad.

Finally, the International Scientific Advisory Board had some suggestions as to the relevance of the "wasted work" project that need to be discussed in the evaluation and continuation of that particular work package. Also, the ISAB is an all-male group which is somewhat surprising since there are female researchers within the field, in Europe as well as in the US.

4 Researcher training, engagement in education

The research performed within the group is excellent and innovation is taken care of primarily by the participating companies. Medical research students however seem to receive little formal training in the innovation aspects of translational research. We have some concern regarding the availability of research supervision for the clinical PhD students. For instance there are only two faculty members supervising in WP 1.2, the largest and most active work package, Thor Edvardsen and Kristina Herman Haugaa, and that these supervisors are also leading the new work package WP1.4. This has had impacts, for example when supervisors have been on international secondments. Naturally, some supervision will be given by other people within the group and some practical help given by other students. However, for the future success of research education and to secure the availability of new talent for future research supervision, the creation of additional faculty tenured positions is of paramount importance.

Efforts have been made to offer research courses that are of benefit to engineering as well as medical PhD students, examples are a course in cardiac anatomy and another in ultrasound physics. Thanks to the CCI, engineering students are exposed to patients, and medical students have some familiarity with the problems of mathematical simulations as applied to patient management.

The group of PhD students do not consider themselves to be part of a "School of research" at the CCI. Whether that is negative or of no consequence to their education should be discussed. International benchmarks, however, consider formal research training and training in relevant transferable skills such as commercialisation and translation in clinical settings to be important. Further, some regular formal review and revision of their research plans and some external support and mentoring would allow the students more independence and would strengthen the human aspects of the PhD programme.

5 Plans for final three-year period

The overall plan for the final three years is good with a high probability of success. However the Centre should carefully consider how it coordinates its work in its new and more exploratory areas when this is carried out by different individuals at different career stages in different partners. This is reflected in the request for additional details in some of the plans and in the Centre's own SWOT analysis highlighting the need for project management. The Board is encouraged to prioritise the issues and opportunities arising from the SWOT and define and take appropriate action.

6 Organisation and Management of the Centre

The work is clearly nationally and internationally visible. Centre identity is less clear and there are opportunities for some improvement in the visibility of CCI as a centre. Board and Management processes are good. Communication is good including an excellent web page. While the interactions with the host are generally excellent, links with education could be better, for instance there are opportunities to bridge to Masters level engineers. The Centre makes a significant research contribution to the host and all other partners.

The panel was concerned with respect to the potential for conflict of interests with the Board. These take the form for instance of the consequences of Board and Management team members having multiple roles. The panel recognised that the double vote of the chair ensured that user partners had a majority and that the members of the Management team have the right to attend the Board, but do not have voting rights (Ex Officio members). The panel encouraged the Board to keep in mind that it is acting in the best interests of the Centre and as a representative of the funder.

7 User partners and other innovation aspects

The evaluation panel was extremely positive with respect to user partner involvement and interaction within the CCI. We also observed that the choice of UP has been carefully tailored not only to take account of international value chains but also to be congruent with the overall vision of the centre. However the centre should consider strategically adding further companies as partners in order to become even stronger in the international arena. This is of special importance for the life of the centre following the eight years funding from RCN. The panel encourage the board to take clear action to address this issue during the final three years.

The centre is commended for its excellent model for commercialisation and the output in forms of patents and licensing.

8 Gender aspects

The centre show good performance with respect to gender and high awareness of this issue. However there is potential for improvement in the composition of the ISAB in combination with the opportunity to add research competence within for example simulation and modelling, e.g. by engaging with Ellen Kuhl, Stanford. This will also strengthen the visibility of the centre internationally. This is of special importance to future opportunities for the centre.

9 Financial aspects

The financial contribution from partners is primarily in kind. For the final three years the panel wish to see more cash contributions directly or indirectly to the centre (for example by securing adjacent projects with partners). We also encourage the centre to make more efforts to increase external and internal fundraising. The additional resources should be used to strengthen strategic research fields necessary to secure the future of the environment, i.e. to increase its excellence on an international level.

10 Future activities

The evaluation panel observed that the board clearly have not yet started a strategic discussion on centre continuity after the eight years of RCN funding. The panel strongly recommend the board take this responsibility as a matter of urgency in order to secure the future of this excellent environment. The panel also emphasize the importance of embracing new science fields/partners and new potential industrial partners in the value chain both at a national and international level.

11 Conclusion and recommendations to the centre

This is an excellent and highly performing centre. It has a strong and well-articulated vision which is being translated into high-risk high-return science and tractable and important applications at the clinical-engineering interface. This in turn is delivering prototypes that are being industrialised into products by user partners. Their work is delivering clinical impact and improved outcomes and their approaches are being applied internationally in the clinic with consequences on the reduction of healthcare costs as well as delivering improved healthcare quality and security. The clinical aspects of the research are complemented by significant progress in simulation methods and tools. It is a particular strength of the centre that numerical simulation and clinical research are well connected and benefit from each other. The economic impact of the Centre is clear in particular by its contribution to the industrial user partners by both additions to their product range and by increasing the research intensity at their sites. These success stories should be formally captured.

The Centre has good leadership with clear succession. Management processes are effective and thorough with good use of ICT. Good evidence of added value from the Centre was presented spanning from increases in publication output to increases in protectable and protected intellectual property. That the excellence of the science crossed all three of the Centre major partners was clear and a significant differentiator. The Centre commercialisation model was straightforward and effective.

Moving to a difference phase of operation highlights that Centre should:

1. Provide more details and to develop a clear plan for WP 4.
2. Increase opportunities for PhD students and post-docs to:
 - a. visit international research environments
 - b. visit user partners for longer periods
 - c. have their own budget for taking initiatives for example for training in commercialisation, leadership and other career and group identity boosters.
 - d. industrial mentors should also be considered for the PhD students.
3. Re-organise the board and/or management structure to ensure no potential conflict of interest.
4. Complement the ISAB with one or two persons in scientific fields relevant to new areas of work. Equal opportunity must be considered here.
5. Find resources for additional 2-3 positions in the centre to ensure the future proofing of scientific competences and prevent overload of current leading senior staff. This should also consider the opportunity to embrace new scientific fields to ensure international future competitiveness. The board, host institution and UiO have major responsibilities for this issue.
6. Consider adding new strategic industrial partners and securing cash contributions from industry to secure the future sustainability of the centre activity.

12 Recommendations to RCN

All centres need to think more carefully about their long term future.

Boards must recognise that they are acting for the best interest of centres and take care of conflicts of interest.

Industrial PhD studentships should be considered as an opportunity for all centres to enhance the impact of SFI-programme.

RCN is encouraged to facilitate mentoring programs for different roles in the Centres. Exchange between different centres is one mechanism for addressing this issue.

Oslo, 12 March 2015

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Drilling and Well Centre for Improved Recovery, DrillWell

1 Introduction

On March 13, 2015, the evaluation team met with the Director, project leaders, PhD students, representatives of the host institution and representatives of the industrial partners of DrillWell. In the morning the discussions centred on the research at DrillWell. In the afternoon there was a meeting with PhD students as well as discussions on management and organisation of DrillWell. This evaluation is based on these interviews and on the extensive written report and self-assessments supplied to us beforehand. We thank the whole DrillWell-team for an extremely well-organised meeting as well as very open and informative discussions.

2 Research activities

The Review by the scientific experts was conducted in a two hour session with SFI DrillWell scientists and project managers in a full program run-through. Key conclusions of the panel from this review are that:

- the full potential of the three DrillWell programmes is not yet realized
- the individual projects are of varying quality and maturity, some are clearly on the leading edge but others lag and are of more questionable value
- the individual pieces of work appear to be somewhat fragmented and not tied together in an overarching "big" vision commensurate with a world-leading drilling research programme and the high level of funding provided for this programme. The lack of interaction between the PhD students is symptomatic of this. They did not clearly identify themselves with a DrillWell "identity" and their mutual interaction mainly revolved around a single yearly seminar with the industry reference group
- a sense of urgency as well as a performance culture of aggressive pursuit of being the leading drilling research institute in the world appeared to be sorely lacking within DrillWell. Yet this is absolutely essential if DrillWell is to achieve its goals. Note that R&D is a competitive business, and that other research institutes around the world are pursuing their goals far more aggressively than DrillWell appears to be.

An overview of expert feedback on the programme, its individual elements and projects is given below:

- Programme 1 is devoid of the involvement of PhD students and the development of new talent. In some cases, e.g. the mature modelling work done by Cayeux et al., this is understandable, but for the other projects it would be beneficial if new talent could be developed, for subsequent industry deployment for example.
- Programme 2 appears to be the weakest of the three programmes despite its large promise and potential. This programme either should be taken to the next level with more focus and significantly increased resources, or otherwise discontinued.
- Programme 3 appears to be well on track with meaningful deliverables, publications, patents, support by industrial partners and their engagements with PhD students. As such, it is a good example for the Centre as a whole to emulate and build upon.
- The true achievements and highlights of the programmes should be better publicized and communicated to attract attention and build external recognition of the DrillWell brand. This appears to be an opportunity missed, possibly because of restrictions with respect to the communication of information labelled "confidential".

Programme 1 – Safe and Efficient Drilling Operations for Cost Reduction

ROP Management and Improvement

This project is led by a world-leading researcher (Eric Cayeux) featuring fully integrated wellbore / drillstring modelling (hydraulics, hole cleaning, drillstring dynamics). It is clearly state-of-the-art and has been progressed to a level of maturity where prototype systems can be developed and transferred to end-users in a Phase II development. This Phase II development is strongly supported by the reviewers. The work on the Gyda well is seen as a highlight, despite the fact that Talisman (now acquired by Repsol) has left the program. This work should be extensively published and given the credit it rightfully deserves. Publication will serve the purpose of recognizing DrillWell as a world-leading R&D initiative.

Formation Integrity / XLOT

It is difficult to see the fundamentally new aspects of this project, which seems to be more concerned with internal competence building and gate-keeping than progressing the state-of-the-art. The only new aspect that was brought to the attention of the reviewers was the work on 3D modelling which has not yet been pursued despite guidance from the industry partners. When progressing 3D modelling, it is important not to remain inwardly focused, but consider what has been achieved in recent years with respect to 3D modelling of hydraulic fractures in shale. In addition, potential global collaboration should be considered with R&D group that have expertise in such advanced hydraulic fracture modelling. In general, this project should be subjected to internal review and scrutiny, with discontinuation as a possible option.

Determining Changes in Oil-Based Mud during Well Control Situations

Although oil mud formulations have changed since the 1960's and 1970's, this project should clearly articulate what the fundamentally new aspects are when compared to the pioneering work that was done in this area by Bourgoyne's group at LSU. Currently, the project seems more like high-end technical service work, i.e. gathering gas solubility data for use on HPHT wells, rather than truly pushing on the boundaries of well control science. This project should also be subjected to internal review and scrutiny, with discontinuation as a possible option.

Managed Pressure Drilling (MPD) in Depleted Reservoirs and Long Wells

MPD is a very important technology that will undoubtedly gain further prominence in drilling in future. DrillWell appears to be making meaningful contributions to progressing MPD and MPD automation technology. The only concern, which will be further explored below, is that the focus appears to be rather inward-looking rather than exploring strategic partnerships with R&D institutes and universities outside of Norway.

Programme 2 – Drilling Solutions for Improved Recovery

Geosteering and Deep Imaging

The novelty and deliverables of this project were not immediately clear to the reviewers. Interviews with the PhD students revealed that actual involvement with an operator (ConocoPhillips) on geosteering had only recently begun. A higher level of operator involvement and technical direction from geosteering subject-matter experts will benefit this project.

Flexible Earth Model

Considering its ground-breaking potential and impact, this project is critically under-resourced, with only a single researcher (who is also a PhD student) progressing the work on new modelling concepts. With under-resourcing comes the tangible risk of the project not delivering anything meaningful. It should be remembered that the project aims to deliver a meaningful alternative to

the approaches provided by the service industry, i.e. Schlumberger's Petrel. A way should be found to accelerate this work, potentially through strategic partnerships.

Programme 3 – Well Solutions for Improved Recovery

Life-Cycle Well Integrity

This project, which explores cement sheath integrity, cement formation bonding and reliability of downhole safety valves, is well on its way to deliver meaningful results and has attracted the justified attention of operators and service companies alike. The only technical recommendation provided by the reviewers is to conduct integrity and bonding testing under downhole conditions, this requires extension of the current experimental capability.

Plug & Abandonment (P&A)

This project arguably has the highest immediate impact of the entire DrillWell programme given the considerable future P&A challenges facing the industry. Good progress appears to have been made while exploring new materials and technologies. It was particularly encouraging to see the active participation in this project by the graduate students, high activity in patenting and publication, as well as capitalizing on the strengths of the centre as a whole in terms of leveraging internal capabilities, accessing industry partners and obtaining their guidance.

Production Optimization through the Use of Water Shut-off and Intelligent Well Completions

For this project, it appears that assessment of global EOR expertise and brokering effective strategic partnerships has been lacking. Other groups around the world (e.g. EOR groups at UT Austin) are far more advanced in their understanding of both EOR as well as water shut-off. As mentioned earlier, the focus here appears to be internal competence building rather than truly progressing the state-of-the-art in EOR and conformance control. The project should be critically reviewed and possibly re-tooled to make a truly world-class contribution.

3 Internationalisation

As indicated above, the opportunities for further international collaboration appear to be present but not fully explored by the DrillWell Centre. Because of this, DrillWell has remained largely contained within Norway, which has hampered both meaningful scientific progress as well as impeding international recognition. Even though the DrillWell effort has several world-class scientists associated with it, this has not translated into DrillWell becoming an internationally recognized name for technical excellence. We strongly recommend that DrillWell becomes less internally oriented and explores international partnerships more.

A first effort that should be undertaken is to map the global expertise in the areas in which DrillWell wants to be a major player. DrillWell should subsequently reach out to global centres of subject matter expertise to explore the opportunities for alignment and collaboration through exchange students, scientist exchange, joint approaches to industry sponsors and joint execution of R&D. The opportunities to deploy young international scientists more, e.g. through post-doc positions, should be further explored.

4 Researcher training, engagement in education

The reviewers did not have any particular concerns about researcher training and education. All the PhD students appeared to be eager and excited about their work, with the majority of them indicating that they wanted a career either in academia or at the interface between academia and industry. A concern did arise, however, with supervision and guidance of some of the students on particular projects. As indicated above, some of the projects appeared to be suffering from under-resourcing and/or a lack of focus, "meandering" along without meaningful deliverables and

achievements. This then exposes underlying issues with student preparation, supervision and guidance. Overall, DrillWell appears to be behind the times in how students are trained and mentored. This should be addressed, as this will adversely affect future employability of the students.

5 Plans for final three-year period

The proposed plans for the final three year period presently lack definition and focus. This should be urgently addressed. The involvement and peer-review/assist of an international advisory panel is considered to be essential in this regard. DrillWell must be able to present a comprehensive plan that is vetted by this panel and that contains specific information addressing the remaining three year vision, challenging goals, deliverables and milestones, resource allocation, pro-active partner involvement and timeline.

6 Organisation and Management of the Centre

While individual scientists are visible internationally and the collaborating institutes are well known, DrillWell itself has very little international presence.

The Board and Management and management processes of the Centre reflect the structures used in many of the Centres. Technical input to the work of this Centre is at four levels: a little at the Board, some in the Management Group, significant capability in the Technical Group and detailed input at project Reference Group level. This in combination with the Director's role as "secretary" of the Board makes the technical vision diffuse, this vision should be the business of the Board. Project management processes should be stronger and reflect international industrial practice in the sector. Research cultures should also reflect international norms with respect to ambition, pace and impact.

Formal processes of communication in the Centre are well established. There are good relationships between IRIS and SINTEF and between IRIS and the University of Stavanger (UiS). No senior representative of the University of Trondheim was available, so these relationships could not be directly explored. The host Institute contributes some of its best researchers to the Centre as does SINTEF. The activity is strategic to UiS research.

7 User partners and other innovation aspects

The panel observed that the centre reflected the broad needs of the partners and saw their engagement and involvement in the projects. The activity is clearly of strategic importance to the technology supplying partners. However the tendency to fragmentation and the loose connections between projects have had a severe negative impact on the potential of added value for this centre. The potential to improve the impact for the partners is high but will require effort to achieve. This potential was reflected by the scale of the budget of the centre at approximately 140 million NOK 2011-2014.

It was also established during the interview that there have been more deliverables from the centre than was reported to RCN and the panel, for example by circulation of confidential reports. During the evaluation it was also clear that the centre had achieved a number of key results, but it was disappointing that these were not as clearly visible to the partners as they might have been. Knowledge transfer is strongly recommended by the panel to be better expressed in the future, for example in forms of KPI targets. It was also not clear to the panel what the magnitude of the added value of the main results from the centre is to the partners.

It was also observed that the centre is to start the development of prototypes and that the centre has been involved in patent protection of intellectual property originating from the centre. However it was disappointing that this had not been reported more explicitly as a KPI.

The innovation process also has the potential for improvement during the final three years and it should be accelerated by using targets for innovation KPIs including technology transfer, building of demonstrators, co-authored publications and confidential technical reports.

The composition of the centre partner group also has the potential to be better suited to the future needs of the industry and the centre scientific programme, for example the centre should consider adding service companies in some of the scientific domains of the centre.

8 Gender aspects

The equal opportunities in the centre and the host institution are good in the light of current male domination in this industry sector. This is especially true for the PhD students. The centre and the host are well aware of the challenges here. The panel strongly encourage the centre to secure gender balance in their new SAB.

9 Financial aspects

In addition to its RCN funding, the centre is well funded by industry partners. The panel observed lack of clarity on the reporting of additional funding outside the centre that had been a consequence of the centre activity. The centre does not seem to have a clear strategy to increase its overall capacity. The centre should increase its capacity by targeting the different funding schemes available both in Norway and in the EU H2020 programme.

10 Future activities

The long term plan for the centre is as yet unclear and consequently this should be taken into account in a revised work plan for the final three years.

11 Conclusion and recommendations to the centre

This review has concluded that a proportion of the work in the Centre is important and delivers impact and that there are high spots of scientific excellence. However much of the work is solely sustaining an existing competence or is scientifically disappointing and this is not appropriate for this source of funding. There is good project work in the Centre but much of it appears to be effectively bilateral because of industry engagement via reference groups.

There is a good interface to education especially at Masters level with 41 students already engaged with the Centre. Discussions with PhD students funded by the Centre confirmed their quality, showed a good understanding of the fit of their individual work of the Centre and good exposure to industry experts and to practice in the field. It also showed that there are some clear “young stars” within the PhD programme and that the students were aware of the value of “tough customers” to guiding their work.

Discussions during the day showed that the Centre had committed users, a strong industrially dominated Board and senior industry advocates including those that were already identifying processes to permit businesses to work with the consortium in the long term.

The evaluation panel found several important opportunities for improvement:

1. Reporting was disappointing and a lack of depth in both the reporting and the presentations did not assist the evaluation process. The emphasis should have been to show succinctly that the programme is world-class and operating at the cutting-edge of science.
2. The Centre should work harder to capture and communicate their success stories and to increase their volume of refereed journal publications. The evaluators noted that Centre output and impact included a large number of confidential partner reports to project reference groups.
3. Collection of management information was disappointing and should be improved – this particularly showed in the auditing of effort (FTE) by the Institute partners, a key indicator of Centre scale and importantly Centre value for money.
4. Plans for the final three year period must be much better elaborated with respect to aims, objectives and measurable milestones and deliverables.

Most significantly the panel considered that the Centre is a missed opportunity and has yet unrealised potential. Consequently there are more fundamental issues that must be addressed, as follows:

5. The Centre requires a technical re-visioning/re-invention. It must establish the niche in which its activity can make a world class contribution and achieve international visibility with a balance of activity that delivers excellent science and value to users,
6. The pace and scale of delivery must be accelerated and the Centre must demonstrate more responsiveness to the changing science environment and user priorities,
7. The Centre must be more outward looking and seek to exploit international collaborations to Norway's benefit,
8. The Centre should immediately establish an international scientific advisory committee and this should be engaged in the re-visioning process. It should consider whether the composition of the board should be strengthened with the addition of a high achiever at the scientific-commercial interface.
9. The partners must create more synergies and focus on "centre-ness" as well as the delivery of individual projects.
10. Centre funding must be more than just a reliable resource for the partners to help them maintain headcount. Additional funding must be systematically pursued in order to increase the pace and scale of the Centre. This should include industrial PhD funding.

12 Recommendations to RCN

Consequently the panel wishes to empower the Chair of the Board to initiate and monitor the necessary actions by the host institution to re-invent DrillWell to the satisfaction of the stakeholders and this should be demonstrated in a further review in 18 months. This process must be systematic and take account of other work internationally.

Stavanger, 13 March 2015

John Thorogood
Scientific Expert Evaluator

Eric van Oort
Scientific Expert Evaluator

David Williams
Chief Generalist Evaluator

Mattias Lundberg
Generalist Evaluator

Sea Lice Research Centre, SLRC

1 Introduction

On March 24, 2015, the evaluation team met with the Director, project leaders, PhD students, post-docs, representatives of the host institution and representatives of the industrial and research partners of SLRC. In the morning, the discussions centred on the research at SLRC. In the afternoon there was a meeting with students and post-docs as well as discussions on management and organisation of SLRC. This evaluation is based on these interviews and on the extensive written reports and self-assessments supplied to us beforehand. We thank the whole SLRC team for an extremely well-organised meeting as well as very open and informative discussions.

2 Research activities

The panel were impressed with the range of core competencies encompassed within the senior research team at the Centre. The range of expertise spanning veterinary medicine and parasitology, through nutrition, immunology and biochemistry to molecular biology and genomics represents an extremely diverse and singularly appropriate skillset. The infrastructure put in place for the maintenance of line-bred lice strains and to facilitate experimentation, LiceLab (WP6), is unique on an international level. This has been a key factor in facilitating fundamental work in the other work packages. Similarly the LiceBase (WP5) database has contributed to efficiencies in retrieving information and in facilitating cross cutting research between the work packages. The fundamental work undertaken in the work packages, WP1 - WP4, has led to significant advances in the state of knowledge in a range of areas including the sea lice genome, resistance pathways, developmental biology of *Lepeophtheirus salmonis* and immunomodulation. A feature of the research is the cross disciplinary synergies evident in the approach to the research. This was evident in the areas of resistance analysis and immunomodulation in particular.

There is a need to develop the fundamental advances made to date so as to provide the basis for the development of tools that are relevant to the needs of the industrial partners and end users.

A total of 29 peer reviewed publications have been produced together with a large number of presentations at conferences and meetings. Together with publications submitted and awaiting acceptance this represents a significant addition to the body of knowledge in the area of sea lice research. It is not possible to comment on the number of presentations at recognised international conferences as this data was not available to the panel.

The profile of the SLRC has been increased by participation at the international sea lice conference in Portland, Maine in 2014, where one of the Centre's post-doctoral researchers was presented with the young scientists' award for her presentation, and at the meeting of the European Association of Fish Pathologists in Keele, England in 2014, where one of the Centre's PhD students won a prize for her poster on selective breeding for resistance to sea lice.

3 Internationalisation

While the Centre has engaged in international collaborations to good effect, much of this has been within the confines of the consortium and its associates. This has no doubt contributed to the excellent focus and efficiency of the operation of the work plan to date. As the Centre moves towards its work plan for the final three years it is important that the Centre puts in place

structures to encourage meaningful international collaboration with other centres of excellence, nationally and internationally.

4 Researcher training, engagement in education

The SLRC currently has eight PhD students and 13 post-docs, eight funded by SLRC, working on various aspects of the project. Some of these students are now nearing the successful completion of their studies. Students have published six papers already and we look forward to this increasing greatly. When the panel met the PhD students and post-docs it was obvious that they are enthusiastic and positive about the Centre. The first cohort of PhD students underwent existing classes at UiB (University of Bergen) and NMBU (Norwegian University of Life Sciences), but a new SLRC-specific course, albeit just one week long, is scheduled for Summer 2015 and is very much welcomed by the panel. The panel recommend training or courses of a general character, e.g., Project Management, Intellectual Property Rights and Commercialization for the Centre's PhD students; some of these could involve the commercial partners. The SLRC uses modern genomic and transcriptomic approaches: much sought after skills in the jobs market. The panel was concerned that the students appeared not to be involved in next generation sequencing data analysis; given the competency profile of the Centre, this is a missed opportunity.

During the site visit, Centre staff and commercial partners voiced reluctance for PhD students working on industry projects because of perceived difficulties of publication in commercially sensitive areas. The panel regards this as a missed opportunity and encourages the Centre to review this stance.

Personnel from SLRC (academic staff, post-docs and PhD students) teach across UiB and NMBU. Masters students are co-supervised by PhDs and post-docs: an excellent experience for future research leaders.

5 Plans for final three-year period

The Centre opened in September 2011 and is in its fourth year of operation. At the evaluation meeting, the Director and industrial partners outlined a process for the development of its annual work plans that includes meetings between industrial partners and work package leaders, with ultimate approval by the Board. The action plan for the remaining Centre funding period has a strong emphasis on further scientific developments. At this stage the panel would expect to see more focus on specific innovation goals, informed by the industrial partners and other international stakeholders, including development of vaccines and drugs candidates.

A number of concerns were highlighted with respect to the membership and role of the Scientific Advisory Board (SAB) which meets every 18 months. The SAB includes two UK academics and last met in 2013. The record of this meeting was in the form of an agenda and hand-written notes from the Director. Based on these notes, the SAB met with the WP leaders but not the wider Centre and research community. The SAB is due to meet again in May 2015. The rationale for meeting every 18 months, especially given the annual research planning process, is unclear. In addition, a written report from the SAB should be regarded as a minimum requirement of a Centre such as this. More broadly, the limited engagement with the SAB, and the absence of processes to integrate their perspectives into research planning activities, was seen as a symptom of a wider issue related to the limited exposure of the Centre's activities to international academic scrutiny and peer evaluation.

6 Organisation and Management of the Centre

The Centre has a well-designed and informative web site that includes an intranet for members of the Centre. The Centre Director and Chair of the Board form an effective team in leading both

scientific and, increasingly, innovation activities. Succession planning for the future leadership of the Centre was not discussed but should be considered, especially in planning for after the RCN funding period. The Centre benefits from efficient and effective administrative support. From the partner evaluations, which overall were strong, communication was identified for an area for development. At the evaluation meeting a number of ways in which research is communicated within the Centre were highlighted. The host universities are strongly supportive of the Centre and its research has strong alignment with the UiB's forthcoming strategy. There is evidence of collaboration between researchers from the host institution and university, for example, through the LiceLab and co-authored publications.

7 User partners and other innovation aspects

The involvement of user partners is very good and the partners seem to articulate clear needs in the Centre. The Centre is aware of both the industry challenges and its potential to improve commitments from the partners and cross-fertilization between work packages. The panel strongly encourages the Board to take clear action ensure improvements in these areas happen in the near future to pave the way for higher impact in industry. The mutual mobility is good in Centre. From the information available to the panel, the extent to which publications were co-authored with the user partners was unclear.

8 Gender aspects

Equal opportunities and gender balance are good. We encourage the Centre to continue this work on all levels in the Centre, including the SAB.

9 Financial aspects

The panel commends the Centre for its funding strategy, including increased finance from user partners, as evidence of success. Finance reporting is excellent and should be seen as best practice for other centres. The panel was concerned that the Centre seems to be reluctant to add more partners, especially in the light of the need to start planning beyond the RCN financing period. The Centre could also put more efforts in adding associated projects during the final three years of operation.

10 Future activities

The Centre demonstrated sound scientific work; key challenges for the future lie in translating this science into industrially relevant innovations and in building international research partnerships that will be essential for the long term sustainability of the Centre and its research. The Board, Centre and host institution should prioritise the building of frameworks to enable and encourage meaningful international collaboration with centres of excellence in this and related fields. This should be seen as an opportunity both for the development of associated projects during the lifetime of the current financing period and as a pathway to future funding. The action plan for the remaining period of the Centre funding would be improved by more focus on specific innovation goals including development of vaccines and drugs candidates.

11 Conclusion and recommendations to the centre

This is an excellent and highly performing Centre. In this first period the Centre established a strong scientific platform and infrastructure that has been externally recognised by international awards and an increase in industry funding. The Centre has high potential to deliver economic impact, as has been shown in its performance to date, in terms of patents filed and products developed. For the coming period key challenges lie in increasing the international exposure of the research and ensuring the delivery of innovations to end users and other stakeholders. The

Centre has excellent administrative professional support. However, there remains potential for improvement in communication inside the Centre. The host institution is encouraged to consider succession planning as part of the planning for the final three years and beyond.

The panel makes following recommendations:

1. The Centre secures the LiceLab infrastructure, including the line-bred sea lice strains, as an international research facility (open to all with a mandate for international cooperation) beyond the initial RCN funding period of the Centre.
2. The Centre reviews the action plan for the remaining Centre funding period to be more focused on specific innovation goals including development of vaccines and drug candidates.
3. The Centre puts in place meaningful international collaboration with other researchers and centres of excellence before the end of and beyond the RCN financing period.
4. The Centre secures its future sustainability by including additional partners and other relevant stakeholders.
5. The Centre formalizes its relationship with the SAB and ensures that its views are considered in the establishment of future research plans.
6. The Centre enlarges its SAB to include between three and five international members.

12 Recommendations to RCN

1. RCN supports the Centre in securing the LiceLab infrastructure beyond the initial funding period of the Centre.
2. RCN improves the reporting of publications in terms of co-publication between researchers and industry and increasing the clarity of international visibility in conferences.

Bergen, 24 March 2015

Dr. Alan Bowman
Scientific Expert Evaluator

Dr. David Jackson
Scientific Expert Evaluator

Dr. Mattias Lundberg
Generalist Evaluator

Professor Alison McKay
Chief Generalist Evaluator

Centre for Service Innovation, CSI

1 Introduction

On March 25, 2015, the evaluation team met with the Director, project leaders, PhD students, post-docs, representatives of the host institution and representatives of the industrial and research partners of CSI. In the morning, the discussions centred on the research at CSI. In the afternoon there was a meeting with students and post-docs as well as discussions on management and organisation of CSI. This evaluation is based on these interviews and on the extensive written reports and self-assessments supplied to us beforehand. We thank the whole CSI team for a well-organised meeting as well as very open and informative discussions.

2 Research activities

In terms of its competence profile, the panel recognised promising pockets of academic strength and potential for scientific progress in the thematic areas. The number and quality of publications is developing positively as are research relationships with the business partners. A significant strength of the Centre lies in the extremely positive views the business partners expressed in relation to the Centre and the research impacts that have and are being realised in the companies. There is good potential for longer term industrial research cooperation.

In the research activities, the panel was concerned by a lack of focus on service innovation. Three of the main themes are business model innovations, service design, and organisational development. These areas look promising and could yield good academic merits and industry relevant results. However, the panel found it problematic that these areas remain as separate activities and appeared to have little in common and to be only loosely interconnected (as illustrated in Figure 1). This problem needs to be addressed and common ground needs to be built around and focused on the concept of service innovation. It is also important that interaction between these three thematic areas is improved.

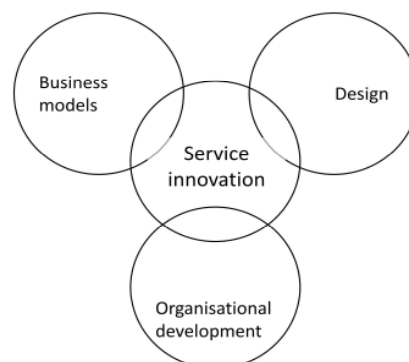


Figure 1: Current state of the research themes

The fourth theme, economics of innovation, is also very important but has not yet reached the same level of academic rigour as the other themes. To bring this fourth theme to the same academic level as the other three, it needs major scientific development and could benefit from stronger involvement of scientific economists. Ways in which the three Norwegian scientific partners contribute to the core mission of the Centre was unclear from the scientific presentation

in the morning. There is a specific opportunity to strengthen the cross research partner collaborations within the Centre.

The leadership of the Centre places a heavy emphasis on the delivery of outputs such as high quality publications. However, more focus on the new science and theories in service innovation being developed through the Centre is essential if such outputs are to be delivered. In addition, more clarity is needed on the extent to which specific publications resulted from the Centre’s activities; this was not clear enough in either the evaluation reports or during the interview session.

3 Internationalisation

The Centre has good relations with foreign research groups and centres with whom they have long term experience in collaboration. The Centre could consider whether the existing collaborating institutions cover all necessary competencies, e.g., economics of innovation and service design.

The Centre could also work more systematically to build an international profile so that researchers from abroad regard the Centre as an attractive research collaboration partner. Examples of such international profile building activities could include development of an international training activity, jointly authored papers with overseas scholars, research visits to overseas universities and regular visits to CSI by international scholars including PhDs.

4 Researcher training, engagement in education

The panel found that the PhD students at CSI have a lot of potential and they could make a major contribution towards the future success of the Centre. From discussions with the researchers, there seemed to be a demand for more PhD courses within the field of service innovation. Such courses can provide a very useful learning platform and a way to both strengthen the Centre’s profile internationally and achieve deeper cross theme research interactions within the Centre.

In addition to PhD courses, there is room for more extensive Masters level education in service innovation.

5 Plans for final three-year period

Plans for the final three-year period are promising. Strengthening the scientific base of the economics of innovation theme and improving interactions across the research themes would lead to an improved model for the Centre’s activities, as illustrated in Figure 2.

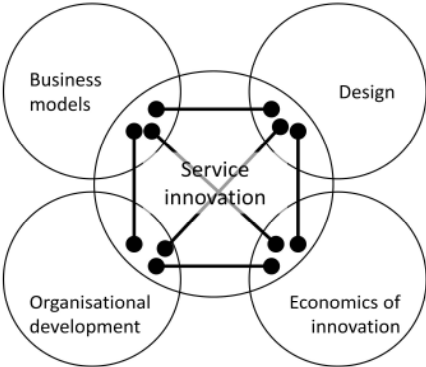


Figure 2: Four equally strong scientific research themes, interacting with each other

6 Organisation and Management of the Centre

Marketing of the Centre is very effective. The web site is well designed but would benefit from a review of its structure to ensure that information is only presented once. The Centre's brand is communicated well through the web site and associated artefacts, and the use of social media is to be commended. The Chair of the Board is the rector of NHH (Norwegian School of Economics). At the evaluation meeting all parties expressed their satisfaction with the current performance of the Board and management of the Centre. This arrangement has been effective in leading the Centre through recent administrative turbulence within NHH. However, going forward, the priority is now changing to focus on the delivery of innovations and there is a strong need for more focus on service innovation research; to support this, the post of Chair of the Board would be better held by an industrialist with practical experience of service innovations and industrial research needs.

The Centre appeared well organised and communication within the Centre is achieved through regular meetings including quarterly meetings between the director and theme leaders, and between the theme leaders and industrial partners. From the NHH web site, the Centre's research is regarded by NHH as a national [Norwegian] centre. For its long term sustainability, the Centre needs to establish itself as an international centre. Key steps towards achieving this status lie in gaining increased international visibility and improving its international reputation as a service innovation centre bringing together key competencies from three Norwegian research institutions. In the light of this issue, the panel was disappointed that the SAB had not yet met although a meeting is planned for June 2015. The Centre is encouraged to take this opportunity, as a matter of urgency, to explore ways in which it might improve its overall performance and visibility.

7 User partners and other innovation aspects

The reports prepared for the evaluation panel included very limited details of innovations delivered through the Centre. However, at the evaluation meeting the user partners provided several examples of innovations that have resulted from the Centre's research. The impact of these innovations was quantified in a number of ways including the number of employees and customers of the company concerned. For example, Telenor (with 35,000 employees and 200 million customers) described the global roll-out of a strategic marketing tool that builds on the Centre's research and DnB quantified the benefits of a project on digital trust in on-line mortgage sales systems in terms of reduced costs and increased customers and income. The partners also highlighted softer benefits such as supporting the maturation of a business to a service and customer-focussed organisation and the changing of staff mind-sets through cross-sector interactions between researchers and other partners, and company staff through the CSI network. In addition, the industry partners contribute to the research partners' research-led education strategies by bringing industrial perspectives (e.g., through invited lectures to undergraduate students and student projects with industry), so contributing to the development of future generations of professionals who will drive future service innovations.

The Centre's annual planning process is the key means by which the industry partners influence the research. There is some mobility of personnel to the companies. This is more systematic for PhD students, several of whom have access to data from the companies, and two industrial PhDs. In the final part of the funding period the Centre is encouraged to generate more publications co-authored with international collaborators and industry partners. The panel was impressed by the spin-out projects from the Centre such as the Moveon and Customer Care 2015 projects.

8 Gender aspects

The Centre is commended on its gender balance through all levels of its management structure and research projects.

9 Financial aspects

The recent departure of three industry partners has affected the financial balance of the Centre. This issue is currently being addressed by recruiting two new partners, each of whom is expected to make a cash contribution of NOK500k as an entry fee. If this plan fails then the Centre should consider other ways of achieving the balance required by RCN. This could be through reducing the Centre budget or increasing the cash contributions of existing partners. Given the model of annual financing, the Centre has some potential to improve and the panel encourages the Centre to consider a revised model where more cash is contributed to the Centre by existing partners. There was some funding of associated projects; this needs to be increased in terms of both the number of projects and the magnitude of the overall resources. These aspects are of particular importance in sustaining the Centre's long term activity beyond RCN funding.

10 Future activities

The Centre is commended on the start it has made in planning an exit process after RCN funding. We encourage the Centre to recognize and consider a wide range of possible future funding models when building a strategy for the future.

For its long term sustainability, the Centre needs to establish itself as a world-leading international Centre. In order to achieve such a position, the Centre needs to develop a strong academic track record in service innovation research and maintain fertile interactions with its business partners.

11 Conclusion and recommendations to the centre

During the day there was evidence of good science delivered to innovation mainly for three user partners. It was also evident that the knowledge transferred to the user partners has great potential for delivering societal and economic impact. However, the panel was disappointed that progress to identify clear success criteria and key performance indicators for innovations has not developed further at this stage, after more than three years of operation. The Centre has several serious scientific and innovation opportunities and challenges that need to be addressed as a matter of urgency.

The panel makes following recommendations.:

1. The Centre ensures the SAB is set up to act in the role of critical friends and provides a written report after each meeting to support the Centre in understanding its potential scientific contributions and prioritize activities funded by the Centre.
2. The senior scientists, post-docs, PhD students and user partners work to articulate a clear shared research vision and mission including the theoretical contributions in service innovation that the Centre aspires to before the SAB meeting 2015.
3. The Centre ensures and gets feedback from SAB on the revised vision and mission by the end of September 2015.
4. Within the existing themes, the Centre reviews priorities and reflects them in all future annual work plans.
5. The Centre puts more emphasis on the production of theoretically or methodologically innovative research publications based on specific Centre activities.
6. The Centre reviews its core competencies on an annual basis, draws in additional resources and capabilities as needed, and reserves Centre funds for this purpose.
7. The Centre establishes company-led service innovation projects that draw on and contribute new knowledge from multiple themes, and reserves Centre funds for this purpose.
8. The Centre reports progress clearly distinguishing between work that was supported through the Centre and work carried out through associated projects.

9. When reporting outputs and publications from the Centre, it only includes outputs (empirical and/or theoretical/methodological) that can be directly related to Centre activities.
10. The Centre leads an international PhD course on service innovation, e.g. in form of a summer school.
11. The Centre appoints as Chair of the Board an industrialist with experience of service innovation before the 2016 work plan is decided.
12. The Centre maintains a record of industry innovations originating from the Centre, including estimates of their values quantified in the form of KPIs.

12 Recommendations to RCN

1. As was identified in the 2010 review, RCN ensures governance processes are structured so that there is no risk of potential conflict of interest between the Chair of the Board, the host institution and other bodies in the host institution.
2. RCN gives clearer instructions and shares best practise to all Centres on the definition and use of KPIs.

Bergen, 25 March 2015

Dr. Jari Kuusisto
Scientific Expert Evaluator

Professor Jon Sundbo
Scientific Expert Evaluator

Dr. Mattias Lundberg
Generalist Evaluator

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Chief Generalist Evaluator

Centre for Research-based Innovation in Sustainable fish capture and Processing technology, CRISP

1 Introduction

On March 26, 2015, the evaluation team met with the Director, project leaders, PhD students, post-docs, representatives of the host institution, and representatives of the industrial and public partners of CRISP. In the morning, the discussions centred on the research at CRISP. In the afternoon there was a meeting with students and post-docs as well as discussions on management and organisation of CRISP. This evaluation is based on these interviews as well as on the extensive written reports and self-assessments supplied to us beforehand. We thank the whole CRISP team for a well organised meeting as well as very open and informative discussions.

2 Research activities

During the morning session the Director of the Centre noted that the primary aim of the Centre is to enhance the position of Norwegian fisheries-related companies as leading suppliers of equipment and seafood through the development of sustainable trawl and purse seine technologies. For this reason, the Centre activities are largely driven by the needs of the fisheries-related industry. Nonetheless, it became clear during the introductory presentation that the needs of stock assessment and fisheries management are also highly prioritized in the project. It is also noteworthy that many environmental organizations support the main objectives of the project. Clearly, the project paves the way to modern sustainable fisheries.

In trawl fishing, the major challenges were listed as the following: bottom impact, selectivity, fuel economy, catch quality and value adding. With purse seine fishing, the challenges are mainly linked to capture of non-target species and sizes, unaccounted mortality and fish welfare, lack of catch control and fish quality.

The project is tackling these challenges through six work packages, each having a leader and various numbers of other actors from the public and private sectors. Four of these work packages (WP1 - WP4) are led by IMR (Institute for Marine Research) senior scientists. WP5 and WP6 are led by the scientists from Nofima. There are a large number of associated projects.

The competence of the research team is high and many of the senior scientists are among the world leading actors in their fields. We were impressed by many aspects of this project. The work program is very relevant and timely. The work on developing new instruments, tools and methods has been highly successful and there is true evidence that the Centre's activities are driven in good and fruitful collaboration between the research organizations and private industry. The project has already produced at least ten new innovations and products, and more innovations and products are in the pipeline. It is obvious that many of these innovations and new products will have a long-term industrial impact and will be utilized by the international research community as well as by the fishing industry. In most of the work packages the minimum criterion of critical size is achieved, but it is obvious that the work would benefit from a larger number of scientists and, in particular, of junior level scientists (see below).

The production of international scientific publications has not yet been as effective and successful as the development of innovations and new products. Partly because of this, the international visibility of the Centre is not yet adequate. However, a large number of scientific papers are under

preparation and it is expected that in the final three years of the project the number of scientific publications will grow significantly. This is an issue where the Centre clearly should put more efforts to guarantee that all the new innovations and research findings are properly disseminated in international arenas. The key papers should be published in high quality journals, preferably co-authored by industrial and academic authors. The Centre should also explore opportunities for publishing a high level vision paper for future fisheries; the results obtained to date would support such a publication.

Participation of the project in international scientific and industry meetings and conferences has not yet been as active as it could be. This has contributed to the inadequate international visibility of the project. Clear improvements are required in this area.

3 Internationalisation

The Centre's scientists are involved in international research networks, in particular ICES (International Council for the Exploration of the Sea), WGFASST (the ICES Working Group on Fisheries Acoustics Science and Technology) and ICES-FAO (Food and Agriculture Organization of the United Nations) WGFTFB (Working Group on Fishing Technology and Fish Behaviour). These venues allow the Centre scientist to showcase their research and receive feedback from their international peers. In addition, active involvement with some EU projects is worth noting.

There is, however, a need for more two-way engagement with international science communities (e.g., through more active involvement in international projects) which could increase the profile of CRISP, attract researchers into the Centre and broaden the competencies of CRISP researchers. One such project, identified in discussions, was the Centre's active participation in the four year EU Horizon-2020 MINOUW project, that is beginning in 2015, and which will provide supplementary funding to the Centre via FHF. Participation in other international projects could further increase the profile of the Centre and may lead to other future spin-off projects. In addition, the creation of opportunities to increase participation of scientists from Nordic countries, and in particular from Russia, in non-industry based activities of the various work packages would improve the international standing of the Centre.

4 Researcher training, engagement in education

The panel met a small but very strong group of PhD students and post-docs associated with the Centre. The Centre needs more students to increase renewal of research critical mass in addition to the senior staff. This will add competencies for future projects. The issue of finding suitably qualified students to join the Centre as PhD students was highlighted in later discussions; the Centre, with support from the Board, could encourage the creation of industrial PhD positions to bridge entry of students into the industry.

The potential value of the Centre's research to PhD students from other countries and institutions is high. Hosting an international research summer school for training of current and new PhD students along with international students would increase both the profile of the Centre and the competencies of students, locally and internationally. To support the development of academic leadership skills in the current students and post-docs, the Centre is encouraged to make the organization of such a school their responsibility, with support from the Centre and other research partners.

The exchange of PhD students with other international institutes should be encouraged as a way of increasing student competencies and increasing the profile of the Centre.

5 Plans for final three-year period

The Centre's original objectives and the direction of the research methodology have remained unchanged and all partners intend to continue their participation. The generation of innovation and value creation to partners and other sectors of the business industry are likely to continue.

The Centre intends to continue testing, developing and refining innovations in technology and solutions described in the original six work packages. These research areas include, but are not limited to, ecosystem-friendly and energy-efficient fishing methods, fish quality, and the creation of value added products for the fishing industry. Some minor changes are likely to occur in the research tasks and leadership of WP2 and WP3 but no major changes in the scientific content are expected. More publications from Masters and PhD candidates and post-docs are expected as the students' research matures. Three more PhDs are expected to join the team in the near future: two situated in Tromsø (UiT) and one in Bergen (UiB).

To increase its critical mass, the Centre would also benefit from attracting more Master students; this should be regarded as a high priority for the final three year period.

6 Organisation and Management of the Centre

The Centre has strong visibility within Norway and reported a range of outreach activities at the evaluation meeting including technical reports and meetings with fishing industry representatives. However, despite the Centre's strong scientific research and industry innovations, its visibility internationally is limited. In addition, the Centre appears to have more than one web site (e.g., <http://www.imr.no/crisp/nb-no> (found through a Google search) and <http://www.imr.no/crisp> (accessed from the IMR home page)) and the one accessed from the English version of the IMR home page contains material written in Norwegian. Within the CRISP web site itself, IMR is listed as a partner but it is not clear that it is hosting the Centre.

The Board meets twice a year and has clear processes for the selection of projects. From the interview, the Board recognises the value and impact of the Centre's work but a clear record of scientific and end user impacts needs to be collated and maintained. The Centre has a clear and effective management structure that is delivering strong results. Extending the membership of the Board to include a senior scientist with expertise in stock assessment from the IMR population dynamics group could make the Centre better placed to identify future research opportunities related to ecosystem resource assessment and monitoring, and improve its profile within IMR. From the discussions with PhD students and post-docs, there is good dissemination of the Centre's work into the academic community. For the future sustainability of the Centre, more exposure to international academic critique of the Centre's work and research plans is needed. Establishing an International Scientific Advisory Board (ISAB) comprising between three and five international research scientists to act in the role of critical friends is an effective way in which this has been achieved in other centres. The ISAB should meet annually and provide a written report to support the Centre in articulating its scientific contributions and planning for after the end of the RCN financing period.

Through informal discussions at the end of the meeting, the panel learnt that the current director is planning to step down as director within the next 12 months. It is essential that his succession is planned effectively and, ideally, that there is a handover period where the new director can transition into the new role. At this stage in the development of the Centre, and given its significant successes to date, it is essential that the new director, in addition to research leadership, has the necessary competency to raise the international profile of the Centre's activities.

The impression gained from the evaluation meetings was that the Centre is an independent centre hosted but not sufficiently valued within IMR. For example, from the evaluation report and

discussions in the meeting, the Centre has low visibility within IMR and IMR provides less administrative support to the Centre than promised in the proposal to RCN. This could be improved if the Centre was more pro-active in promoting its already significant achievements and if the industry partners made cash (in addition to current in kind) contributions that could be used at the discretion of the Board and Centre management to explore new avenues of activity for the final stages of the RCN funding period and beyond.

Real strengths of the Centre lies in the large number of projects that have spun out from its activities and the team working between individual researchers that is fostered through research cruises where researchers from different projects live and work together on a research vessel.

7 User partners and other innovation aspects

The panel commend the Centre for a very good and engaged partnership that represents all important parts of the industrial value chain. It was also obvious during the interview that the Centre has delivered several innovations originating from its activities and there are more to come. It was also evident that the Centre delivers novel knowledge and educates graduates who are attractive to industry. The communication between the industry partners and research organisations is excellent on an individual basis. However there are several opportunities to improve these aspects. A clearer documentation of success criteria for the Centre has the potential to increase the internal and external international visibility. The written documentation did not cover this in a systematic way. Cross communication in the Centre could be further developed, especially between different industries and research partners, and has the potential to improve cross fertilization between work packages. It was evident during the interview that there are several cross project connections and synergies, but these were not evident from the written reports. There are also opportunities for more co-authorship of publications with the user partners.

The panel was concerned that the reporting of associated projects in the written documents was limited and details of funding and participants were unavailable. However, it was evident during the interview that there are several associated projects with significant levels of funding.

8 Gender aspects

The Centre is well aware of gender aspects and the gender balance is reasonable but with room for improvements. The panel encouraged the Board and the host institution to focus on this issue when recruiting people to new positions, especially when recruiting members of a new ISAB.

9 Financial aspects

The Centre has shown very good commitments from the industry through increased (relative to the proposal) in kind financial support. The panel formed the opinion that this could be better communicated to key stakeholders within the partner organisations. To increase the Centre's dynamic capacity the panel strongly recommend that the industrial partnership considers the introduction of a funding model that also includes cash contributions. This would increase opportunities for the Board to respond to upcoming new urgent needs, e.g., through support for feasibility studies, recruitment of research staff on short term contracts and the delivery of courses to user partners. Associated project are in place but their economic scale needs to be better communicated.

10 Future activities

The Centre has made significant achievements in its first 3-4 years and there are many more outputs in the pipeline. To ensure the long term sustainability of the Centre three key actions are needed: succession planning for the appointment of the new director; establishment of an ISAB

and inclusion of additional strategic research competencies in preparation for beyond the RCN financing period.

11 Conclusion and recommendations to the centre

At the interview, the Centre and its director presented a substantial volume of impact in the form of industry innovations originating from the Centre's activities. In addition, the intellectual contributions of each work package were extremely well articulated and the industry partners confirmed the added value of the Centre. The panel commend the Centre director for his delivery of this range of outcomes and outputs from the Centre. It was impressive to see that the Centre covers all major parts of the value chain in the wild fish industries. The Centre is also commended for having started economic and environmental modelling (in WP6) of the impact of work in this area. The outcome from WP6 is not yet proven but is expected to be of significant importance for industry and policy makers in their aspiration for an international sustainable future fisheries industry. To maximise the impact of the Centre's work, it is essential that it raises its international profile and becomes an international asset.

The panel makes following recommendations:

1. The Centre, as a matter of urgency, establishes an International Scientific Advisory Board that meets on an annual basis, starting in 2015.
2. The Board raises the profile of the Centre within IMR and internationally. This should include ensuring that the web site is in English and clearly hosted by IMR, and ensuring scientific results and industry innovations are published on the web site and kept up to date.
3. The Board increases its membership to include a senior stock assessment scientist to identify future research opportunities related to ecosystem resource assessment and monitoring, and improve its profile within IMR.
4. Given the forthcoming succession of the Centre director, the Centre recruits a new director whose competencies include those needed to raise the international profile of the Centre's activities.
5. The Centre's senior researchers prioritise the publication of their work in high ranking journals, including some papers that are co-authored with industry and international academic partners.
6. The Board establishes a fund, using cash contributions from the industry partners, so that they can fund concept feasibility projects from the researchers, proposed by the Centre director, and user partners.
7. The Centre defines opportunities for cross fertilisation across work packages in addition to WP6.
8. The Centre creates more new positions for Masters and PhD students, and post-docs.
9. The Centre introduces additional strategic research competencies into its membership, in preparation for beyond the RCN financing period.
10. The Centre, IMR and other research partners support the PhDs and post-docs in establishing an international research summer school.

11. The Centre collates and maintains a record of scientific and end user impact.
12. The Centre gains more recognition and administrative support from the host institution.

12 Recommendations to RCN

The panel makes following recommendation:

1. RCN gives clearer instructions and shares best practise across all Centres on the establishment of success criteria and key performance indicators.

Bergen, 26 March 2015

Dr. Stephen Walsh
Scientific Expert Evaluator

Dr. Petri Suuronen
Scientific Expert Evaluator

Dr. Mattias Lundberg
Generalist Evaluator

Professor Alison McKay
Chief Generalist Evaluator

Appendix

A **Terms of reference**

B **Templates**

C **List of centres and experts**

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 budgets of The Ministry of Education and Research (mainly) and The Ministry of Trade, Industry and Fisheries. 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 3,5 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 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 evaluation will also give advice to the Centres on aspects of their activity that should be improved.

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.

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 Centre to Centre 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 The Research Council, will be distributed by The Research Council to all members of the evaluation team not later than one month prior to the evaluation. The evaluation of the 7 Centres will be carried out during the period March 2015 - April 2015.

The evaluation report is due within 6 weeks after the interview sessions.

The evaluation team will perform one day site visit to each Centre. During the site visit the evaluation team should meet:

- The Centre Leader
- The Chair of the Centre Board
- Representatives from the industrial and public partners
- Representatives from collaborating research institutions
- Host institution staff incl. representatives from the top management
- Research leaders active within the Centre
- Doctoral students.

The Research Council 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.

The meeting of the evaluation team with the parties from the Centre will be divided into two sessions, one session devoted to the research activities and one session devoted to innovation aspects and organisation. The evaluation team will also meet with 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.

The Research Council 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 The Research Council project data base*
- *Annual reports 2011, 2012, 2013 and 2014 (draft) from the Centres*
- *Work plan for 2015 including tables for funding and cost*
- *Report from the Centre and its partners according to a standardised outline:*
 - 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 including CV for the management team, data for the staff working in the Centre, list of publications, PhD candidates, financial data and selected indicators.
 - C) An assessment of the Centre from the host institution.
 - D) An assessment of the Centre from each of the partners.
 - E) Project description for final three-year period, including a plan for the winding-up.
- *Report(s) from Scientific Advisory Committee/Board* (for Centres which have established this)
- *Documents describing the scheme (Research Council of Norway, 21 October 2009):*
 - Centres for Research-based Innovation. Description of the SFI scheme.
 - Centres for Research-based Innovation. Requirements and guidelines.
 - The Centres for Research-based Innovation. Information to applicants.

2. Mandate for the Evaluation Team

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 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 Research Council of Norway 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, PhD students and postdocs
 - 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 may also comment on the self-evaluation report, the assessments by the partners 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 The Research Council of Norway. 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 in consensus by the evaluation team and sent to The Research Council of Norway. 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 the Centres, the host institutions, relevant ministries and to any other agency or person who have expressed interest for this kind of information.

Success criteria for the Centres for Research-based Innovation (SFI)

In addition to fulfilling the formal requirements, a successful Centre for Research-based Innovation will be characterised by the following:

Research activity

- The centre conducts long-term, business-sector relevant research of high international quality in the field specified in the project description, and demonstrates this through its production of doctorates, scientific publications, papers for presentation at recognised international conferences and other measures of scientific excellence.
- The centre has a distinct research profile and has been successful in achieving recognition at the international level (e.g. researchers associated with the centre have received awards or been 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 commitments 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 activity has generated or is expected to generate the potential for innovation and enhanced competitiveness among user partners and expectations about the ramifications for society over and above the partners' direct participation in the centre's activities.
- The centre has achieved reciprocal mobility of staff between the centre and 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 implemented measures to ensure that the expertise and results achieved by the research activity are effectively transferred to and utilised by the partners.
- The centre paves the way for results that fall outside the 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 under the EU's framework programme.
- The centre engages in active collaboration with international research groups and has contributed in other ways to the internationalisation of Norwegian research and business and industry.
- The centre attracts outstanding international researchers, including research fellows and senior staff, as visiting researchers.

Research training and recruitment

- The centre has an effective framework in place for researcher training, and helps to train highly skilled personnel in the centre's areas of specialisation.

- The centre is actively engaged in education, especially at the master's degree level, and promotes recruitment to the centre's subject areas with special focus on increased recruitment of women.

Partners and funding

- The centre receives long-term funding from the host institution and partners, and these have increased 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 companies with a high technology and innovation profile.
- The centre has been successful in securing other external funding.

Organisation

- The centre has a visible profile, a strong identity and a successful collaboration with its partners.
- The centre is organised in a manner that is well adapted to the host institution's organisation.
- The centre has a board and management which ensure that the intentions and plan for the centre are followed up.
- The centre has a common administration with a high degree of scientific and administrative autonomy.

Appendix B

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:*
 - o *Board*
 - o *Centre director*
 - o *Management team*
 - o *International Scientific Advisory Committee (if relevant)*
 - o *Other (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:

<p>Strengths</p> <ul style="list-style-type: none"> • 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. 	<p>Opportunities</p> <ul style="list-style-type: none"> • 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
<p>Weaknesses</p> <ul style="list-style-type: none"> • Transfer of knowledge not adequately addressed • Resources are not prioritised well • Number of partner companies too low 	<p>Threats</p> <ul style="list-style-type: none"> • 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

1. *General information*

The centre

Name of centre

Name of centre director (Short CV, Enclosure 1)

Management team (Short CVs, Enclosure 1)

Address

Host institution

Partners

(Indicate if the partner has joined the centre after the start or has left the centre)

- Research partner(s)
- Company partners
- Public partner(s)

Governance

Board members

Scientific Advisory Committee (if relevant)

Other (if relevant)

Additional comments to General information

2. *Staff*

- a. List senior staff members that spend more than 10 % of their time working in the centre in 2014 (name, affiliation, university degree, sex, position within own organisation, % of full time in centre).
- b. List Administrative and Technical staff (name, position)

Own hard and soft indicators

The centre is requested to come up with their own hard and soft indicators in addition to the sub-items in 3-6. These should be the indicators that they find relevant to give a good documentation of the results of the centre.

3. *Research*

- a. Publications (for the centre so far – but only if not listed in the Annual reports 2011, 2012, 2013 and 2014) - Enclosure 2.

4. *Innovation*

- a. List patent applications and patents (for the centre so far).

5. *International cooperation*

- a. List organisations in other countries that are taking active part in centre projects in 2014 (name of organisation, country, time period of project).
- b. List researchers in other countries that are taking active part in centre projects in 2014 (name, position, organisation, country, time period of project).
- c. List visiting senior researchers from other countries with a stay of more than two weeks in 2014 (name, position, organisation, country, duration of stay).

- d. List researchers from the centre with a visit of more than one month to other countries in 2014 (name, position, organisation, country, duration of stay).

6. Recruitment

- a. List PhD students working in the centre in 2014, both those financed by the centre budget and those that work in the centre and receive funding from other sources (name, affiliation, source of funding, sex, nationality, period worked in the centre).
- b. List Post docs working in the centre in 2014, both those financed by the centre budget and those that work in the centre and receive funding from other sources (name, affiliation, source of funding, sex, nationality, period worked in the centre).
- c. List PhD thesis completed on projects in the centre so far (name, sex, title of thesis, adviser, institution granting degree).
- d. List M.Sc. thesis in centre in 2014 (name, title of thesis, sex, adviser, institution granting degree). A master student in the centre is writing his/her thesis on a topic within the research agenda of the centre and is supervised by one of the senior researchers in the centre.

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 (if not listed in the Annual reports)

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 Marianne Nereng, The Research Council of Norway (mn@rcn.no) as an attachment to an E-mail
Deadline 10. December 2014**

.....
(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 borders, 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 Marianne Nereng, The Research Council of Norway (mn@rcn.no) as an attachment to an E-mail
Deadline 10. December 2014**

.....
(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		
Other (specify)		
Other (specify)		

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	
Increased competitiveness within the area of research of the centre	

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 Marianne Nereng, The Research Council of Norway (mn@rcn.no) as an attachment to an E-mail
Deadline 10. December 2014**

.....
(Name of centre)

.....
(Project number)

*To be prepared by the research partner
Maximum length 3 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 borders, i.e. collaboration 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. *Has the centre contributed to investment in research infrastructure?*

Write here....

..

10. *Has the centre contributed to improvement in study programmes at Master level (only relevant for universities)?*

Write here....

..

11. *Has the centre contributed to improvement in doctoral education (only relevant for universities)?*

Write here....

..

12. *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 Marianne Nereng, The Research Council of Norway (mn@rcn.no) as an attachment to an E-mail
Deadline 10. December 2014**

.....
(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

9. Describe the focus of own R&D in thematic area of the centre, within and outside the centre (strategic platform)

Write here....

..

10. What is total volume of R&D within your organisation in thematic area of the centre.

Write here....

..

11. How has the participation in the centre influenced the R&D activity of your organisation?

Write here....

..

12. 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		

13. What opportunities have been created that would not have existed without the centre?

Write here....

..

14. Has the centre contributed to specific innovations within your organisation?

	Yes	No
New services		
Other (specify) ...		
Other (specify) ...		

15. 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....

..

16. 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	
Increased competitiveness within the area of research of the centre (if relevant)	

Name of public partner

.....

Place and date

.....

Signature and name in print of reporting person from partner

.....

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

E – Project description for the final three-year period

.....
(Name of centre)

.....
(Project number)

*To be prepared by the centre and signed by the Centre director and Chairman of the Board.
Maximum length 8 A4 pages. Word format, Times New Roman,
12 pitch font, single line spacing*

Background

Each centre has a current project description for the whole period of the centre and a work plan for each year. During the four to five years since the original project description was written, many things may have changed. Even if some centres have made revisions through the first years, it is expected that the centre now should perform a more in depth review of the different sections of the project description. ***This report should focus topics that, as a result of this review, is going to be changed in the project plans for the final years. Those items where the centre will continue to follow present plans need not be commented upon.***

The centres may not have budget plans for the complete eight year period. In any case the budget for the next four years should be presented.

Objectives for the centre and background for changes in the project description

Write here....

..

1. Status

National and international state-of-the-art of the relevant technologies and research topics for the centre.

Write here....

..

2. Research methodology

Describe the methodology and theories planned used, and explain why they are suitable for generating relevant knowledge in the field and promoting future value creation. Describe plans for publication in scientific peer-reviewed journals as well as plans for conferences and any patents.

Write here....

..

3. Research tasks

Identify and describe the research questions that will be examined. Define key research tasks and research-related targets and explain their significance for future innovation and value creation.

Write here....

..

4. Researcher training and recruitment

Describe plans for researcher recruitment. Specify the number of doctoral degrees planned within which research areas. Provide a target figure for the percentage of women fellowship-holders (cf. Point 8).

Write here....

..

5. Significance for the business sector

Describe how the knowledge developed by the centre will be important to future innovation and value creation for the user partners. Describe the potential that the centre's results may have for generating innovation and value creation in other segments of the Norwegian business sector. Describe the centre's relevance and benefit to society.

Write here....

..

6. Organisation

Describe how the cooperation at the centre will be organised and why this structure has been chosen. Describe how knowledge acquired through research activities at the centre will be transferred to the individual partners to stimulate innovation and value creation.

Write here....

..

7. International cooperation

Describe plans for international cooperation at the centre.

Write here....

..

8. Gender equality

Describe how gender-related considerations will be incorporated into the centre's activities as well as plans for increasing recruitment of women. Provide a target figure for the percentage of women fellowship-holders (cf. Point 4).

Write here....

..

9. Progress plan with milestones

The plan should provide a timeline for and describe the main activities and milestones, including project deliveries associated with the given milestones.

Write here....

..

10. Budget

General comments on budget situation. Action plans for the final three year period.

Write here....

..

11. Costs distributed among the individual partners

An overview of how the project costs will be distributed among each of the R&D-performing partners is to be presented in table form.

Cost	2015	2016	2017	2018	2019
Host institution					
Consortium partner A					
Consortium partner B					
Consortium partner C					
Consortium partner N					
Total					

12. Financial contributions from the individual partners

An overview of the partners that will contribute financing to the centre and their individual contributions are to be presented in table form.

Funding	2015	2016	2017	2018	2019
RCN SFI-grant					
Host institution					
Consortium partner A					
Consortium partner B					
Consortium partner C					
Consortium partner N					
Other public funding					
Total					

13. Environmental impacts

Describe whether and how the research conducted by the centre or the use of the results will have environmental impacts of significance (positive or negative).

Write here....

..

14. Plans for further activities after the eight year period of financing from RCN

Write here....

Signatures

Place and date

.....

.....

Centre director
(Signature and name in print)

Chairman of the board
(Signature and name in print)

.....

.....

List of centres and experts

SAMCoT - Sustainable Arctic Marine and Coastal Technology

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

Professor David Williams, Loughborough University, UK (generalist - panel leader)
Dr. Mattias Lundberg, Swedish Foundation for Strategic Research, Sweden (generalist)
Professor Matti Leppäranta, University of Helsinki, Finland (scientific expert)
Dr. Joachim Schwarz, Germany (scientific expert)

Certus - The Certus Centre

Host institution: Simula Research Laboratory

Professor David Williams, Loughborough University, UK (generalist - panel leader)
Dr. Mattias Lundberg, Swedish Foundation for Strategic Research, Sweden (generalist)
Professor Jean-Marc Jézéquel, Director of IRISA, France (scientific expert)
Prof. Dr. Stefan Leue, University of Konstanz, Germany (scientific expert)

CCI - Centre for Cardiological Innovation

Host institution: Oslo University Hospital

Professor David Williams, Loughborough University, UK (generalist - panel leader)
Dr. Mattias Lundberg, Swedish Foundation for Strategic Research, Sweden (generalist)
Professor Jan Engvall, Linköping University, Sweden (scientific expert)
Prof. Dr. Rolf Krause, University of Lugano, Switzerland (scientific expert)

DrillWell - Drilling and Well Centre for Improved Recovery

Host institution: International Research Institute of Stavanger (IRIS)

Professor David Williams, Loughborough University, UK (generalist - panel leader)
Dr. Mattias Lundberg, Swedish Foundation for Strategic Research, Sweden (generalist)
Dr. John Thorogood, Aberdeen, UK (scientific expert)
Professor Eric van Oort, University of Texas, Austin, USA (scientific expert)

SLRC - Sea Lice Research Centre

Host institution: University of Bergen

Professor Alison McKay, University of Leeds, UK (generalist - panel leader)
Dr. Mattias Lundberg, Swedish Foundation for Strategic Research, Sweden (generalist)
Dr. David Jackson, The Marine Institute, Galway, Ireland (scientific expert)
Dr. Alan Bowman, University of Aberdeen, UK (scientific expert)

CSI - Center for Service Innovation

Host institution: Norwegian School of Economics (NHH)

Professor Alison McKay, University of Leeds, UK (generalist - panel leader)
Dr. Mattias Lundberg, Swedish Foundation for Strategic Research, Sweden (generalist)
Dr. Jari Kuusisto, University of Vaasa, Finland (scientific expert)
Professor Jon Sundbo, Roskilde University, Denmark (scientific expert)

CRISP - Centre for Research-based Innovation in Sustainable Fish Capture and Processing Technology

Host institution: Institute of Marine Research (IMR)

Professor Alison McKay, University of Leeds, UK (generalist - panel leader)
Dr. Mattias Lundberg, Swedish Foundation for Strategic Research, Sweden (generalist)
Dr. Stephen Walsh, Scientist Emeritus, Fisheries and Oceans Canada, Newfoundland
Dr. Petri Suuronen, FAO, Rome, Italy (scientific expert)



The Research Council of Norway

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