

Mid-term Evaluation of the Innovation System Research on R&D and Growth Programme of VINNOVA

FINAL REPORT
30. OCTOBER 2006

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Contents:	
1	The evaluation set-up 4
1.1	Background 4
1.2	The objective of the mid-term evaluation 5
1.3	Evaluation methodology 5
2	The Innovation System Research on R&D and Growth Programme 7
2.1	History and rationale of the programme 7
2.2	Programme objectives and the selection of research centres 8
2.3	Programme management and joint activities 10
3	The four research centres 12
3.1	CIRCLE – Centre for Innovation, Research and Competence in the Learning Economy 12
3.2	CESIS – Centre of Excellence for Science and Innovation Studies 13
3.3	CIND – Centre for Research on Innovation and Industrial Dynamics 15
3.4	RIDE – R&D, Innovations and Dynamics of Economies 16
4	Progress and performance of the centres 18
4.1	Progress 18
4.2	Performance and scientific quality 19
4.3	Centre-building activities 22
5	Issues raised by the mid-term evaluation 24
5.1	Basic funding of the centres versus earmarked project funding 24
5.2	Fulfilment of the objectives set to the centres 25
5.3	Programme management and coordination 27
5.4	Funding of the centres 28
5.5	Collaboration between centres 29
5.6	Policy dialog and exploitation of knowledge 30
5.7	International collaboration and visibility 32
6	Concluding remarks 33
	Annex 1: List of interviewees 35

Annex 2: List of International Advisory Board Respondents	36
Annex 3. Self evaluation questionnaire for the centre managers	37
Annex 4. Questions to the International Advisory Board Members	40
Annex 5: Summary table of the four centres	42

1 The evaluation set-up

1.1 Background

The Innovation System Research on R&D and Growth programme¹ was initiated with the publication of a call for proposals in 2002. The objectives, as stated in the programme description, were to:

- Improve the understanding of the effects on growth of different types of investment in R&D from an innovation system perspective, and to develop methods and skills for measuring these effects.
- Contribute to the development of a knowledge base for Swedish innovation policy and to the skills available in Sweden for the continuing development and renewal of this knowledge base.
- Help to give Swedish innovation policy, through ministries and public authorities, access to world-class research and research skills, together with analysis and appraisal skills related to R&D and innovation systems.

These objectives were to be reached by supporting the foundation of 2-4 centres of excellence and providing core funding for a maximum of six years. The annual budget for core funding of the centres was set to 9 million SEK. Some additional funds were made available for specific project on an *ad hoc* basis through separate applications.

As an outcome of the call, a decision was made to provide funding for four different centres. One of these was CIND (*Centre for Research on Innovation and Industrial Dynamics*) at Uppsala University, which received funding from the first of July 2003. The other three centres, RIDE (*R&D, Innovations and Dynamics of Economies*) at Chalmers University of technology, CESIS (*Centre of Excellence for Science and Innovation Studies*) at Royal Institute of Technology and CIRCLE (*Centre for Innovation, Research and Competence in the Learning Economy*) at Lund University, were started during 2004.

¹ Sometimes also referred as the *Centres of Excellence Programme*

1.2 The objective of the mid-term evaluation

The funding of the centres is provided on a three plus three years basis. Before entering into a new contract for the next three years, a mid-term evaluation of the first operational years is needed to assess the performance of each centre. This will also allow for an adjustment of the activities of centres and the programme management routines. With this in mind, the overall objective of the mid-term evaluation was to:

- Map and assess the performance of each centre
- Identify weaknesses in centre management and make suggestions for improvements
- Identify weaknesses in VINNOVA programme management and make suggestions for improvements

1.3 Evaluation methodology

The mid-term evaluation was carried out in a period of three months (July – September 2006) and with a total effort of 22 working days. The following steps were taken to gather an overall picture of the progress and performance of the four research centres.

Document analysis

VINNOVA provided a large set of programme-related documents for the pre-analysis purpose, such as programme applications, work plans and activity reports of the centres.

Kick off meeting with VINNOVA

A one-day kick off meeting was held with VINNOVA in the beginning of June 2006 to discuss the programme background, objectives of the evaluation as well as practical arrangements.

Visits and interviews in the centres

In August 2006, Tarmo Lemola visited the centres and carried out several joint and separate interviews with the management and research staff. The list of interviewees is given in the Annex 1.

Self-evaluations by the centres

Each of the centres (i.e. the responsible managers) were asked to provide a self-evaluation of their performance according to a pre-fixed template with open questions. The responses are integrate in the overall performance assessment and suggestions (sections 4 and 5) and the questions covered in the self-evaluation are given in the Annex 3.

Policy-maker feedback

VINNOVA also collected feedback from selected policy-makers (ones that had been involved in the programme) regarding their perception and participation in joint activities with the centres. A few responses were received and the results are integrated in the overall views.

Response by the International Advisory Board members

Each of the four centres have an international advisory board of well reputed academics. An open question template was submitted to each member, covering the topics of a) overall scientific performance, b) meeting of scientific objectives, c) linkages to research elsewhere, d) setup of research activities and e) future prospects of the centre. The list of respondents is in the Annex 2 and the detailed questions in Annex 4.

2 The Innovation System Research on R&D and Growth Programme

2.1 History and rationale of the programme

Although the current research programme has substantially boosted innovation system research in Swedish universities, it is important to notice that this is merely one period in a longer continuum. The leading researchers have carried out innovation-related studies for a few decades already. Earlier financed by STU, later by NUTEK and since the beginning of 2001 funded by VINNOVA.

Although leading researchers and their research units have existed at universities, VINNOVA's programme has aimed at building top-standard research centres - bigger, well organised and more professional than before. A substantial part of the programme has thus focused on centre-building activities, particularly during the first years of operation.

In the background of VINNOVA's new research programme, there was a perceived need to strengthen Swedish innovation research and it was seen particularly important that strong research centres would be established allowing for multidisciplinary in their research. Selecting four centres to the programme allowed also for variable approaches and geographical spread.

At the time of programme initiation, there was a political pressure to better analyse, understand and show the effectiveness and economic impacts of the significant research and development investments made by the Swedish government.

The perception was that Swedish innovation research had been very strong at the conceptual level of innovation systems, while with the new programme VINNOVA was looking also for complementary approaches (e.g. econometric analyses) and 'hard evidence' to support decision making. It is questionable whether this programme has yet been able to significantly change the course of Swedish innovation research, as hoped earlier.

The programme funding provided VINNOVA is basic funding for the research centres. It is a sort of 'prime pumping' of centres and meant to enable other

sources of funding to be generated. The ability of centres to attract and sustain external funds is thus one indication of their progress to this end.

2.2 Programme objectives and the selection of research centres

The aim of the Innovation Systems Research on R&D and Growth programme has been, from the innovations systems perspective, to increase the understanding of the effects of different types of R&D investments and to develop methods and expertise that will also enable to measure such effects. The research was therefore to be relevant to methods that help R&D to have a major positive impact on economic growth.

The programme was focused on three areas²

- Gaining an understanding of the effects on economic growth of private and public investment in R&D by studying the processes and interaction which define the connection between R&D and growth
- Normative research to reinforce the effects of R&D investment on economic growth by discussing the effects on economic growth of different types of public R&D programmes
- Measuring the effects on economic growth of private and public R&D investment using effect methods and effect studies

The programme has been primarily aimed at overall issues concerning national innovation systems to make, while in connection to those, studies that would be focusing on specific sectors, such as biotech, were financed through VINNOVA's sectoral programmes. VINNOVA's goal has been to allocate around 10% of the funds in sectoral programmes to studies, which analyse impacts and describe structural dynamics in those sectors. With this respect, the centres were expected to take responsibilities in coordinating sectoral studies, their researcher to participate those studies and to produce syntheses of them.

² According to published programme specifications, 19.02.2003

VINNOVA's approach to support the establishment of research centres instead of just research projects had its reasoning in the perceived need to support continuing skills development in Sweden and the renewal of the innovation policy knowledge base. This way Swedish ministries and other public authorities, including VINNOVA naturally, would have a continuous access to world-class research and skills, on top of the impact analyses and other studies. This was reflected via four goals for the centres to contribute:

- Advanced knowledge base for innovation policy
- Effective public R&D investment in Swedish innovation systems
- World-class research publications within research and innovation systems
- Leading appraisal of skills in innovation policy at an international level

It was anticipated that by the time of this mid-term evaluation – two years after programme commencement, the centres of excellence would have been established with the following features:

- based at a university
- clear long-term goals and knowledge strategies
- a number of experienced leading researchers with their own research projects
- a research programme with an interesting subject profile and ideally multi-disciplinary projects
- a clear, coherent and ambitious education strategy at doctorate level

The centres were also expected to bring together the forces within the Swedish innovation research. This was foreseen to take place in three ways. *First*, by building research environments that have critical mass to interest internationally and to accumulate knowledge within those. *Second*, by facilitating cross-border co-operation, multidisciplinary and broad-based discussions among the players of the Swedish innovation systems – including VINNOVA. *Third*, the centres would need to establish and strengthen effective educational links between basic education, doctorate programmes and advanced researchers in the field.

2.3 Programme management and joint activities

VINNOVA's coordination role in this programme with respect to research topics has been more distant. As the core funder, VINNOVA has approved the operative plans of centres and reflected on relevant research topics. However, it has been clear from the very start that the centres have independence with respect to definition of their research profile and working methods.

One objective of the research programme has been to produce innovation policy experts which would, to some extent, find their way to work in the government sector as policy planners etc. According to VINNOVA, this has indeed worked out well as they have recently hired two experts from the centres.

Twice a year VINNOVA has organised one-day *joint management meetings* with the centres. These meetings have addressed both general issues such as planning of joint activities (e.g. conferences) and evaluation questions, but also centre-specific issues such as foreseen implications by certain organisations, economic changes, connection of educational programmes to the Bologna – process, etc.

The programme has had *two conferences*. The first one took place in Stockholm in November 2004 and was organised by CESIS. This was structured into three consecutive parts of a) presentations by researchers and international advisory board members, b) elaboration of challenges and research questions by policy-makers, and c) doctorate seminars.

The second conference took place also in Stockholm in January 2006. It was jointly organised by VINNOVA and the centres. The second conference was a follow up of the first conference with the aim also to build more joint activities among the four centres. International Advisory Board meetings of the centres were held in connection to this conference so that a number of high level innovation system researchers were present. As a result, the conference interested around 80-100 participants and the result was considered a success.

The division of strategy development of VINNOVA – the division probably closest to the themes and topics of the programme and also the most active user of the programmes outputs in VINNOVA – has each year made a *group visit to one of the four centres*. This is a way to make the centres, their research projects, methods and approaches as well as the individual researchers more familiar with VINNOVA and vice versa. Of the centres yet to be visited is only CESIS, but that has already been planned for this fall.

The programme's external communications have been linked to *ESBRI* – the Entrepreneurship and Small Business Research Institute. VINNOVA, together with the four centres, decided to take advantage of ESBRI's already established and broad communication channels for the use of the programme and each of the centres. In particular, ESBRI has a newsletter called *Entré*, in which the programme, the centres and their research topics are regularly presented. ESBRI also organises a seminar series (*ESTRAD*) in Stockholm.

In November 2005, the VINNOVA organised a *joint study trip to Japan*. The trip was essentially built on the long personal relations of Lennart Stenberg, but included a substantial preparation of the programme as well. Besides VINNOVA and the four centres, delegates were coming from IPTS (Institutet för Tillväxtpolitiska Studier) and the Ministry of Economic Affairs (Näringsdepartementet). Among the joint activities of the programme, the study trip to Japan has been considered the most useful and successful.

Besides the above mentioned joint activities that have been organised by the programme and/or by VINNOVA together with the centres, there are a number of joint activities among centres which are not similarly visible. Most evidently there is collaborative research and joint or complementary courses for innovation policy and innovation environment at Masters and Doctorate levels.

3 The four research centres³

3.1 CIRCLE – Centre for Innovation, Research and Competence in the Learning Economy

CIRCLE (Centre for Innovation, Research and Competence in the Learning Economy) is a multidisciplinary research centre spanning several faculties at Lund University and Blekinge Institute of Technology. CIRCLE was formally established on July 1st 2004 and the second half of 2004 was a period of formation. Twelve new positions for associate professors, post-doctoral fellows and doctoral students were announced and they had all been filled by January 2005.

The research carried out at CIRCLE is organized into four main research areas addressing different aspects of innovation and knowledge creation. They are:

- learning in innovation systems and the consequences of R&D and innovation for productivity growth
- regional innovation systems
- the entrepreneurial university and the creation of research-based firms
- public policy in the field of innovation, R&D and competence building in a comparative perspective.

A seminar series has also been started at CIRCLE. It has included several guest lecturers, e.g., Professor Poh-Kam Wong, National University of Singapore, Professor Richard Whitley, University of Manchester, Professor Edward Lorenz, University of Nice-Sophia Antipolis and Professor Bart Nooteboom, Tilburg University. CIRCLE's own research is also presented and discussed in the seminars, which is one of several ways of achieving cross-fertilization among the different research areas and disciplines represented at CIRCLE.

³ The information in this section is collated from annual reports and websites of the four centres.

Another CIRCLE activity aiming at cross-disciplinary understanding is the so-called 'reading circle'. In each meeting of this group, a couple of key articles related to innovation, selected from the literature associated with one of the academic disciplines represented at CIRCLE, are discussed. These discussions help to clarify differences and similarities in relation to the other disciplines' perspectives. This activity is intended to establish a 'common language', although not necessarily a common perspective, among the different disciplines in CIRCLE.

CIRCLE has initiated an ESST Master's programme in Society, Science and Technology.¹ The programme started in August 2005 with about 30 students from all parts of the world.

The staff during 2005 has consisted of five part-time professors, one part-time associate professor, one full-time senior lecturer, three full-time post-docs, one part-time post-doc, and 5-7 PhD students. In addition to the research staff, CIRCLE has employed a part-time director of studies for the ESST MA programme and a part-time secretary.

3.2 CESIS – Centre of Excellence for Science and Innovation Studies

CESIS was established as a research centre in January 2004, with the mission to organise and carry out studies of innovation systems and with a specific focus on innovation activities in Sweden. The ambition is to provide a deeper understanding of the interdependencies between R&D, innovations and economic development. Special attention is paid to how R&D may influence economic growth, and to develop models and methods to examine such influences and to provide policy-relevant characterisations of innovation processes. The research is oriented towards problems that can be approached by means of quantitative methods and that allow for collaboration with international research centres.

A key issue in CESIS' research is to uncover major driving forces in innovation activities, and these may include aspects such as knowledge provision, organisational structures, entrepreneurship, institutional settings and economic

conditions with regard to capital supply, competition patterns and market demand.

In essence, the research area of CESIS is the relationship between the incentives to make R&D and innovation efforts and the economic effects of such efforts for the individual firm and economy-wide. These effects may be traced in terms of variables such as sales, profits, employment and exports. In this regard, the centre aims at academic research with *intra-disciplinary quality*, *cross-disciplinary synergy* and *relevance for innovation policy*.

The CESIS research is arranged in the five programme areas: (1) Science, University and Firm relations, (2) Industry and Firm Dynamics, (3) Innovative Regions, (4) Institutions and Property Rights, (5) Assessment of Innovation Policy.

These programme areas are overlapping and comprise approaches such as economic modelling, econometrics, history, institutional and policy analysis, as well as in-depth case studies. In this context CESIS will offer a knowledge source in the areas technical development, innovation and growth in firms, industries and economy-wide. This will also make it possible to assess conditions and consequences with regard to public R&D support.

Research and education activities of CESIS aim at improving the understanding of the growth consequences of R&D investments. Such an aim also comprises ambitions to model and analyse systems features of innovation processes. In this context, empirical studies will focus on the interdependence between technical, organisational, financial and policy-support aspects of the innovation processes of firms, research organisations and industries. In order to accomplish this, the centre has the ambition to develop methods to study and measure how R&D efforts – under different systems conditions – affect the emergence of new products, improvement of technical solutions and rise in productivity, the growth of sales and exports, and other similar performance measures. These effects can be studied with regard to firms, industries and regions. CESIS' research should be assessed with regard to how well it covers these problem formulations.

In view of the objectives presented above, CESIS will

- develop a systematic, scientific approach to the analysis of national, regional and technological systems in a context where the interaction between university and firm R&D is central,
- develop methods to assess the importance of public programs that are intended as support to innovation systems,
- orchestrate and utilise the research activities at KTH, SISTER and JIBS, as well as the different national and international networks of the pertinent research teams,
- form a platform for a well-functioning interface with policy makers in the public and private sectors, and
- create education programmes and special courses at Master and PhD levels with a focus on innovation and economic growth

3.3 CIND – Centre for Research on Innovation and Industrial Dynamics

On the 11th of March 2003, the Rector of Uppsala University made the decision to establish the Centre for Research on Innovation and Industrial Dynamics (CIND). The basis for the decision was an agreement between three parties: The Swedish Agency for Innovation Systems (VINNOVA); the Bank of Sweden Tercentenary Foundation (Riksbankens jubileumsfond, RJ); and Uppsala University. Each party has contributed 2 000 000 SEK per year for 2003 and 2004 (in the case of Uppsala University, 750 000 SEK as a cash contribution and 1 250 000 SEK in indirect funding). After deducting VAT from the RJ money, the basic (cash) allocation for CIND has thus amounted to 4 590 000 SEK per year for 2003 and 2004 (i.e. 9 180 000 SEK for the two-year period).

The ambition is that CIND will be in operation over a ten-year period. The research programme Clusters and Innovation Systems in Time and Space has been accepted as the overall framework for CIND's research during the period 2003-2006, which is divided into two phases (2003-2004 and 2005-2006, respectively).

CIND is a multi-disciplinary research initiative, aiming to establish a strong environment for cluster and innovation system studies at Uppsala University.

CIND is organized as an independent research programme within Uppsala University. The activities are located in the Ekonomikum Campus, where all research and education activities in the economic disciplines at Uppsala University are co-located. In disciplinary terms, CIND is situated at the intersection of business studies, economic geography, and economic history.

CIND is largely a virtual organization. In administrative terms, CIND is linked to the Faculty of Social Science and the Department of Social and Economic Geography. All in all 25 senior scholars and PhD students are engaged in the research activities of CIND. The Departments of Business Studies, Economic History, and Social and Economic Geography employ and provide office space for most of these. CIND rents one large room in the Ekonomikum campus, where temporary visitors and part time scholars share two desks, and where there are facilities for small seminars and research group meetings.

The CIND research programme Clusters and Innovations in Time and Space, is organized along three main lines:

- Interactions and dynamics in clusters and innovation systems
- The impact of local labour market dynamics on the development of clusters and innovations systems
- Global companies in local clusters

3.4 RIDE – R&D, Innovations and Dynamics of Economies

RIDE is a VINNOVA-Chalmers Centre, under the auspices of IMIT. RIDE works within four key research areas:

- 1) Interaction between Education, Science and Business R&D*
- 2) Structural Change and Economic Dynamics*
- 3) Strategic Management in a Dynamic Environment*
- 4) Public Policy in a Dynamic Environment*

The four key research areas are strategic choices for practical implementations, such that fitting into these four categories is a major criteria for deciding whether or not RIDE should support certain activities. Over the life of the centre, seed-

money financing to stimulate new projects and applications will be distributed across the four keynote research areas. Thus, seen from a dynamic perspective, each research area is envisioned to attract additional research and projects.

RIDE envisions the engagement of members in original research, in the development of a creative learning environment, and in learning networks with decision-makers in public policy agencies, universities, and firms. The learning networks with decision-makers may be specifically organized through RIDE but may also be based on RIDE being an active and visible participant in broader Swedish and international debates. The RIDE 'creative learning environment' consists of a number of activities, in addition to research.

RIDE has structured research and activities in order to achieve five aims, namely to stimulate 1) *'Infrastructure' or 'Creative Environment'*; 2) *Research*; 3) *Teaching*; 4) *New areas of research*; 5) *'Third Mission'*.

4 Progress and performance of the centres

4.1 Progress

The overall Swedish economic and research landscape is in flux. Global knowledge-based competition is changing fundamentally the environment in which the players of the Swedish innovation system operate. Sweden as well as the rest of the industrialised world can no longer take their technological leadership for granted. While Sweden still maintains leadership in certain industrial areas, supported by a well-educated workforce, concerns about the future Swedish competitiveness arises.

The Innovation System Research on R&D and Growth programme has been playing an important role in developing the knowledge base for Swedish innovation systems and innovation policy over the period of the evaluation (2003-2006). The strong emphasis and wide scope on dynamics of innovation systems at national, regional and local levels have been instrumental in strengthening Swedish capabilities to understand and manage these fundamental phenomena.

Despite notable success the achievements of the programme have been more modest in terms of direct contribution to the original focus areas, i.e. to factors, which are of particular significance in gaining understanding of the effects of R&D investment on innovation and growth in Sweden. However, widening of the scope of the programme from the original one has been an expected outcome. The tendency to expand the objectives has resulted from the bottom-up approach, which was applied in the formation of the programme. The centres were given free hands to produce their own original proposals.

In addition to achievements in the generation and diffusion of new knowledge the programme has reinforced inter-organisational networks, both amongst Swedish players and players world widely. A main stress has been on further development of existing networks. Much less the programme has been able to generate new research collaboration or collaboration with other stakeholders of

the centres and the programme as a whole. Networking with companies has remained insignificant.

The VINNOVA's programme could be viewed as a catalyst or stimulator for the Swedish research on innovation and innovation systems. The proportion of financing coming from VINNOVA has been approximately one third of the total expenditure of the centres. However, the factual importance of VINNOVA's financing has been bigger than this. As seed money it has had a strong impact on the orientation of the centres more generally. Without VINNOVA's programme, all of the centres would not have existed, or they would have existed smaller and with less ambitious goals.

4.2 Performance and scientific quality

The centres have been carrying-out internationally recognised, high-quality academic research. In terms of a number of publications all centres have been very productive without any significant differences between the centres. Most of the papers produced by the centres are English, and a great number of them have been accepted for scientific publication after peer review. These achievements are very much in line with the original objectives of the programme.

The following comments and suggestions regarding the centre-specific scientific performance are largely based on the feedback and responses from the ***International Advisory Boards***.

It appears that *CESIS* has shown a very high level of activity and performance, which has positioned it well and visibly in its scientific field. Significant scholars of their field have visited the centre and are exchanging research efforts and results. Research is being conducted at a perhaps faster rate than initially expected and the centre is well linked with leading research units in Europe, Japan and North America – perhaps even a leading node in these networks. The utilisation of knowledge is still in its early stage, however. Rapid staffing of the centre has given a sign of dynamism to its current research fields, while it has been suggested that it is time to review the original plans and objectives of

CESIS with respect to where its research could provide even stronger impetus and relevance.

Similarly, *CIRCLE* appears to receive a very high appreciation among its scientific peers. The recent Linne –award is a good evidence of its recognised scientific performance and reputation. *CIRCLE* has ambitious scientific objectives and it is early to say how well they have been achieved. This strong and sizeable centre may have an impact in shaping the research agenda of the whole field. High value has been given to its achievements in establishing a dynamic setup with a group of young scholars that is being ‘*cultivated*’ in the centre. The policy relevance of the centre’s research agenda is very strong and the work is much used in Nordic countries, but also for example in EU and OECD. However, a broader global perspective was also called after. The centre is well networked – it is an international node in innovation and related economic and business research – and this could be actively taken stock of by, for example, in encouraging visiting scholars and organising conferences. Much of the international visibility is naturally related to the well-reputed directors of the centre.

CIND has produced a good, and increasing number of high quality research papers and other policy relevant outputs. The centre has strong international linkages with high degree of cross-collaboration and has been able to attract top-level researchers. The centre has been able to utilise multidisciplinary in its novel research agendas and to establish an attractive ‘*intellectual milieu*’ overall. It has a specific profile within the scientific community with a strong emphasis on spatial processes and their interaction with economic history and business studies. The research has typically been carried out in many smaller and specific projects. It is now well placed to set and pursue more targeted scientific objectives in its area of expertise that would also encompass high policy relevance.

It was perceived that the scientific performance of *RIDE* is also of good level. Its academic reputation is good and both senior and junior researchers are actively

involved in relevant research scientific networks (eg the DIME network). The international mobility is also strong.

The centre has gained in a relatively short time a good visibility in the evolutionary economics/ technical change community. Their lines of research (knowledge-based entrepreneurship, regional clusters, biotech, energy and sustainable innovation, universities) are clearly important from an academic point of view and also relevant to policy. In the long run however, a stronger policy orientation of research was called for, for example through conducting substantive research for the Swedish government.

The international visibility of RIDE is rather concentrated around a few experienced persons with high academic outputs. Efforts could be made to broaden this base, by for example setting the overall academic ambition levels even higher.

Overall RIDE has been able to set up a dynamic research environment that is able to attract good speakers from abroad. However more could be done to attract leading researchers from other universities to visit and stay at the centre. This requires entering into networks of exchanges and offering good opportunities for supervision and/or short term mobility.

Efforts should also be made to disseminate working papers and seminar presentations more broadly on the web. Genuine multidisciplinary of research should remain strongly on the centre's agenda.

RIDE is developing as a research centre on a good track. Its research agenda has until now covered a rather broad set of topics, which has been considered a rational strategy for a new centre. However its current field of studies is highly competitive and for the future, it was suggested that it should seek to excel in fewer selected areas. In those areas, larger research programmes could be initiated and experienced research staff sought for. Besides academic results, this could bring international visibility along as well. Overall, RIDE was encouraged to invest more into new interesting topics, which would at the same time leverage on its existing competencies. These could be found supported for example, with organising a series of small scale, well-focused workshops.

All centres have contributed to raising the quality of education and to increasing the number of students at undergraduate, masters and doctoral levels. In these respects the centres differ somewhat but this is mainly due to differences in their age and nature, not in their performance. The centres or university departments affiliated with them have examined several doctorate theses, even if the centres cannot take credit for all of them. However, there are in the centres several doctorate students who are due for defence their thesis in coming years, and very much thanks to the activities of the centres.

The programme has stimulated the centres to develop ways to increase the societal impact of their research in the framework of the third mission of the universities. In addition to national players, the centres have been networking with regional and local communities. These are difficult to quantify but from all appearances the centres have taken seriously the needs and opportunities of binding closer links with users and user organisations.

4.3 Centre-building activities

The main aim of the centres has been to establish and develop a strong, creative and attractive intellectual milieu for research and education. All centres have been moving on in the direction of the original aims. They represent a particular stage in the development and growth of innovation and innovation systems research in Sweden. Even by international standards, the achievements of the individual centres as well as the programme as a whole have been very good.

One of the strengths of the centres is their multidisciplinary approach. This is a common feature of all centres as it is to a major part of innovation studies and its various specialisations in general. The centres have managed to bring to various projects approaches, themes, ideas and concepts from several disciplines.

However, deepening interaction between disciplines (economics, social sciences, engineering, geography etc.) is one of the big challenges of the centres in the future. Briefly speaking, the challenge is to move from a

multidisciplinary towards an interdisciplinary centre with real theoretical and empirical cross-fertilisation between the disciplines represented in the centres.

The centres have been organised as independent research programmes or more permanent organisational units within a university or jointly with two universities. The CIRCLE is characterising itself as a multidisciplinary research centre, whereas CIND is termed as a virtual or semi-virtual organisation, which means that by structure CIND is somewhat looser than CIRCLE. However, in these respects the centres do not differ very much from each other. It is typical to all centres that the centre is an umbrella to university researchers who conduct differing amounts of centre-related research. Some combine it with teaching and administration, some with consultancy work, and some with research in other fields.

The centre has turned out to be an effective instrument to integrate experts from various disciplines, universities, university departments etc. to work for common goals with different time frames and attachments. Through this mechanism, the total amount of work and intellectual capacity mobilised for the centre is bigger than the total costs of the centres. VINNOVA programme has been essential for creating this arrangement. The fact that to some extent the centres also function as branding for a number of researchers doing their individual research more than as a centre in the real meaning of the word does not weaken the vital importance and achievements of the programme.

5 Issues raised by the mid-term evaluation

5.1 Basic funding of the centres versus earmarked project funding

The basic idea of the concept of the centres of excellence is to allocate research financing to a research organisation on the grounds of its scientific merits without specified interests to influence on the direction or content of the research. This has been very much the point of departure with VINNOVA's Research Programme of Innovation System on R&D and Growth. The programme is providing financial support to existing research groups, which have proved their competence and which are supposed to have the best potential to accumulate new knowledge and know-how in the field of innovation and innovation policy studies. This is believed to be the best mechanism to contribute to the development of a knowledge base for Swedish innovation policy and to the skills available in Sweden for further development and renewal of this knowledge base.

The other choice would have been a traditional targeted research programme with more specific goals, topics of research as well as more or less clear expectations with regard to the exploitation of research results in policy making. The advantages of this approach in comparison to the previous one are better possibilities to ensure policy relevance of research, and to create from the very beginning stronger links between researchers and policy makers. In addition, from the point of view of the financier, a targeted research programme is a flexible instrument, which makes easier to react to new and even to acute research and information needs.

VINNOVA's solution has turned out to be positive both for the research community and policy-making. The establishment of the four centres of excellence within the framework of the programme with financing for a six years period (maximum of three years plus a further three years) has offered the centres opportunities to do research and give education in relatively long run and with certain levels of freedom. VINNOVA's total investment in the programme is not exceptionally big in international or even in Swedish

comparison, and when the total is divided by the four centres, the new resources per centre provided by the programme are rather modest than significant. Originally, the prospect has been that a third of the funding of the centres comes from VINNOVA, a third from university and business, and a third from public bodies involved in the relevant issues. This has not come true in all centres, but it is more than evident that VINNOVA's seed financing has been catalysing the research and education activities of the centres more generally, and contributed for their part to increasing skills and deepening understanding of the fundamental issues of innovation.

One of the unquestionable strengths of the programme has been the fact that in addition to research, all centres except CIND are running master's and doctoral programmes with a great number of foreign students. This would not be possible in the realm of project based targeted research programmes. Training programmes produce skilled labour force for growing needs of innovation research as well as for other tasks of experts in the private and public sectors in Sweden, and also abroad. This is a very important aspect both for the continuation of the field and for the accumulation of knowledge and know-how.

5.2 Fulfilment of the objectives set to the centres

The original goal of the programme has been to improve the understanding of the effects on the growth of different types of investment in R&D from an innovation system perspective, and to develop methods and skills for measuring these effects. Therefore, it was expected and presumed that the research within the programme is related to measures, which can contribute to ensuring that R&D has significant positive effects on economic growth. Even more concretely, an emphasis was put e.g. on discussing the effects of different types of public R&D programmes on growth.

If we take these objectives literally and evaluate their realisation from a narrow point of view of economic research, an inevitable conclusion is that the original objectives of the programme have not been achieved, or have been achieved just to a small extent (mainly studies by Hans Lööf and colleagues at KTH). The set of objectives has been extended during the selection process, and even

more through the integration of the four centres with the programme. From a fairly narrow point of departure has been gradually moved towards a larger spectrum of topics and areas of innovation and innovation policy research.

In retrospect, this has been a positive development even if it has not been intentional in all respects. The programme has been offering room for manouvering and bottom-up initiatives, which is normal and necessary in centres of excellence types of research based programmes. Putting the centres together the programme has covered innovation systems research at international, national, regional and local levels. Among the main research areas are also universities, firms and their interrelationships, the role of local labour markets, and the role of public policies in the fields of innovation, R&D and competence building. The wide spectrum implies that the programme cannot be characterised as a focused programme. It has been a collection of various theoretical and methodological approaches and research themes.

Because the programme was born out the proposals of the universities there has been some overlapping between the centres. However, this has been more an advantage than a disadvantage for the programme and its participants. On one hand, overlapping has created conditions for cooperation between the centres, and on the other, common research interests have accomplished positive competition between the centres and their groups. Problems have been more related to smallness of cooperation rather than overlapping.

Anyway, the lesson to be learnt from the centres of excellence programme for coming similar exercises is an importance of explicit goals, and not only for the content and general objectives of the programme, but also for its supportive measures. Particularly important are goals for exploitation of research results, domestic cooperation, and international cooperation. General goals for these activities are not sufficient. More profound discussion and reasoning on these subjects is needed in order to generate common understanding of and commitment to the supportive activities.

5.3 Programme management and coordination

The formal mechanisms for the management and coordination of the programme are an international advisory board and a steering committee or equivalent. The international advisory board consists of distinguished foreign professors of innovation research. The members of the steering group are representatives of the university or universities in question, a representative of VINNOVA (the coordinator of the programme), and in some cases additionally a representative of a sister organisation.

The factual role of the international advisory board has been remote, as can be expected from a board the members of which live outside Sweden. The advisory board is more a collegial network reflecting the willingness of the members to give occasionally their intellectual contribution to the development of the centre. As board members the foreign experts are naturally better committed to exchange information with the centre and develop further other forms of research cooperation.

The steering group has a closer relationship with the centre and its management than the international advisory group. However, also the role of the steering group is more in the exchange of information than in steering. This means that the centres have a lot of levels of freedom to set up their priorities and to build up their research portfolios. This is how universities and their centres use to work, and there are not any particular reasons to make changes to these mechanisms and practices of self-management of universities.

All in all, coordination of the programme has been very much coordination of the centres one by time through the steering groups and annual reports. The crucial point is not to try to interfere with the independence of universities and university centres but to think of means improve exchange of information and other cooperation between the centres and their major stakeholders. This is such an important issue that it can not be left to more or less formal structures only. Finding new ways of interaction is as much in the interest of the centres as it is in the interest of the stakeholders like VINNOVA.

The challenges for Swedish research and innovation policy can only be addressed by systemic approach reflecting the interactive nature of innovation and the complexity of the national innovation system. This requires that innovation policy should be coordinated with other socio-economic policies which affect the Swedish innovation environment. These include competition, intellectual property protection, human resources, education etc. The programme and its centres have a lot of theoretical knowledge and understanding of these facts but these aspects are not very well built into the coordination and utilisation mechanisms of the programme.

5.4 Funding of the centres

As mentioned above, in terms of financing the centres are sort of hybrid organisations having funding from different sources. In addition to VINNOVA, basic financing is coming from the university or universities of the centres, the Swedish Research Council (e.g. CIRCLE) and the Bank of Sweden Tercentenary Foundation (e.g. CIND). The centres are receiving project financing from several sources, from VINNOVA's different sectoral programmes, from regional and local organisations, and from the research Framework Programmes and other research programmes of the European Union. The proportion of financing coming from companies or other organisations of the private sector is small of the total financing of the centres.

Consequently, the centres are not only the centres of excellence of the VINNOVA programme but they are, and most probably will be more and more, shared centres with several "owners" or "shareholders". Individual financiers do not even know what is their share or their projects and how they are related to the shares of other financiers. For the centres, this not an issue. Existence of several financing sources helps the centres to achieve a critical mass and to stabilise fluctuations in financing of individual financiers.

It is important for the centres that this situation does not lead an unnecessary increase in planning, reporting, evaluation and other administrative tasks. The situation should be seen as an opportunity for new kind of fruitful cooperation between the partners. Innovation research has two sides. It has an ambition to

search for fundamental phenomena and interactions between society, economy, science and technology. In addition, it is application and user oriented with the aim to produce exploitable results. Innovation research is a field in which the separate financiers mentioned above could easily join their forces to generate and establish a real shared programme for innovation research.

5.5 Collaboration between centres

The programme is making up of four centres in different parts of Sweden. The centres have research and education profiles of their own, but they have a lot of joint theoretical, and methodological approaches, research fields as well as other joint interests. This offers a fertile ground for a lively and successful cooperation and interaction between the centres. From this perspective, the programme should be seen not as a loose collection of separate units, but as an entity with opportunities to new synergetic combinations, shared learning processes, and occasionally or on a more permanent basis to an appropriate division of labour and financial costs.

The centres have cooperation in research and education but it is quite easy to come to the conclusion that the centres have more cooperation with foreign research centres and groups than with each other. The current situation is not bad, and perhaps even the relation between foreign and domestic cooperation is healthy. Anyway it is evident that there are needs and possibilities for much closer cooperation between the centres. The existing cooperation is based on earlier personal links and takes place bilaterally between two centres. The programme has not managed to generate new cooperation either bilaterally or on a broader basis, and it has not very much managed to deepen earlier cooperation.

In the framework of the programme two annual meetings and a joint trip of the representatives of the centres and VINNOVA to Japan have been organised. Both of these events and particularly the trip to Japan have been given a positive reception. These kinds of events and forms of cooperation are needed more, but even more important than the number is the quality of events. The

minimum is a well organised annual meeting directed not only at the researchers of the centres but also at their external stakeholders.

In the longer, it is important for VINNOVA and other financiers of innovation research to consider in depth, how domestic cooperation between innovation researchers could and should be deepened. There are available positive incentives like financing for joint initiatives (research projects, seminars etc.) of the researchers. It is acceptable that in the spirit systems approach, VINNOVA identifies failures (lock-ins, lack of cooperation, skills shortages etc.) in the Swedish system of innovation research, and makes interventions, which are desirable and necessary to improve performance of the system.

5.6 Policy dialog and exploitation of knowledge

The basic goal of the programme is to contribute to the development of a knowledge base of Swedish innovation policy and to the skills available in Sweden for the continuing development and renewal of this knowledge. This has been interpreted to mean creation of fundamental or theoretical knowledge and understanding of the complexity called innovation system. In addition, the programme has been expected to help to give Swedish innovation policy, through ministries and public authorities, access to world-class research and research skills. In other words, also the relevance and use of created knowledge has been very much on the agenda of the programme.

The centres and particularly their senior researchers have had contacts and collaboration with ministries, VINNOVA, and other public agencies both at the national and regional levels. They have been acting as mediators of new knowledge and as experts in specific policy issues. As for VINNOVA, the coordinators of the centres of excellence programme and representatives of the strategy development division have been playing important role as counterparts to researchers and also as translators of research publications and findings to sectoral experts of VINNOVA.

Regardless of positive examples and satisfaction among the researchers and users, development and policy dialog and better exploitation of research is one of the biggest challenges for the programme. It is not a challenge particularly to

the researchers and research communities. At least as much it is a challenge to users and their representatives. Analysing the present situation further and developing new ways and means for policy dialog and exploitation of research should be understood as a joint effort, which requires contribution from both sides, from producers and users.

All partners agree that publications are not the most efficient way of transferring knowledge from users to producers. Quite the contrary, this is the worst way to do it. For many users the biggest problem is not lack but oversupply of knowledge. This almost automatically leads to the fact that books and papers stay unopened in the bookshelves. Tailor made reports and means of direct communication between the producers and users are needed. In these processes experts of ministries and public authorities with research background and close links with research communities are vitally important in two respects: as articulators of user needs and as mediators and translators of research results.

One important subject matter is improvement of cooperation between the user organisations. In addition to VINNOVA itself, as other potential user organisations with regard to the centre of excellence programme have been mentioned e.g. the Ministry of Industry, the Swedish Agency for Economic and Regional Growth (NUTEK), and the Swedish Institute for Growth Policy Studies (ITPS). This list could be made longer very easily. However, very little has been done in practice in order to get these partners together or better informed about the programme and about the possibilities which the programme and the centres could offer to them. Therefore, if it is important to increase cooperation among researchers, as important it is among user organisations.

There are similar kinds of needs within VINNOVA, too. Originally the idea was that centres of excellence would also interact with, and possibly take part in the sectoral studies which are carried out with financing from VINNOVA's other programmes. These include around 20 initiative areas for the development of innovation systems. The centres were planned to take responsibility for

coordinating sectoral studies and producing syntheses of the sectoral studies. This has been done but to a much less extent than originally was outlined.

5.7 International collaboration and visibility

All the centres of excellence have a lot of international collaboration. The centres and their researchers have been active in European research cooperation, and they have lively links with best American researchers and research groups. Researchers of the centres are well represented in leading international journals of innovation research. Because of their good level of research and an organised way of doing research and cooperation, Swedish researchers have been recognized as desired partners for cooperation. It is fair to say that Swedish innovation research is at the front line of this area, and not only in a few but in several fields. This cannot be accredited too much with the centres of excellence programme. It is more a result the research work which has been done in Sweden since the early 1980's. The programme has helped the centres to further improve their relative position in international research networks.

Because of the good reputation and strong international position of Swedish innovation research, VINNOVA and its centres of excellence programme would have a unique opportunity to increase international visibility of its activities and achievements by organising a high-level international conference or equivalent. As much as time and resources of centres allow, this would be a joint effort of the centres. A suitable point in time might be the end of programme in its current form.

6 Concluding remarks

The “Innovation System Research on R&D and Growth Programme” of VINNOVA has been a broadly successful initiative. In a short time the four centres have been able to establish and develop strong, creative and attractive intellectual milieus for research and education. Therefore, our concluding remarks are more about how to continue.

Because of very good achievements so far, there are all reasons to continue the programme in accordance with the original plans until 2009. There is some variation in the achievements of the four centres in terms of scientific quantity and quality, but nothing which would give justifications for any radical changes in the basic financing of the centres.

The slow shift from academically oriented focus to a more user-based focus should be continued, as the capabilities of the centres improve. Care needs to be taken, however, that willingness and readiness of decision makers and their representatives is at the highest possible level. New ways and means for policy dialog and exploitation are needed.

Continued efforts in better cooperation between the centres are increasingly important – not only for the reasons of more effective use of financial resources in research and education, but also in order to improve their quality.

The centres are joint efforts of a few domestic public financiers complemented by funds from the Swedish private sector and EU research programmes. There are good possibilities for Swedish financiers, by joining the forces, to establish better-integrated projects and programmes, which would be of benefit to the research groups and to the financiers themselves and their cooperation.

All in all, in the field of innovation research, there are a lot of needs in Sweden to extend and intensify cooperation at all levels and among all actors. In addition to researchers, intensified cooperation could be an important learning opportunity for the Swedish policy system as well as for companies as ultimate users of innovation research.

Because of their good level of research and organised way of doing research, Swedish innovation researchers are recognised and desired partners in international cooperation. On the basis of this, the Swedish community of innovation research would have very good possibilities to increase the international visibility of its activities and achievements as a part of efforts to promote innovation research and education.

Annex 1: List of interviewees

Göran Andersson, VINNOVA
Joakim Appelqvist, VINNOVA
Björn Asheim, CIRCLE
Christina Chaminade, CIRCLE
Lars Coenen, CIRCLE
Charles Edqvist, CIRCLE
Lennart Elg, VINNOVA
Tobias Fridholm, CIND
Jonas Gabrielsson, CIRCLE
Daniel Hallencreutz, CIND
Ulf Holm, CIND
Johan Jansson, CIND
Börje Johansson, CESIS
Sven Lindqvist, RIDE
Daniel Ljungberg, RIDE
Per Lundquist, CIND
Anders Malmberg, CIND
Göran Marklund, VINNOVA
Henrik Mattson, CIND
Maureen McKelvey, RIDE
Jabob Nobuoka, CIND
Dominic Power, CIND
Christian Sandström, RIDE
Martin Wallin, RIDE
Anders Waxell, CIN

Annex 2: List of International Advisory Board Respondents

Assistant Professor Julian Birkinshaw, London Business School (CIND)

Professor Andrea Bonaccorsi, University of Pisa (RIDE)

Professor Roberta Capello, Politecnico di Milano (CESIS)

Professor Phil Cooke, Cardiff University (CIRCLE and CIND)

Professor Jan Fagerberg, University of Oslo (CIRCLE)

Professor Bengt-Åke Lundvall, University of Aalborg (CIRCLE)

Professor Peter Maskell, Copenhagen Business School (CIND)

Professor Stan Metcalf, University of Manchester (CIRCLE)

Professor Roger R. Stough, George Mason University (CESIS)

Sven Sjögren, Swedish Ministry of Trade and Industry (RIDE)

Annex 3. Self evaluation questionnaire for the centre managers

MID-TERM EVALUATION OF THE INNOVATION SYSTEM RESEARCH ON R&D AND GROWTH PROGRAMME BY VINNOVA

Self-assessment of centres

Advansis Oy has been commissioned by VINNOVA to conduct a mid-term evaluation during the summer and fall 2006 regarding the performance and management of the four innovation centres financed by the Innovation System Research on R&D and Growth programme; CESIS, CIRCLE, RIDE and CIND.

The work will consist of document analysis, short visits and interviews/discussions in each centre, advisory panel consultations and of this self-assessment by the centre managers.

The purpose of this self-assessment template is to collect, in a very concise format, each centre's perception of their main developments, operational performance and outputs as well as challenges (and future prospects) related to the management and first years of operation of the centre.

The responses will be used as background information for the interviews and expert meetings of the mid-term evaluation. Scientific performance will be reviewed separately with the international advisory boards.

It should be noted that Advansis Oy has access to the annual reports submitted by the centres to VINNOVA. Hence, the objective of the self-assessment is not to repeat information already available in these reports, but to give each centre an opportunity to highlight the most significant achievements.

Please submit your response by e-mail to tarmo.lemola@advansis.fi by 20th June 2006. Thank you for your collaboration!

Name of the Centre:

Person responding:

A brief description (max 7-10 pages in total) of the following issues:

1. Please give your view on to which extent the general objectives of the centre have been achieved during the first operational years.

2. Please state in a few sentences the specific approach or a strategy for the establishment and development of your centre. According to your view, what have been the main achievements and challenges related to centre-building.

3. What have been the most significant outputs of the centre with regard to

3.1 Research (a list of ten most significant publications)

3.2 Education (main actions in education)

3.3 Fostering policy dialogue & support to policy-making

4. Knowledge creation. Please indicate the major achievements in terms of new empirical knowledge and theoretical understanding in the field of innovation studies internationally.

5. Collaboration with external actors, e.g. co-operation with other research groups, with regional, national or international policy-makers, industry, etc.

- a) How significant role does this play in your centre?
- b) What have you done to facilitate it?
- c) What have been the main achievements to this end?

6. Internal collaboration between the different academic disciplines in the centre and the practical employment of the multidisciplinary approach.

- a) How significant role does this play in your centre?
- b) What have you done to facilitate it?
- c) What have been the main achievements to this end?

7. Added value of Vinnova's programme. What has been the added value of the programme and VINNOVA with regard to volume, quality or ambition of the centre's research? What would not have been accomplished without the programme?

8. What is your personal assessment of strengths and weaknesses of your centre?

9. What is your personal assessment of strengths and weaknesses of the Vinnova's programme?

10. What are your expectations and prospects for the forthcoming financing period?

Annex 4. Questions to the International Advisory Board Members

MID-TERM EVALUATION OF THE INNOVATION SYSTEM RESEARCH ON R&D AND GROWTH PROGRAMME BY VINNOVA

Dear International Advisory Board Member,

Advansis Oy has been commissioned by VINNOVA to conduct a mid-term evaluation during the summer and fall 2006 regarding the performance and management of the four innovation centres financed by the Innovation System Research on R&D and Growth Programme; CESIS, CIRCLE, RIDE and CIND.

The work consists of document analyses, visits and interviews/discussions in each centre, self-assessment by the centre managers and of brief consultations of the International Advisory Board Members of the centres.

The purpose of this consultation is to collect from each centre's International Advisory Board members, in a very concise format, their professional perceptions as regards to the overall scientific performance, orientation and approach of the centre, as well as to point out what they consider the key challenges and future prospects.

We thank you in advance for taking a few minutes and filling in your comments to the boxes below. Kindly submit your response by e-mail to kimmo.halme@advansis.fi by 20th July 2006. Thank you for your collaboration!

Person responding:

Name of the Centre:

1. What is your perception on the **overall scientific performance** (ambition, quality, policy relevance) of the centre that you are an advisory board member of? How is the centre positioned among its scientific peers and other research units – does it have a particular role in the scientific community?

2. According to your view, to which extent have the **scientific objectives** of the centre been met during the first years of operation?

3. Is the centre **actively linked** to leading research units and researchers? Are the researchers actively contributing to scientific conferences and journals? Is the centre acknowledged and well reputed for its research?

4. How do you see the **setup of research activities** in the centre – in terms of its dynamism, multidisciplinaryity, ability to attract leading researchers, general atmosphere, etc. Is there a sufficient flow of young researchers and links to further education to ensure sustained growth? Does the centre appear to have the means to achieve ambitious scientific objectives?

5. How do you foresee the **future of the centre** – is the centre developing its scientific base determinedly? Is there a clear vision and focus for research areas? Are there challenges or concerns in sight? What are your prospects and expectations for the centre's research for the coming years?

Annex 5: Summary table of the four centres

	CIRCLE	CESIS	CIND	RIDE
Operating years	2004-2006	2003-2006	2003-2004 & 2005-2006	2003-2006
Total funding	22,6 m SEK	12 m SEK	16 m SEK	
University /other funding	13,6 m SEK	6,0 m SEK	RJ 8,0 m SEK UU 8,0 m SEK	Chalmers (39,5 %) External grants (28,9%)
Vinnova financing	9,0 m SEK	6,0 m SEK	8,0 m SEK	6,0 m SEK (31,6 %)
University location	Lund University & Blekinge Institute of Technology	KTH	Uppsala University	Chalmers Tekniska Högskolan & IMIT
Professors	Charles Edquist , Björn Asheim, Mats Benner, Hans Landström, Jan-Evert Nilsson, Lennart Schön	Börje Johansson , Pontus Braunerhjelm, Arne Kaijser, Charlie Karlsson, Hans Löf, Folke Snickars, Sverker Sörlin	Anders Malmberg , Mats Forsgren, Ulf Holm, Lars Magnusson, Örjan Sölvell,	Maureen McKelvey , Staffan Jacobsson, Åsa Lindholm-Dahlstrand,
Main focus area 1	NIS in global economy: studies of the relation between R&D and economic growth	Science, university and firm relations	Interactions and dynamics in clusters and innovation systems	Interaction between education, science and business R&D
Main focus area 2	Regional innovation systems	Industry and firm dynamics	The impact of local labour market dynamics on the development of clusters and innovation systems	Structural change and economic dynamics
Main focus area 3	Entrepreneurial university and the creation of technology-based ventures	Innovative regions	Global companies in local clusters	Strategic management in a dynamic environment
Main focus area 4	Public policies in the fields of innovation, R&D and competence building	Institutions and property rights		Public policy in a dynamic environment
Main focus area 5		Assessment of Innovation		

		Policy		
Number of staff				
Expected outputs	Articles, books, dissertations, annual conference, workshops, seminars			Improve the infrastructure for lively debate, raise quality of research and research training, raise quality of undergraduate and masters training, stimulate research, develop learning networks and societal impacts
Other remarks	Reference Group of Users			
Website	http://www.circle.lu.se/	http://www.infra.kth.se/cesis/cesis/index2.htm	http://www.cind.uu.se/eng/index.htm	http://www.chalmers.se/tme/EN/centres/ride

Note: The information in the summary table is collected from websites and other written documentation. Please note that the information has not been checked with the centres. Before citing the information contacting the each centre is recommended.