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INNOVATIVE GROWTH THROUGH SYSTEMS INTEGRATION AND GLOCALISATION

INTERNATIONAL EVALUATION OF THE 2004 VINNVÄXT PROGRAMME INITIATIVES

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VINNOVA develops Sweden´s innovation capacity for sustainable growth

VINNOVA is Sweden's innovation agency and our aim is to increase the competitiveness of Swedish researchers and companies.

Our task is to promote sustainable growth in Sweden by funding needs-driven research and the development of effective innovation systems. To this end, we have 220 million euro to invest in new and ongoing projects each year.

An important part of VINNOVA´s activities consists of increasing the cooperation between companies, universities, research institutes and other organisations in the Swedish innovation system. We do this in a number of ways, including long-term investment in strong research and innovation milieus, investment in projects to increase commercialisation of research results and by creating catalytic meeting places in the form of conferences and seminars.

VINNOVA is a Swedish government agency under the Ministry of Enterprise, Energy and Communications and the national contact agency for the EU Framework Programme for R&D. Some 200 people work at VINNOVA´s offices in Stockholm and Brussels. VINNOVA was established in January 2001.

VINNVÄXT is a programme that takes the form of a competition for regions. The aim is to promote sustainable growth by developing internationally competitive research and innovation environments in specific growth fields. The winning regions will receive funding of up to SEK 10 million per year for a period of 10 years. The objective is that the winners will become internationally competitive in their respective fields within this period. A prerequisite for the programme is the active participation of players from the private, public and research sectors and from the political sphere. VINNVÄXT also comprises a number of support activities such as seminars, training/education, the exchange of experience and the extension of knowledge/research. The programme began in 2001

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Innovative Growth through Systems Integration and Glocalisation

International evaluation of the 2004 VINNVÄXT programme initiatives

Philip Cooke, Alexander Eickelpasch, Ifor Ffowcs-Williams, Peter Kempinsky, et. al.

Preface

In this evaluation report The Swedish Governmental Agency for Innovation Systems (VINNOVA) presents the second evaluation of the initiatives in the second call of the VINNVÄXT programme, launched in 2004. The first evaluation of the VINNVÄXT 2004 initiatives is presented in the VINNOVA Report VR 2008:12.

The objective of the VINNVÄXT programme is to promote sustainable growth based on international competitiveness in regions, by developing regional innovation system´s functionality, dynamics and efficiency to an international level. According to the evaluation strategy the initiatives are evaluated every third year. The overall objective of this second evaluation is on results and the capability for future competitiveness. Evaluation aspects are outcome and impact of the initiatives in terms of knowledge development, innovation and international competitiveness as well as organizational and leadership issues.

The evaluation has been carried out during September 2011 through a group of international specialists from university and industry, a combination of experts in both cluster development, regional innovation systems, programme evaluation and in the specific knowledge area of each initiative.

This second three-year evaluation of the VINNVÄXT programme concerns the following five regional initiatives appointed as winners 2004:

- Fiber Optic Valley (www.fiberopticvalley.com)
- GöteborgBIO (www.goteborgbio.se)
- New Tools for Health (www.halsansnyaverktyg.se)
- ProcessIT Innovations (www.processitinnovation.se)
- Triple Steelix (www.triplesteelix.se)

After a short introduction to the evaluation, the following chapters present the evaluation of each of the initiatives. The last chapter gives a generalized summary of the evaluation and recommendations for further development of the initiatives as well as for the VINNVÄXT programme at VINNOVA.

VINNOVA in December 2011

Charlotte Brogren
Director General

Anne Lidgard
Director
Head of Transport and Environment Division

Content

Summary

The objective of the VINNVÄXT programme is to promote sustainable growth based on international competitiveness in regions, by developing the innovation system's functionality, dynamics and efficiency in functional regions to an international level.

The initiatives evaluated are the second generation initiatives selected through a call to be funded by the VINNVÄXT programme, commencing in 2004:

- **Fiber Optic Valley –** the vision is to be a fiber optics centre of Europe by 2015 and a natural choice of location for any new business in the field. Is working to make Sweden into the world leader in the development of products and services based on fiber optics.
- **GöteborgBIO** - aims to create a solid base for long-term growth in the biomedical field within the region, by cultivating academic research and commercial innovations and adaptations within the health care system.
- **New Tools for Health** – is working to develop new products and services to meet tomorrow's increasing need for care with effective residential care home as a base.
- **ProcessIT -** the aim is to bring together the process and engineering industry in the region with ICT services in universities and industry to reinforce existing primary industries and develop the region's ICT-industry to an internationally competitive position.
- **Triple Steelix -** the vision is to be the leading innovative region in Europe for advanced steel, steel products, industrial service and processing.

The evaluation of the initiatives was carried out by a group of international specialists from university and industry, both in cluster development and regional innovation systems and in the specific knowledge area for each initiative.

In the evaluation conducted 2008 the evaluators pointed on several general and strategic improvement areas for initiatives:

- Strategy Development
- Approach to Research & Innovation (R & I) Systems Strategy and Project Portfolio
- Internationalisation
- System Governance
- Evolution of the Core Idea of Innovation Systems
- No 'One-Size-Fits-All' Policy Implementation Methodology
- From 'technology push' to 'Open Innovation'

Several achievements regarding these areas could be clearly perceived by the International Evaluation Panel from its visits to the five VINNVÄXT initiatives in September 2011.

As part of the evaluation of the initiatives a model were used to summarise the observations building on the criteria's and objectives for the VINNVÄXT programme as well as experiences on cluster development from Sweden and globally.[1]

- The innovation stretch of the initiative:
  - Knowledge base: academia
  - Knowledge base: firms, absorptive capacity
  - Commercialisation & Entrepreneurship
  - Equity finance: venture capital, angel funding
  - Cluster scale: potential regional impact
- The quality of the clustering intervention:
  - Governance
  - Strategic focus, including internationalisation
  - Process leadership
  - Connecting & catalysing; Leveraging the regional innovation actors
  - Raising the cluster's profile

The VINNVÄXT initiatives generally show a positive development regarding the aspects identified in the evaluation model. In general the initiatives shows positive development when it comes to, for example, strengthening the knowledge base, supporting commercialisation and entrepreneurship as well establishing a governance structure based on triple helix collaboration and in having an effective process leadership in place.

The challenges for the initiatives to handle in their further development regards, for example, the strategic focus and internationalisation of the cluster. This also has to do with raising the cluster's profile as well as international linkages and partnership between related cluster initiatives, universities and companies.

The ten-year funding through the VINNVÄXT programme will come to an end in 2014 for the 5 initiatives. Therefore issues concerning strategies for sustainability are of concern for the evaluators as well as issues concerning the external management of the innovation system-building process at regional and sub-regional levels that the VINNVÄXT initiative represents. This involves issues as of grand challenges, systems integration, relatedness and transversal innovation. To varying degrees such cross-fertilisation linkages were beginning to develop in the VINNVÄXT initiatives.

Of key importance to achieving such integration based on 'platform innovation' will be 'system integrator' firms that bring together different technologies, knowledge and expertise in the normal course of their business, and different innovation policy business models that can be used to support the development in this direction. The international

[1] The model and the concluding recommendations are based on the evaluation both of the VINNVÄXT initiatives funded from 2004 (evaluated in September 2011) and the VINNVÄXT initiatives funded from 2008 (evaluated in June 2011).

evaluators was reasonably satisfied that thought had been given by the 5 initiatives to questions concerning sustainability and exit-strategies – and the role for the initiative in this new context, even though the evaluators felt that the Boards sometimes needed a reminder.

Based on the evaluation of the initiatives, the evaluators would like to make the following recommendations to the initiatives for further development:

- Clarify the importance and potential of the industry to the region and nationally
- Systemic thinking and developed business models are needed for the sustainability of the initiative
- Internationalisation needs to be at the core of the initiative, strengthening the initiative and supporting the cluster companies in globalisation
- Strengthen the business dimension in governance board and process management
- Take the accumulated knowledge and experiences on innovation systems/clusters to a wider Swedish audience (regionally, Tillväxtverket, Reglab)
- Diversity as a driving force for growth and sustainability needs a broader perspective than just Gender

For VINNOVA the evaluators would like to make the following recommendations. An important basis for our recommendations is how VINNOVA can build on and leverage the investment made in the VINNVÄXT program.

- Inserting more competitive elements in the further implementation of the programme; rewarding the most competitive
- Supporting the initiative more pro actively – by stretching the ambitions
- Use the Challenge Driven Innovation Concept to build on and link the VINNVÄXT initiatives
- The initiatives are ”mini-VINNOVA’s” and the hands on involvement of other parts of VINNOVA is a win-win
- Supporting more active learning and sharing between the initiatives
- Tightening collaboration with supporting national actors, especially for the internationalisation of the initiatives
- Establishing standardised web presence for all Swedish cluster initiatives (see for example www.kompetenznetze.de)
- Supporting the learning of regional authorities in the development of integrated regional innovation systems, drawing on VINNOVA’s comprehensive learning from different programmes, including VINNVÄXT
- Need for a more regional/client oriented work division within VINNOVA

1 Introduction

This report presents the evaluation of five VINNVÄXT-initiatives:

- Fiber Optic Valley
- GöteborgBIO
- New Tools for Health
- ProcessIT Innovations
- Triple Steelix

1.1 The VINNVÄXT programme

The initiatives evaluated were the second generation of initiatives to be funded by the VINNVÄXT programme which commenced in 2004.

As the original proposal stated: “The programme aims to promote sustain-able regional growth by developing internationally competitive research and innovation environments in specific growth areas. This is done by funding needs-driven R&D to strengthen the cutting-edge competence of the respective environments and by means of strategic efforts for the development of innovation systems.”

The twelve initiatives that to-date have been supported through the VINNVÄXT programme have been picked through national calls and competition, with all the winners believed to have excellent growth potential. The objective is that the winners will become internationally competitive in their respective fields within 10 years. A unique aspect of VINNVÄXT is the long time horizon. VINNOVA will provide the winners with funds of up to 1.1 million euro per year for a period of 10 years.

1.2 The evaluation task

The initiatives in the VINNVÄXT programme are to be evaluated every third year in order to determine whether they are complying with the demands set by VINNOVA. The first evaluation was made during the spring in 2008 focussing mainly on the process to organise and establish the innovation system. The six year mid term evaluation of the VINNVÄXT initiatives was established to have both a summative and formative (learning) approach focussing both on achieved results in comparison to goals and action plan as well as strategic issues related to the further development of the initiative. The focus of the evaluation was the following issues:

- The quality of implemented research and innovation / commercialisation strategies and results from an international comparison perspective
- The achievement of the initiatives when it comes to setting up the organisation, the processes and mobilising key actors that embodies the platform for future growth and international positioning in their respective growth area

- The conditions established for the sustainability of the initiative after the financing through the VINNVÄXT-programme has ended

The evaluation also should be seen as a support to the strategic development of the initiatives and the action plan for the coming three years.

1.3 The evaluation team

The evaluation was carried out by an international team consisting of experts with:

- Academic and/or business oriented profile with excellent knowledge about state of the art on innovative clusters and innovation systems
- Academic and/or business oriented profile with excellent knowledge about state of the art in the specific field for the initiative

The evaluators are presented in the matrix below.

Name	Expertise	Fiber Optic Valley	GöteborgBIO	New Tools for Health	ProcessIT Innovaitons	Triple Steelix
Philip Cooke	Clusters & Innovation Systems	x	x	x	x	x
Alexander Eickelpasch	Clusters & Innovation Systems	x	x	x	x	x
Ifor Ffowcs-Williams	Clusters & Innovation Systems	x	x	x	x	x
Aleksandra Boskovic	Research & Technology	x				
Luiz Carlos Guedes	Research & Technology	x				
Samuel I Stupps	Research & Technology		x			
Bengt Westrin	Research & Technology		x			
Maria Teresa Arrondondo Waldmeyer	Research & Technology			x		
Joerg Habetha	Research & Technology			x		
Kalle Lyytinen	Research & Technology				x	
Lena Norder	Research & Technology				x	
Maria Angeles Gutierrez	Research & Technology					x
Rodin Genof	Research & Technology					x
Peter Kempinsky	Process leader	x	x	x	x	x

For background on each of the evaluators, see Appendix 1.

Personnel from VINNOVA participated in the evaluations as observers: Johanna Adami (HNV), Göran Andersson (GöteborgBIO, ProcessIT), Sven-Gunnar Edlund (FOV), Emma Gretzer (FOV), Inger Gustafsson (TS), Lars-Gunnar Larsson (HNV), Karin Nygård Skalman (TS), Anna Sandström (GöteborgBIO), Jonas Wallberg (FOV) and Marit Werner (TS).

1.4 The evaluation process

The evaluation of the five initiatives were carried out in September 2011:

- Triple Steelix, 5th-6th September in Borlänge
- Fiber Optic Valley, 8th-9th September in Hudiksvall
- ProcessIT Innovations 12th-13th September in Umeå
- GöteborgBIO, 15th-16th September in Göteborg
- New Tools for Health, 19th-20th September in Linköping

The evaluation is based mainly on the three years follow up report presented by the initiatives and discussions with different stakeholders and players at meetings during the site visit. The results from the evaluation of each of the four initiatives has been presented in a report to the board and management team of each initiative

In this report a summary of the results from the evaluation of each of the four initiatives is presented together with general conclusions from the evaluation.

The report is presented by Philip Cooke, Alexander Eickelpasch, Ifor Ffowcs-Williams and Peter Kempinsky.

1.5 About the report

The following chapters present the evaluation of each of the initiatives. The last chapter gives a generalised summary of the evaluation and recommendations for the both the further development of the initiatives as well as the VINNVÄXT programme.

2 Fiber Optic Valley

The vision for Fiber Optic Valley (FOV) is to be a fiber optics centre of Europe by 2015 and a natural choice of location for any new business in the field. Fiber Optic Valley is working to make Sweden into the world leader in the development of products and services based on fiber optics. The core business is to assist the growth of global and local companies. This is achieved through the support presented by FOV in the form of research, training, financing, contacts and business development combined with and equally unique test environment for technical tests and behavioural science studies.

2.1 Achievements and challenges

Based on the discussions at site and the self-evaluation report the Panel has identified some important achievements and challenges in the development of the initiative.

2.1.1 Achievements

Triple Helix-support and governance

The evaluation team was impressed by the TH-support and regional governance presented at the site visit including local and regional government, support from two regional universities and the participation of local business in the board of the initiative.

Business leadership in the board

We also acknowledge the importance of business leadership in the board as an asset for the further development of FOV. This will help directing FOV into an agenda with a clear focus on innovation and commercialization.

Efficient, enthusiastic management team

FOV has a very efficient and motivated management team that, given the restrictions and challenges at hand in the region, has done an impressive job in developing the initiative to a regional platform.

Arenas for open innovation (test beds, labs)

One important part of FOV is the impressive work done in building arenas for open innovation. The arenas are one FOV´s most important asset with a potential for attracting interest, collaboration and resources outside the region.

Well connected with the actors in the innovation system

FOV has built strong relations and good collaboration with the local actors in the regional innovation system. The participation in the meetings during the site visit from the Triple Helix actors in the region is an illustration to this.

Strong brand with visibility on the Google

We also like to acknowledge the brand – Fiber Optic Valley – that has a potential to make an impact internationally and that are already visible on the net. But to attract resources, competences and international partners FOV still needs to improve the visibility of the initiative.

Gender to the forefront

FOV is since several years engaged in a work to mainstream gender into cluster practice and gender perspective as tool to identify and support innovation, competitiveness and sustainability. It is clear that FOV is at the forefront when it comes to gender, innovation and cluster development not just in Sweden but also at a European level.

Interesting innovative ideas and companies

At the meetings the Panel was presented for companies and innovators with interesting innovative idea. The flow from innovative ideas to new products and companies is at the core of the cluster initiative. However, the panel sees the need to develop this process further to get a more substantial flow of ideas and products, thus making a stronger impact on the market and in the region.

2.1.2 Challenges

The meetings made visible the high expectations on FOV as part the development and growth potential in the region from the regional actors, especially from the governmental side. It´s a challenge for FOV to meet these expectations. The Panel has questions to what extent FOV will be able to meet these expectations, given the regional resource base at hand and the industry that is in focus for the initiative.

This has to do with the fact that there are few commercial successes in six years. That is despite considerable efforts and some interesting innovative ideas and products presents. One aspect of this is the linkage between R&D and innovation and the need to strengthen the process from R&D to innovation and new products further. Otherwise there is a risk that initiative will end up being to research oriented, building ”research silos” rather than utilizing research in company driven innovation processes.

Our fear is that the base for commercialisation, and thus economic growth, is too thin in the region when it comes to innovations and products based on fiber optics (even in a wide sense). The Panel also sense that the initiative still is of minor importance for the regional economy and has yet to make a substantial contribution. The initiative should also get connected to the industries that are of major importance in the region.

As pointed out one of the challenges of FOV is the rather thin base for the initiative when it comes to competences, resources etc. in the region. In strengthening the initiative there is a need for international linkages that will make FOV as part of a stronger international network or platform. This is especially important as fiber optics as international growth area is highly competitive and many of the competitors to the initiative are more resourceful than FOV.

2.2 Knowledge and industrial base

2.2.1 Visit to test beds outside the programme for the Site Visit

Before heading to Hudiksvall, Luiz Guedes had the opportunity to visit Acreo's fiber optic laboratory in Kista. He was hosted by Walter Margulis who showed the facilities and presented a quick overview of the R&D work being done pointing out the strong connection between the two sites, Kista and Hudiksvall. Clearly the first one is dedicated to developing applications, devices and sensors, based on optical fibers designed and fabricated at the other site.

The impression was that the laboratory is well equipped, has a good permanent staff of eight researchers, headed by Dr. Walter Margulis (well known internationally as a top expert in fiber optics) and a few graduate students. There is a mixture of more basic, long-term research and more applied, short-term projects. It can be affirmed that they have the ability to develop new ideas into prototypes but not to a level that could be directly transferred to production and commercialization.

In the morning of the first day of evaluation, 11/09/08, the two experts were guided by Åsa Claesson, head of the Acreo's fiber Lab in Hudiksvall and member of the board of FOV through Acreo's local facilities. Although it was a short visit, it was possible for the experts to gain a good understanding of what was being done relative to fiber optic fabrication (two fiber draw towers and perform making) and associated characterization equipment.

There was not enough time to visit the test bed facilities at Acreo's fiber lab and off-site, nonetheless, they appear to be an important capability. The test beds at the Acreo site were operational and being used to test commercially available equipment interoperability and some of the novel digital services being developed in the area. New capabilities were being added off-site focusing on deployment techniques and infrastructure.

With respect to sensors, that is one of the focuses of FOV, nothing was technically described and the evaluators cannot say much about the level of the R&D work that may be going on, either at Acreo or at the partner universities or companies.

During the technical interviews, discussions were limited to some questions directed to two companies which presently commercialize fibers from Acreo (Fibertronix and Raybium) and some more general questions related to broadband based innovations.

The Evaluation Teams view on the knowledge and industrial base can be summarized as follows:

2.2.2 Knowledge base

Fibers:

- International standard in optical fiber in particular specialty fibers

- Specialty fibers – one of the few international players as a manufacturing operation with some unique designs
- Support of Kista lab where application research work takes place
- Broadband – Test beds: Synergy of lab assets (deployment, equipment compatibility and transport test beds) and local skilled work force
- Fiber sensors:
  - Good base knowledge but lacking in practical implementation skills (metrology, packaging, production, system development)
- Digital services and applications:
  - Innovative business models have leveraged test beds and can potentially benefit from fiber knowledge in general.
  - No international standing today but promising (ex: film editing company, music e-learning)

2.2.3 Industry base

In general, not leading edge international presence:

- Minimal participation from Ericsson
- Participation in international standards forums (FTTH Council and Broadband Forum)
- Specialty fibers are participating in the international arena through companies such as Fibertronix and Raybium
- As an example: a company from Minneapolis, USA, is setting up a campus at Hudiksvall
- Possibility remains for good international visibility in digital services (example: virtual film editing company with one commercial movie done)

2.3 Support for Innovation, Commercialisation, Business & Market Development

2.3.1 Introduction

The strengths of FOV lie in its access to Acreo research and laboratory facilities, the funding of the initiative by local, regional and national organisations, broadband test bed facilities (Acreo National test bed Kista-Sunds-vall and the local city network Hudiknet) and marketing representation at international exhibitions and fairs. Governance bodies are committed to fun-ding FOV and valuable initiatives such as the IFTAC vocational education facility are admirable.

The weaknesses of FOV relate mainly to the commercialisation issue. In particular the enterprise and innovation support infrastructure is weak. There are incubator facilities such as Movexum for Gävleborg county and Åkroken Science Park in Sundsvall. Movexum has no technology focus, and Åkroken Science Park is focussing on forest and packaging industry rather than on Fibre Optics. Obviously, there is no dedicated (as opposed to generic) incubator facility and no discernible mentoring, business angel or

venture capital resources. Some limited informal investment has been made by a local investor.

While start-ups are not an imperative for the initiative, innovative products and services that reach the market are. Probably because of the balance favouring research and research links from Acreo to research customers FOV lacks a well-developed network of clients for its own commercial market segments. For the evaluation panel it seemed that the Households test bed does not play an important role in FOV although it could be an asset for the region to attract inward investment.

The potential for commercialisation is also dependent on the companies in the region. Ericsson is running a production plant for sea cables in Hudiks-vall – probably with low potential for collaboration. Ericsson and Hudiks-vall municipality recently reached a seven-year agreement on refreshing and expanding the already existing public broadband network in the region – this could be a point of contact for FOV in order to attract investment. Apart from that there might be further possibilities for linking to the regional industries.

However, the evaluation team was not very well provided with information about the regional economic potential although some of the companies involved were presented during the interviews. FOV provided too little information about the existing companies in the region. It seemed that FOV itself does not have a clear picture. Only on request and at the end of the first day of visit FOV gave a short overview. It seems that there are some interesting companies on which FOV could focus more in the future. Examples are in the field of sensors Sensair, Collectrix, Visualize, and Sensible solutions, and in broadband, digital services Screen solutions, and LandSeaService. In the forestry/ paper industries and services there are about 1,000 companies.

2.3.2 Evolution of the Cluster

The International Evaluation Panel was interested to see the emergence of three nodes of activity by FOV in comparison to the earlier (circa 2008) embedding in the telecoms sector primarily. Now, this has diversified into three ‘Nodes’ of activity: Sensors; Broadband and Fibre Optics; and Digital Services. This seems to have emerged as a rational response to the evolving market for dedicated products and services rather than a more generic demand mainly for cable. For practical reasons it seems that this strategy locates each node more or less in a particular geographical location: Sensors in Sundsvall where Mid Sweden University (MSU) is responsible, broadband techno-logy/ Fibre Optics in Hudiksvall with Acreo as the main actor, and Digital Services at University of Gävle (UG). In addition, nowadays FOV is regarding itself as a cluster initiative in a broader sense as it also comprises the Stockholm region (Kista) as a subset.

The evolution from one to three nodes and from one to three sub regions is a dramatic strategy change, which triggers a lot of time consuming organisational adjustments. On the other hand much more of the regional knowledge and economic potential is covered

by this strategy, including cross-fertilisa-tion, than the former narrow focus on fibre optics did.

Although the Panel understood that FOV is interested in developing its relationships towards sectors outside the telecoms one it was traditionally linked to from past dependence on the presence in fibre optics of Ericsson, it could usefully seek synergies among the three nodes as a possible means to broadening its market base.

This echoes new thinking about targeting innovation opportunities from supplying products and services of an integrated (systems integration) kind to a variety of markets that nevertheless are reasonably well related to the core competence (FO communications). This also reflects the well-establis-hed characteristics of most innovation that it is a recombination of existing and new knowledge. The Panel believes that FOV could benefit in its commercialisation ambitions by:

Examining how it may develop products and services that combine elements of its own internal competences and capabilities,

Developing a 'system-area' of local and regional final customers and inter-mediate systems integrators with whom they will work – rather like having industry as a laboratory or externally surrounding extra test bed

In this way, and in line with good practice as represented in VINNOVA reports like 'The Matrix' and 'White Spaces Innovation' it is anticipated that building first a local then regional customer system in user-fields related to FOV 'nodal' competences and capabilities will be advantageous for the next 3-4 years of VINNVÄXT funding and, hopefully, beyond into the future. Thus we support the FOV vision of engaging large regional industries and linking with them into VINNOVA's 'Grand Challenges' future innovation initiatives.

2.3.3 Implications for FOV

We think that this analysis has implications for near-future action by FOV in relation to the securing of its future as a 'network broker' bridging the gap among the applied research community, the governance community that is so committed and supportive and the large firms and SME that are key elements in the industrial economy of the region. There needs to be an urgent re-focus upon the business aspects of FOV's mission to try to build up that aspect of its activity.

We think the best way forward is to establish a Task Force to design a practical strategy on 'Market Development of FOV' drawn from the company board, possibly to include relevant outside experts and a VINNOVA representative to assist development of an 'emergency' strategy (finished and ready for implementation by early May 2012) along the lines suggested. The preconditions for a successful work of the task force are good as the new chairman of the board is from business and the new mayor of Hudiksvall municipality also seems to have realised that there is a serious need for change.

One major element of the “emergency strategy” is a comprehensive and coherent analysis of the economic potential of the region in the relevant business lines. This is probably not an easy task, but it is manageable as information about individual companies is provided by Sweden statistics – including a comparison with other regions in Sweden. At least one of the VINNVÄXT initiatives is using this database. VINNOVA could help by organising exchange of experiences between the initiatives or even by providing data on companies. Similarly the paper should comprise a comparative regional analysis of the R&D activities in universities, institutes and companies.

The task force should also elaborate further the role of FOV on the national level answering the question what the “unique selling point” and complementarities of FOV is against Kista, the Gothenburg and the Lund region, in terms of knowledge creation and business potential.

It may be opportune that FOV is already committed to producing a new communication plan for a marketing strategy aimed at four target groups: growth companies in the region, large companies, major regional actors and international players. This plan still seems to be quite vague and we advocate strengthening this report substantially by developing and securing market targets, identifying needs of customers and implementing innovation where appropriate to meeting those needs. The report should also address the pro-cess of new business firm support (e.g. more dedicated enterprise and innovation support dedicated to FOV start-ups) in the region.

Thus FOV should be in a better position to fulfil its commercialisation mission armed with the clarity of purpose such a strategy is intended to provide.

2.4 The Way Forward

2.4.1 Growth Opportunities

FOV has three primary growth opportunities. These three opportunities are largely independent with limited synergies between them. FOV acts as the high level connector between these disparate activities, none of which at this point have a sustainable critical mass but all three are in high growth markets.

Digital services/content and bandwidth

A range of niche applications relating to such creative industries as film editing and e-music are developing in the region. Some of the businesses are already successfully servicing customers that are located well beyond the region.

There is a low entry cost for SME’s that are active in this area, which also provides opportunities to quickly scale up to service international customers.

It remains to be seen as to whether the region becomes a significant contributor of digital content on a Swedish, yet alone a European, scale.

Fiber and sensors

Niche low volume applications have already been successfully developed for speciality fibers, and with perseverance may be developed for sensors.

Moving from an R&D concept to a commercial product can well take three/ four years, and it may take even longer to develop a profitable commercial product that has been rigorously tested for niche applications. These applications could relate to local activities such as forestry, hydraulics and steel. They may also relate to more distant opportunities such as oil and gas exploration.

Growth businesses in this high technology area will require relatively substantial up-front development and capital costs. Businesses scaling up from supplying the domestic market to international markets will face strong competitive challenges.

There is minimal crossover and synergy in terms of technology or markets between fibers/sensors and digital services/content. “Fiber Optic Valley” provides a link between these disparate activities but due to the very different nature of these activities it will remain a very limited link.

Technical Training

There may be opportunities to take further the current technical training activities through lifting competencies to a European level. With time it may be possible to develop global niches.

The international competitive position for technical training is unclear.

Technical training is not dependent on the development in fiber and sensors and has very limited synergy with digital content.

2.4.2 Establishment of Task Forces

It is recommended that within each of these three areas FOV should estab-lish a business-led, triple helix taskforce to develop the forward agenda with a focus, in priority order, on:

Commercialisation of inventions

Carefully nurturing and supporting the companies that have a ready demonstrated success in building a customer base

Encouraging start-ups and spinoffs, broadening the local base of businesses.

The current absence of business angels, venture capital and a dedicated fiber optic incubator in the region is a reflection of the current lack of demand and the competitive challenges facing commercialisation in this sector.

Creating the local/national demand

Acreo partnering with FOV in identifying and stimulating demanding customers in the region, providing a local learning context that can then be taken to more distant markets.

Approaching regional companies in other industries such as forestry and hydraulics, which may provide novel opportunities for the application of local competencies.

Levering through closer collaboration with other cluster initiatives, including Process IT, Triple Steelix and Robotics Valley.

Attracting new businesses and talent to the region

It is noticeable that foreign investment has yet to be attracted to the region in any scale.

Collaborating with the initiative and companies in the initiative, e.g. problem solving test-beds.

Promoting success stories.

Developing the FOV website in appropriate languages.

Internationalisation

Building on existing customers and contacts, including academic contacts.

Using international forums such as FTTH Council and Broadband Forum to promote the region and identify target customers and candidates (both firms and talent) for possible relocation.

2.4.3 Concluding reflection: Take FOV's experiences further!

FOV is working exceptionally well with tight Triple Helix engagement across regional political boundaries. Trust and confidence has been built. Complex development agendas have been successfully co-financed and managed.

However, the activities, organisations and businesses that are components within FOV may account for just 1% of local employment at this time. It takes considerable time and investment for emerging hi-tech activities such as this to develop the necessary deep competencies and market presence to be a substantial contributor to a region's economy. This time is measured in decades, not months.

The governance and management experiences that have been accumulated through the FOV initiative could now be extended through developing other sectors of the regional economy.

Can, for example, a similar initiative be developed, under the same manage-ment team, to similarly engage around companies such as Sunfab Hydrau-lics, HIAB, Hudik and Iggesund Tools?

3 GöteborgBIO

GöteborgBIO is a joint project between national and regional players. It aims to create a solid base for long-term growth in the biomedical field within the region, by cultivating academic research and commercial innovations and adaptations within the health care system. GöteborgBIO has the following focus areas:

- New business development as a result of research and development within biomaterial and cell therapy.
- Developing and reinforcing the infrastructure for the commercial development of projects within biomedicine.
- Educating and training future leaders in advanced business development within the biomedical field.
- Attracting both expertise and capital to the biomedical field within the region.

3.1 Achievements of GöteborgBIO

Based on material presented by GöteborgBIO and discussions at the Site visit the evaluation team acknowledges the following achievements and challenges.

Has empowered some investigators and industry to enhance the biomedical platform

In general the evaluation team got the impression that GöteborgBIO was successful in empowering research and industry to develop the regional platform in the field of biomedicine. GöteborgBIO has helped to knit together the biomedical system. However, we also had the feeling that some parts of the research potential in the region are not fully explored. This challenge will be elaborated later.

The review was well managed and organised – all participants showed commitment to the initiative. Good platform for the future

The site visit was very well organised and managed. The meetings were timely joined by important regional personalities and the discussions were very dedicated. This indicates the commitment of the regional actors and stakeholder for GöteborgBIO.

Has created awareness of the importance of biomedicine – commitment in the region from regional actors

The awareness of the importance of biomedicine in the region has in our impression increased in the last years. GötbeorgBIO has contributed to this. However, we feel that this is to a large extent due to a study on opportunities and challenges for the Life Science system in the Västra Götaland Region, which was conducted by the former Prime Minister Ingvar Carlsson and published, in early 2011. It's important that further development of the initiative lever from the conclusions from this study.

Made a difference for the development and localisation of some of the bigger companies

Large companies may be interested in the existence of GöteborgBIO for different reasons. Some large companies do not have all the R&D capacities and/or laboratories they need. The existence of Institute for Biomaterial and Cell Therapy (IBCT) is in this respect essential, and may have made a difference for certain corporate R&D activities. There is experience of collaboration for more than 10 years. Other large companies see other benefits they can achieve by GöteborgBIO, e.g. high-level international scientific events or support for the formation of start-ups.

Capturing the life science industry in the region

Unfortunately, there was no sufficient information provided by Göteborg BIO about the question in how far the initiative captures the regional business potential in this area. According to the presentation the Gothenburg region covers 23 per cent of the Swedish Life science industry. An investigation conducted by VINNOVA mentions 17 per cent (according to a tighter definition of "Life Science"). The number of life science companies increased according to this database from 33 (1997) to 107 (2009). Without being able to quote an exact number it is obvious that the GöteborgBIO does not capture a number of companies. One example for a missing global player is Astra Tech Dental in Mölndal, which was not mentioned to be a partner in GöteborgBIO.

GIBBS is well known outside the region and a regular part of the education system in Göteborg

GIBBS is a joint initiative by Chalmers University of Technology (CTH), Göteborg University (GU) and Sahlgrenska Academy. It was founded in 2005, while the basic idea of the educational structure is based on the Chalmers School of Entrepreneurship (CSE) founded in 1997. GöteborgBIO funds GIBBS since its inception. In the last years funding took with about 20 per cent of the GöteborgBIO's budget. Göteborg International Bioscience Business School (GIBBS) is now a well-established player in the region.

Unfortunately, the links between GöteborgBIO and GIBBS are not visible to the outside world, at least there is information about this mentioned at the website of GIBBS.

Has led to closer collaboration between GU and CTH

For the evaluation team it was difficult to evaluate in how far GöteborgBIO has led to a closer collaboration between GU and CTH. It was clear that there are some overlapping activities. At the same time there are some indicators for collaboration such as the on-going joint applications of GU and Chalmers such as the project financed by VINNOVA's programme Key Actor Initiative ("GoINN programme") and an application to the Swedish National Academy for Higher Education on "the best entrepreneurial education in Sweden". However, the evaluation team likes to emphasise the need to further strengthening the collaboration and integration between GU and CTH in the development of GöteborgBIO.

The two projects within IBCT successfully integrated industrial interest with fundamental research

During the site visit the evaluation team was invited to the Institute of Bio-material and Cell Therapy. The IBCT is presently running three research projects together with regional and other Swedish research facilities, the Sahlgrenska Academy, the University of Gothenburg, the Odontology clinic, some SME, and two Gothenburg based global companies Nobel Biocare and Mölnlycke Health Care.

The aim of the projects is to help the both companies to innovate their pro-duct portfolio. Though, it was mentioned that the research is very much fundamental research. Thus, the results could be also useful for other com-panies in the region.

The verification grants have been critical to initiate start up activities

Verification grants from GöteborgBIO are given in collaboration with Sahl-grenska Science Park. According to the information provided by the process management team 8 grants were approved in 2008, 5 were approved in 2009 and 4 were approved in 2010. In 2011 no grants has been approved, as the verification programme will be re-designed.

The evaluation team views verification grants as a useful and critical measure to fund start-up activities.

Supported the positive development of SSP

Business Region Göteborg (BRG) and Västra Götalandsregionen (VGR) initiated the Sahlgrenska Science Park (SSP). In 2004, the University of Gothenburg and in 2009 Chalmers University of Technology also became owners. The SSP has developed a well functioning incubation environment. One of the main tasks is the handling of the verification programme.

Although it seemed to the team that SSP and GöteborgBIO are working together in a very trustful way, it has not become clear if there is an overlap in responsibility between the two partners.

Part of EU-initiative Regions of Knowledge

GöteborgBIO is part of the TERM project, which is financed by the European Commission in the “Regions of Knowledge” programme. There are also some other international and national co-operations going on with other regional organisations. Also, events for partnering were organised. Though, it is not clear to what extent GöteborgBIO also uses the competence of national supporting organisations in order to enhance the process of internationalisation.

3.2 Develop the outward orientation of GöteborgBIO

One important part in the further development of GöteborgBIO is a change in perspective. The evaluation team senses that the initiative still has a rather inward looking orientation. To fully realize the potential of the initiative there is thus a need for

a more outward orientation in strategy and activities. Important parts in this development are:

Need to develop the understanding of GöteborgBIO in an international context

To market and to develop the region as a world centre for biomedicine is one of the challenges, which really are on the task list. In fact, there were some activities going on, however these have to be expanded very significantly. According to the balance sheet provided to the evaluation team there is only 13 thousand SEK spent for internationalization, which will be raised to 150 thousand SEK in 2011. In the years 2008 and 2009 there were no money spent for this.

What are the main tasks to be fulfilled in the next years? We all know that research is globally, as well as business is working globally. Thus, Göteborg BIO has to realize this and to bear it in mind much stronger than until now when formulating the strategy for the coming years.

Continuation of international symposia and conferences as a means to 1) position the initiative and 2) support knowledge development and 3) scouting

GöteborgBIO can build on activities which were going on already and which are appreciated by the companies. For example, the high level international scientific events organised by GöteborgBIO are useful for companies such as Nobel Biocare and should be continued. Also the presence of GöteborgBIO in trade shows can be helpful, especially for SME or for start-ups in making contacts with potential partners.

However, participating in trade shows are expensive and takes a lot of time. Therefore it has to be carefully decided to how many and to which trade shows to go.

Scouting is an important subject to be considered. We talked to some of the start-ups in GöteborgBIO and learned that they could not find investors from the region in order to "cross the valley of death". Thus, external investors have to be looked for. There are some scouting activities, but it seemed to us that that happens by chance. This should be taking much more systematically. Global companies normally are scouting for new research results and for new products ideas and start-ups around the world. It is not very time-consuming to find and to get in contact with such scouts.

Need to develop brand awareness and branding strategy

Besides the need for the continuation and enhancing of tasks that are already undertaken by GöteborgBIO there is also need for a fundamental creation of a branding strategy. However, it has to be considered that a branding strategy requires a clear initiative's strategy with a strong leadership.

Also, the label "GöteborgBIO" might be evolved into a name that is easier to be understood abroad. Possibilities are "GothenburgBIO" or "BIOGothenburg".

Need for international benchmarking & learning

We asked also for activities with regard to international benchmarking and learning. Actually, there was no clear answer. There are apparently no benchmarking activities whatsoever.

Need for a strategy for inward investments

Strategies for inward investment have also to be taken into account. We saw some investments from aboard. But we think much more can be done in this respect, as there seems to be some potential for business acquisition. Starting point for developing a strategy can be enhancing or starting co-opera-tions with local/ regional/national authorities that are already active in this field.

3.3 Develop the knowledge base

3.3.1 Solid and established knowledge base in the region

The review of GöteborgBIO funded by VINNOVA was very well organized and gave the committee a very clear picture of all the activities that have been embraced by the so called GöteborgBio programme. This initiative has many components and stakeholders and the objective is to create a solid base for long-term growth of biomedical technologies in the Gothenburg region.

The initiative has had an impact on academia-industry research initiatives, entrepreneurial education, and development of start up companies in this techno-logy space, and has fostered new links between the two major academic institutions in the region, Chalmers Institute of Technology and the University of Gothenburg. Most importantly the initiative and its highly commit-ted community have created over the past 7 years a strong biomedical focus in this part of Sweden that could have long term impact in the region's future development.

Even before the initiative started, there was a great tradition and innovation at the University of Gothenburg medical school (Salhgrenska Academy) in the area of dental implants and Osseo-integration of metallic prosthesis. Gothenburg has also been the home for a number of years of the emerging medium sized stem cell company Cellartis. These two facts and the GöteborgBio initiative have identified "Biomaterials and Cell Therapies" as the flagship bio-domain for the region.

The management team of GöteborgBio claims there are over 20 companies in Gothenburg that are at least distantly related to this area, compared to close to 60 in all of Sweden. There are also global companies with a presence in Gothenburg such as AstraZeneca and Nobel Biocare with either direct interest or at least potential interest in this biomedical area. For all the reasons enumerated above, it is reasonable to consider that the area of Biomaterials and Cell Therapies should be the central knowledge base for economic development of the region through life sciences.

3.3.2 Need to both broaden the scope AND support cutting edge research and commercialisation

Bioactive biomaterials and cells are two of the major emerging strategies for regenerative medicine therapies. The field of regenerative medicine is attracting great attention worldwide, driven by the fact that longevity is on the rise and therapies that can provide high quality of life into an advanced age will become a huge engine for new business opportunities. Advances in stem cell biology, supramolecular chemistry, and Nano science have fuelled research in this area seeking to develop technologies that direct cells to regenerate tissues and organs. This area is extremely broad, encompassing all human biology and materials science.

The scope covered by the GöteborgBio in this area, chosen as the central theme in the initiative, is extremely narrow compared to the broad spectrum of research on regenerative medicine around the world. Therefore, based on academic expertise available at the University of Gothenburg and Chalmers, it is suggested that the initiative considers expanding the portfolio.

Two important areas that could be explored include the cardiovascular and neural regeneration, both of great importance to address health care concerns in decades to come. In both of these areas there are opportunities to utilize biomaterials and cell therapies in indications such as myocardial infarction, ischemic disease, neurodegenerative diseases, among others. The initiative in the region could capture some opportunities in this area in the context of academic-industrial collaborations with a global company, medium sized companies, and eventually lead to start up companies as well.

This expansion in the field of regenerative medicine should not be done at the expense of the world-class academic and industrial efforts in the region in the area of Osseo-integration. This effort is recognized worldwide and interfaces with an important industrial platform in the region. Another important direction that the initiative could consider supporting is cutting edge research on wound healing since an important industrial contact exists in Gothenburg.

Expanding activities in this topic may prove useful for economic expansion since an established industry already exists. Generally, the initiative is advised to investigate pro-actively from industrial entities in the region what areas are of interest within the scope of biomaterials and cell therapies for regenerative medicine. Seeking this feedback from the industrial direction should be a dynamic process in the next few years, since interests may shift or companies could move away from the region.

3.3.3 The need to attract talents

A critical issue in expanding the knowledge base will be the ability of the academic institutions in Gothenburg to recruit new talent. This is a difficult and costly challenge that the initiative itself may not have the resources to implement directly. However, the

initiative may be able to help with modest investments in the recruitment of young talent that offer great long term potential for the region.

Another possible approach is to help academic institutions find special financial opportunities that would allow them to find the resources needed to attract senior investigators that are already well established elsewhere. The review committee sees this process as critical for the region's future and the management team and board should actively promote recruitment of top scientists to the area.

3.4 Develop commercialisation and financing

3.4.1 Business models for life science and start ups

The traditional business model for an innovative but mature life science company, as well as for many other industry branches, has three core elements:

a) Product development and manufacturing
b) Sales & marketing
c) Using the profit to support (a)

In a life science start-up company, such as those supported by GöteborgBIO through the verification and incubation processes, the modern equivalence of that model is:

1 Product development
2 Business development
3 Financing from external sources to support (1)

When this model was established some 20 years ago, it was called "the biotech model" but embraced also drug development, diagnostics, medical devices and other life science areas.

3.4.2 The situation for Start Ups

It is natural for a young company to focus on (1), and it's fair to say that without a strong product or service idea, preferably with some kind of IP protection, there is little relevance in doing (2) and (3). When meeting representatives of the innovation system and meeting some of the innovators and entrepreneurs, we were thus not surprised to find a focus on (1), at least when it came to measurable achievements and quantifiable indicators.

For example, when asked to select two shining stars that have come out of the verification and incubation process, the interviewees held forward Arterion and Medfield Diagnostics. However, none of these two have recruited any significant amount of private capital, or have more than a few employees, or have started the pivotal and expensive clinical studies needed to reach product approval.

We are fully aware of the difficulties of raising capital today, and these two particular companies' failure to raise capital or to find licensees or partners is not the core of our

criticism. The Gothenburg region shares that problem with all other Swedish regions and with numerous regions abroad. However, the two examples illustrate that:

- More focus is needed on (2) and (3)
- The GöteborgBIO success criteria, whether these relate to number of employees, turnover, attractiveness, etc., are not yet met and are not around the corner

3.4.3 The challenge of financing

In the simplest way, "more focus" on (2) and (3) just means to "work harder", and for some of the start-ups it is likely that the efforts in business development and financing could increase. If nothing else, it would contribute to the steep learning curve needed for young CEOs and business development managers.

However, "more focus" could also mean to do things differently, and to that end GöteborgBIO could have a very important role and a leveraging effect. GöteborgBIO could engage further in activities to find new sources or new models for venture financing. For example, initiate and facilitate the formation of local business angel networks or small investment funds. CONNECT Väst is such a network, but its role for the regional life science start-ups did not become clear to us during the interviews; in fact it was not mentioned at all. Another creative solution is represented by the life science oriented PULS Invest, based in Helsingborg but with strong ties to Gothenburg. Yet another interesting and low-key example is Ideonfonden in Lund. That fund, which is directed not just to life science, has certainly not solved the seed capital supply in the Skåne region, but it is an example of creative solutions that could easily be emulated by Gothenburg with its proud history with philanthropists such as William Chalmers and Niclas Sahlgren.

Another creative solution is to decrease *the needs* for financing. The most expensive activity is usually clinical studies. Could perhaps a player such as GothiaForum be used not just to facilitate the industry's access to patients but also make it less expensive, at least for the start-ups?

We are convinced that further, creative solutions to the capital supply problem can be conceived by GöteborgBIO and the clever people it serves, or can be found out through systematic benchmarking with other regions in Sweden and abroad.

The most brutal (or perhaps the most human?) way to decrease the need of funding is of course *to avoid at all to start companies* for which it is obvious that huge capital injections will be needed down the road. One shouldn't lightly send people into drug development's Valley of Death without sufficient supplies.

This was in fact suggested by one of the interviewees, so there is without doubt problem awareness within the verification and incubation system of GöteborgBIO.

When setting out new goals for the period beyond 2011 it is thus an excellent opportunity to go from awareness to action. Interviewees from the management and the Board seemed however not yet fully on the same page: one suggested that this was no

big problem and referred to the 200 MSEK in “investments” attracted during the period, another was clearly aware of the problem but not about any GöteborgBIO initiatives to solve it, and a third informed us that the problem indeed was on the agenda already when setting out the 2008-2011 goals but that a deliberate choice was made not to address it. Whatever the reason might have been for that, we are sure that it will receive more attention this time. This financing problem is here to stay and must be addressed. It won’t go away.

3.4.4 The challenge of business development

Let’s leave aside the financing challenge, and have a look at business development that is a challenge that is somewhat easier to address and a little less dependent on global economy. As suggested above, outwards business development is not something that is just complementary to the product development. It is a *core activity* and the equivalent of what sales & marketing is for a conventional company. And who would ever suggest that sales & marketing is not top priority?

Interviews with innovators and entrepreneurs indicated that the young companies hadn’t yet geared up their business development. Some seemed to suggest that outwards business development was something you unfortunately are forced to do though the prospect are slim, while others seemed to suggest that it was a rather easy task that could be addressed later by going to industry and partnering events such as BIO or BIOEurope and meeting top executives. However, more mature biotech companies in Sweden or Denmark or any other country can witness, from bitter experience, that business development is a demanding activity with long lead times between the first meeting to the eventual business deal making. Planning is needed, as well as a budget, and usually it helps to have some experience and seniority.

It is evident that GIBBS gives high attention to this field, but more can be done and, besides, far from all companies are managed by their alumni. Just as the case for financing, here is an important, urgent and high profile role for GöteborgBIO and its network of senior and experienced people. And a useful role, because business development is global and outward looking and when young or mature Gothenburg companies “hit the road” they will also promote the GöteborgBIO brand on the global arena and in places that matters.

3.5 Develop the role as systems integrator

1. Developing GöteborgBIO as a System Integrator

GöteborgBIO, like other VINNVÄXT initiatives, involves building a cross-functional network broker facility in a specific industry platform. In this case it is focused in life sciences, a particularly large and complex platform of distinct but often inter-related research, translation and commercialisation functions. Mapping the system and the key sub-systems (e.g. clinical) is imperative if Gothenburg BIO is to communicate internally and externally what it is expert in facilitating within the broader life sciences platform.

This ‘map’ or ‘organogram’ should show the main regional actors in Bio-materials and Cell research and commercial activity – the core of the initiative’s knowledge and competence – in relation to typical value chain partners and the support infrastructure of entrepreneurship, innovation and financial assistance to firms (especially start-ups). It would also portray key sub-systems in the overall system, for example the ‘clinical’ sub-system with reference to CROs, patient databases and clinical trials facilities among other elements. This has been identified as a useful tool when discussions take place between system actors and foreign investors, for example.

The position and key links of GöteborgBIO will naturally be highlighted in this graphic. In existing examples, a further graphic representation is also used which is of Power Point picture quality such as those on the Internet, representing Boston (‘Genetown’), San Diego (‘Biotech Beach’) etc. It should also show main connections to national and international actors in the public and private sectors of relevance to the initiative. This could include large client firms elsewhere, international funding agencies (research, in particular) that support actors in the Gothenburg platform and regulatory bodies of consequence to it. Thereby, such an ‘organogram’ will be a useful portrayal of the GöteborgBIO ‘world’ that its internal actors and external partners may better understand.

Matrix Database

In the International Evaluation, the Panel formed the strong impression that some entrepreneurs were struggling and incurring significant costs to identify companies that were interested in funding their development costs, perhaps with milestone payments, or starting a licensing or trade sale relationship with new entrepreneurs. Therefore we are of the opinion that Göteborg BIO should create a data matrix of relevant large and medium-sized firms cross-tabulated against their biomedical niche that would be a starting point for contacts that entrepreneurs might swiftly make.

This would improve the efficiency and effectiveness of the partner search process for start-up and other smaller new companies in the initiative. The data search activity for this function could easily be part of the same process as drawing the ‘organogram’ but only for the firm level of activity. It would draw on existing data sources possessed by the initiative and VINNOVA centrally. Improving the knowledge base of client firms, inside and outside the region will be a service of considerable assistance to firms establishing themselves at, as well as graduating from, the biomedical incubator system.

Showcasing GöteborgBIO firms

Another way in which young businesses in the initiative need assistance is in having a forum or arena in which they can showcase their products or services to the full-time ‘Technology Scouts’ that are employed by medical technology and biopharma companies. This requires more than displaying a stand at the US BIO trade fair, sharing a Scandinavian stand with expensive resource input and disappointing results. It involves hosting – possibly in partnership with other system intermediaries – an event

of a few days in Gothenburg, a good Congress location – where Technology Scouts may discuss and assess products and services of young businesses.

An ideal attractor would be to combine it with a themed conference, perhaps on relevant aspects of ‘Regenerative Medicine’ or ‘Diabetes’. Ideally, this would be an annual feature of the programme of events organised by GöteborgBIO demonstrating capabilities of new firms and projects to Technology Scouts, but also showcasing research-based ideas and avenues for development.

Finally, this will help meet the need for a continuous strong commitment from industry in the initiative – business led identification of their areas of future interest will also be a potentially powerful source of new ideas and projects for budding entrepreneurs. This will further help to define core activities for GöteborgBIO as a system integrator and refresh some key activities, showing how, for example, Sahlgrenska Science Park and GIBBS are also key parts of the GöteborgBIO knowledge exploration and exploitation system.

2. Sustainability of GöteborgBIO

Developing the Sustainability of GöteborgBIO

As with other second-wave VINNVÄXT, GöteborgBIO faces a new situation from 2014 with the ending of VINNVÄXT support for the initiative. This creates an urgent need for strategy development concerning a sustain-able future regarding the status, funding and regional priorities of the initiative

Future Status of GöteborgBIO

The status of such a network brokerage in a complex system, which, as we have seen, is the position of GöteborgBIO in the regional Life Sciences plat-form, is important. This is because, although it is an intermediary among powerful institutions such as universities, big pharma and government, it occupies a possibly unique space as a lateral or horizontal means of know-ledge flow among such strong vertical ‘silos’. In the forthcoming GöteborgBIO 2.0 era this character will develop significantly.

A general idea/vision for GöteborgBIO as a systems integrator was presented in the meeting with the process leader and management team as a well an idea for the process to develop this general idea/vision further.

The Evaluation Team support the idea presented but also would like to underline some issues that need to be clarified in this process:

- The operative mandate and ”power” of GöteborgBIO in its role as a systems integrator
- The relation between Sahlgrenska Science Park and GöteborgBIO needs to be clarified when it comes role, mandate and resources. These two organisations have complementary roles that are not inter- changeable and require maintaining separate identities.

- The need to develop the relations between GU and CTH as well as the other actors in region related to life science (for example centres of excellence). This is necessary if we want to base the development of GöteborgBIO on a more collaborative mode of working.

Transversality

This is because of the new responsibility for 'horizontal' intermediaries like GöteborgBIO to make connections to the other main clusters that constitute the future evolutionary trajectory of the West Sweden regional economy. The initiative will thus bridge the 'White Spaces' (VINNOVA Report, 2011) between Life Sciences and, for example, Green Chemistry and its intermediary body and key actors. Possible future links with other unfamiliar platforms like the Automotive, Marine and Sustainable City programmes further enhance the importance of GöteborgBIO's functionality.

Being of independent status would enhance the flexibility of GöteborgBIO in meeting multiple tasks and challenges, but this may not be a preferred option for reasons other than how the initiative best discharges its challenging new functions. Regarding status therefore, consideration needs to be given to the merits and demerits of the following possible juridical forms GöteborgBIO may take in future:

Public private entity

- Private company
- Non-profit organisation
- Governmental element
- University element
- Science Park element
- Foundation
- Other……

Future Resource Base of GöteborgBIO

Equally, status is intimately tied up with funding sources. Regarding funding: Sources of funding to replace/enhance VINNVÄXT-funding that will require establishing in line with the status preference agreed from the above mentioned options. These include elements and aspects such as the following:

- Service income (i.e. selling services like information, tools and advice to GöteborgBIO client firms and organisations)
- Membership fees (i.e. charging firms variable membership fees according to size of member organisation – small fee for start-ups; medium fee for SME's; large fee for large firms and organisations)
- Lobbying nationally to achieve changes in national funding regimes to allow for baseline funding for 'transversal' intermediaries like GöteborgBIO
- Regional funding (i.e. enhanced regional funding for lateral 'cross-fertilisation' innovation support activities at platform 'interfaces')
- Other…..

An Expanded & Interactive Future

In all probability, GöteborgBIO will attract a basket of fee income and core funding support if it is clear on its mission and functions, especially the new ones implied by the emergence of ‘iconic projects’ that depend on integration of knowledge from different sources in the new regional platforms of innovation being formed in the region. This future challenge constitutes one of the strongest factors in arguing for an enhanced status and funding regime for GöteborgBIO. This is because the network broker function must now not only bridge interfaces within the complex regional system of Life Sciences, but also among that platform and the other four or more new platforms that have been identified as future regional growth engines. Identifying lines of exploration and exploitation across the interfaces of these sometimes related, sometimes unrelated industries demands an enhanced role and functionality for GöteborgBIO in future.

4 New Tools for Health

New Tools for Health (HNV) is working to develop new products and services to meet tomorrow's increasing need for care. The focus is on effective residential care home as a base. New Tools for Health supports needs-driven research in healthcare to create opportunities for collaborations between industry, research and health care providers, to thereby stimulate new pro-ducts and services. New Tools for Health support the entire process from requirements, through ideas, feasibility studies, development and commercialization of products and services that can eventually reach an international market

4.1 New Tools for Health at a cross road – green and red lights

In the following the most important topics regarding the achievements and the challenges in the view of the expert team are reported.

Strategy more focussed now after restart – STILL: needs to be sharpened, "Hot Spot" for Sweden

In the action plan for the period 2009 to 2011 the strategy was reshaped according to the recommendations of the previous evaluations. For this period all activities were targeted on the task "Efficient home-based health and social care". As a result the board was changed. Also there were some changes on the operational level, such as the forming of focus groups for distributed health and medical care and for biomedical engineering.

However, the review team had the impression that the focus of the initiative is according to their capabilities still too broad focused taking the size and the knowledge potential of the initiative into account. Thus, here is still some effort to make. On enquiry the process management presented its thoughts about the mid-term future of the initiative. Hence the core of New Tools for Health will focus more on a business orientation with the aim "to stimulate and support home mobile IT solution" with two priority domains "Diagnosis of dementia, diabetes, heart failure and COPED" and "Loneliness and isolation among elderly". This was applauded by the evaluation team because it seems to fit quite nicely into the knowledge and research potential of the region, but also into the "Grand Challenges" the Swedish will meet in the years coming.

Support from regional actors: university, county council, municipality, business – STILL: governance too timid, industry not sufficiently presented

Now regional leaders from academia, public administration (which are also representing the hospital) and the business side are on board, the health care industry as well as ICT industry. The board is headed by the Östergötland County Council. There are 11 members in the board; five of them are from the public administration, three of them from university (including Acreo) and three of them from the business sector.

The business sector is in the view of the evaluation team definitely under-represented. There is a least one large multinational in the region (Ericsson), which is missing here. Also, against the background of the strategic focus it would be preferable to iterate more of the health and home care business into the board.

Board members have to show leadership, i.e. they have to convince by strategic thinking and by representing the initiative in a realistic and self-confi-dent way to the regional stakeholders as well as to the outside world. There was some discussion during the meetings in how far this has happened. In fact, most of the participants in the meeting agreed to the impression that the governance of New Tools for Health is too timid and could be improved in this respect.

Work procedures in place – STILL: Need for measureable objectives with milestones

Work procedures are in place. The process management responsible for day-to-day work comprises three full-timers and thus is well equipped. It is sup-ported by the "extended process management", which includes representatives from the stakeholders. According to that type of organisation the work procedures seem to function quite well. Another example is the way the workflow for the selection of R&D projects and for monitoring is established: Those who would like to have financed an idea have to undergo a two-step selection process. In 2009, New Tools for Health established a specific software tool ("Projectplace") in order to realize the project as efficient as possible.

However we got the impression that the work procedure in the initiative should be stronger organised, notably by formulating measureable objectives that also include milestones and the possibility to stop a project in case the results will not be achieved. Another challenge is that a new acting managing director is wanted. The review team was assured that the new person would have an industry background.

Research potential (university, hospital, FOI) expanded by LIST – HOWEVER: R&D fragmented, too few business driven

There is a remarkable research potential in the region, e.g. in Linköping University (LiU), in the University Hospital, in Sankt Anna IT Research Institute AB and in the Swedish Defence Research Agency (FOI). Currently, 1300 of the 3,800 employees of LiU are researchers (including 400 qualified professors). In 2009 the Linköping Centre for the Life Science technologies (LIST) was set up a part of the. This institute strengthens the research potential for New Tools for Health clearly.

In New Tools for Health, 21 research projects with 54 researchers from LiU have been funded in 2009 to 2011, according to the project list presented. Some of the projects were presented to the evaluation team. All in all, we had the impression that the R&D activities are somehow fragmented and not complementing each other and that most of them are not business driven. By comparison: New Tools for Health identified 121 projects at LiU in the area of "the elderly and ageing". This suggests that there is still a lot of potential yet to be exploited.

Reasonable number of start-ups (11 in 3 years), Ericsson coming in, public and private health care provider at place - STILL: Innovations mostly not cutting edge, lack of companies, regional potential yet to be exploited: ICT companies and care providers

The business sector for health care in the region has changed in the last years. First, there are a reasonable number of start-ups in the last three years, where New Tools for Health was involved in. Second, Ericsson is testing its equipment for remote patient monitoring in the region with the support of New Tools for Health. Most importantly, the health and social care system is the dominant part of the regional economy, and employment here is growing. All in all, there are some good preconditions to build on.

However, from the evaluation team's point of view innovations that were presented are not cutting edge. Another shortcoming is the lack of large or even medium sized companies in this field. Ericsson can fill in this gap only partly; as we heard in the interview, health care is not a strategic field of Ericsson policy. In our view the initiative didn't consider sufficiently the business potential in health care in conjunction with ICT companies and research. For example, private health care companies should be much more included as well as ICT institutes such as Santa Anna and companies.

Test bed (Ljura comprising of 1200 flats) in place and being expanded – Yet not fully used

Another asset is the range of test beds, especially the Ljura housing are in Norrköping. Additional three residential areas have been added.

During the meetings there was not very much time for questions about the test beds, about their suitability to the aims of the initiative and about their use. We had the impression that the test bed is used in order to test some new products, but obviously its potential is not yet fully exploited.

4.2 Grand Challenges as a Driving Force

4.2.1 Introduction

In 2010, the European Union (EU) adopted the idea of Grand Challenges to achieve two objectives. First, the idea originated from EU's efforts to create a Single Market for Research. The European Research Area (ERA) Rationales Committee proposed this would be best achieved if researchers throughout the EU were persuaded to raise their sights to address issues and problems of global importance. These included such global and large-scale issues as Climate Change, Healthcare, Energy and Ageing Populations. The second objective was to make these a focus for EU member states in their response to the financial and economic crisis of 2008-9 where rebalancing of EU economies towards tangible economic issues was agreed to be a priority. The central idea of tackling Grand Challenges is that they do not require specialisation by economies on such vulnerable and narrow sectors as finance, but integration of knowledge across clusters and sectors for recombinations that are the essence of innovation. EU support for Grand Challenge initiatives occurs through instruments such as 'Innovation Union'.

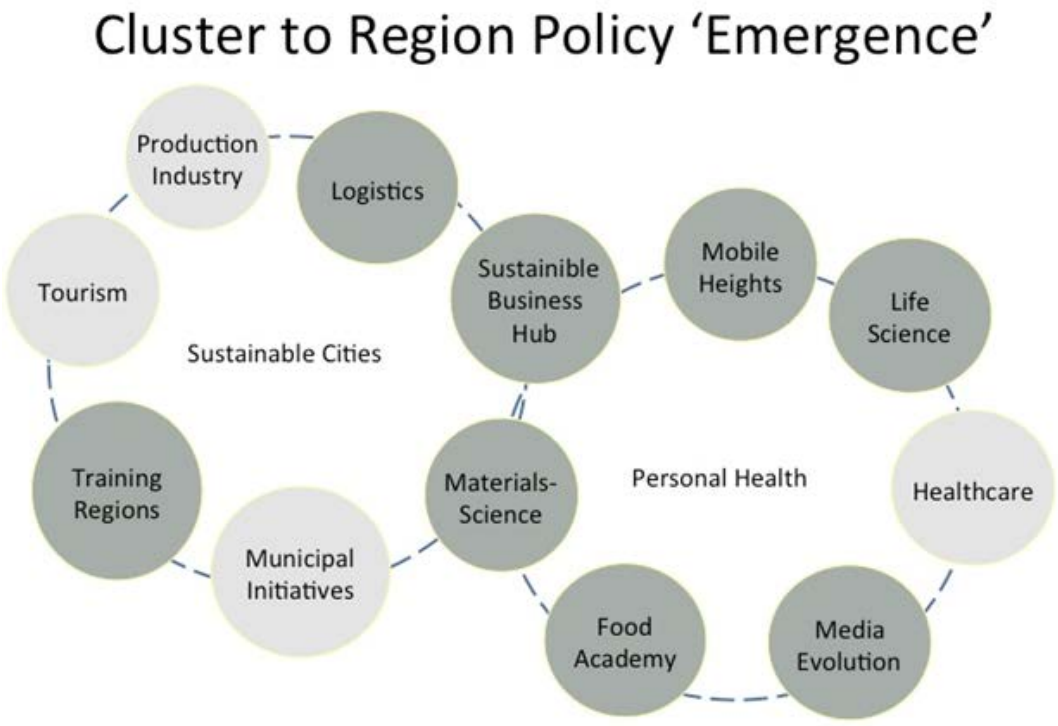
4.2.2 The Swedish Response

The Swedish government is one of the first EU member-states to adopt Challenge-driven innovation. This is reflected in VINNOVA's new 'Challenge-driven Innovation' open call for proposals, which attracted 630 applications for funding in mid-2011. The areas mobilised in the invitation to tender involve: Healthcare; Sustainability: ICT; and Production.

Implementing Grand Challenges at regional level has also proceeded in some Swedish regions, notably Region Skåne and Region Västra Götaland. Both have selected different aspects of Healthcare, on the one hand, and Sustainable Cities, on the other. These involve bringing together diverse clusters with relevant expertise (see Fig. 1) to recombine knowledge and develop innovative networks, solutions, and opportunities for learning. Projects are designed that contribute to different aspects of problem solution or innovation. The long-term objective is that regional firms involved are potential exporters of such knowledge, services, processes and products as well as helping implement solutions at home.

New Tools for Health is in an excellent position to take this thinking forward because of its focus on Healthcare, which is a large and complex segment of the economy in advanced countries. Thus even interconnecting across different parts of healthcare is challenging. Innovation is to be seen in the transformation that the New Tools for Health stakeholders have seen early in the need for 'Distributed Healthcare in the Home'. This, of course is because of the steeply rising costs of healthcare as the population of Sweden and its regions ages in step with the ageing of populations in many advanced industrial economies worldwide.

Figure 4.1 Grand Challenges and Regional Cluster Platforms



4.3 A platform for ICT-based health care solutions

4.3.1 Implementation and achievements so far

Regarding the 2009-2011 Action Plan

The proposal was aligned with the topics addressed by the evaluators at the previous stage (05-07). The objectives were more clear, focussed and realistic, demonstrating a better knowledge of the distributed home care concept, system and services. Specific progress was expected in: adapting devices to the home of the patient and facilitating the clinician surveillance of the citizens in their daily life activities, searching for new companies integrated in the created cluster, as well as for new product and markets, identifying problems and proposing solutions, to be “a leading region for efficient home-based health and social care” (sic).

Regarding the 2009-2011 Results

The main goals mentioned above were covered, and an important progress was reached in terms of the support given by the regional actors: university, county council, hospitals, municipality, business...which was positively con-firmed during the evaluation process: An unusual high number of persons representing the different groups, were there defending the principles and actions coordinated under the New Tools for Health umbrella.

The CV of the participants involved in the two days evaluation meeting covered all the fields needed for the success of the programme: from the academic point of view as well as from the administrative, managerial, medical, social, etc. perspectives. All of them showed a deep knowledge in the field, personal involvement and the aim of improving their participation in the next phase. The attendance of the Governor of the County Council to the last session held was also a clear sign of commitment.

Eleven new SME’s were created in the context of the programme support, which is a clear symptom of growth, even if some of those are not really in the cutting edge of the technology state of the art. The big challenge is now to support these new companies and to promote the creation of new ones addressed to cover the needs that arise from the implementation of new actions.

4.3.2 Develop a platform for ICT-based Healthcare Solutions

The strategy after six years needs to be reshaped regarding aspects that will allow giving clear answers to questions, like:

- What does a real cooperation with the involved companies means?
- Are all the reported (around 60) companies still working in the mentioned projects? Will they be in the future?
- How is it foreseen to find complementary budget?
- How to implement a strong communication strategy between all the actors involved?

- How is the system going to support the new companies created in this context?
- Is the survival of Tools for New Health partially supported by the companies, the public administration and the users feasible?
- Is it possible to create a new services paradigm based in a business model?

The conditions established for the sustainability of the initiative after the financing through the VINNVÄXT programme has ended needs to be clarified and we strongly believe that the programme should continue. But the governance seems still too timid, and it is needed more push in terms of promoting the awareness of the society about the need of a change, acting as a driving force, pushing the agents and empowering the citizens through public campaigns, workshops, etc. The resources needed for the future clinical trials and home service assessment (expanded test bed) and also the employed methodology are not sufficiently described yet, as well as their real dimension. It is a task for the new period.

The goal of Home Care through distributed ICT applications or services is to maximize empowerment, independence and productivity of individuals and their integration and inclusion into the mainstream society.

As an example, some of the key factors for the acceptance and success of Home Care ICT depend on:

- Barriers addressed to support independent living
- Cultural diversity
- Socioeconomic factors
- Environmental conditions
- Usability
- Seamless integration of services and applications
- Support from the Public Administration Services

All those aspects should also be addressed as a part of the new strategy, supported by the definition of a general system architecture that has to be contemplated as a modular system that can be implemented by the different partners during the next period.

The definition of a flow chart with clear milestones will facilitate the work progress and the follow-up of the programme.

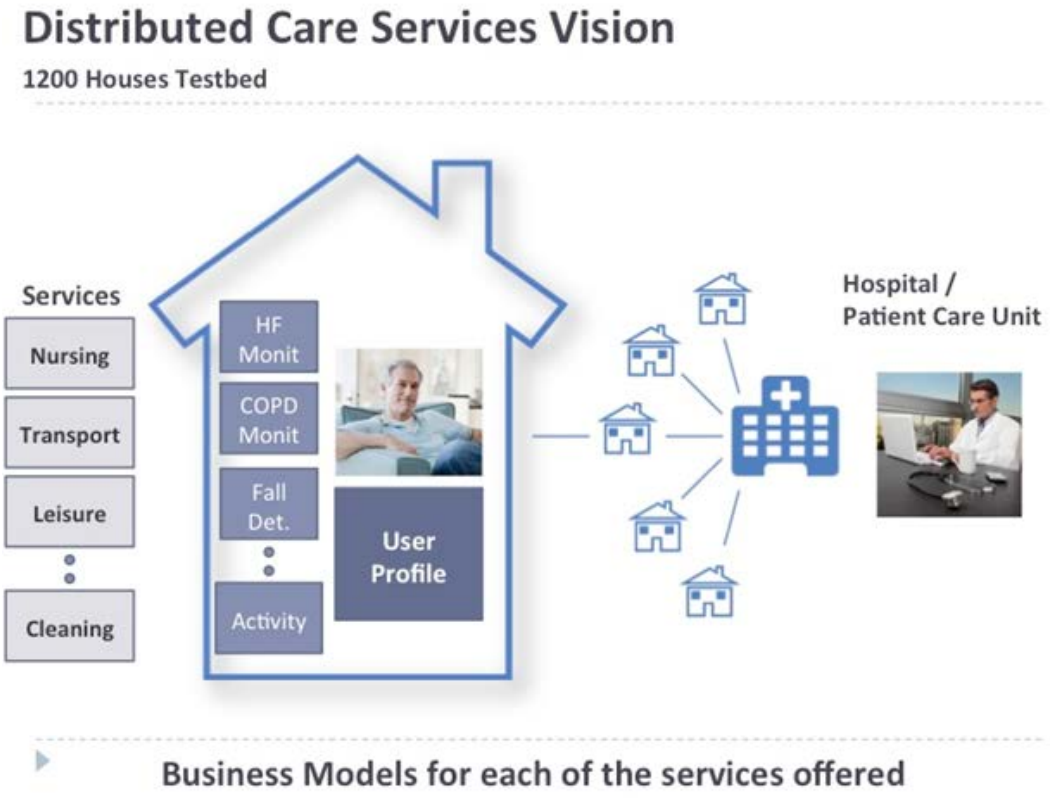
And, summarizing from a technical point of view, we recommend considering the need for:

- Seamless integration of services and applications
- Well defined processes for:
  - User Centred Design
  - Tools to support the process
  - Advance in ***architectures to implement Service Delivery***
- Advance in Service Interoperability

- Standardisation initiatives

The management structure and procedures are appropriate. The roles and responsibilities are identified. The quality and experience of the individual participants in their specific field are relevant.

Figure 4.2 A model platform for ICT-based Healthcare Solutions



4.4 The status from an industrial and international perspective

Over the last three years period the initiative has taken up many of the recommendations that were given in the previous review. Consequently significant progress has been achieved, especially with respect to the commercialization of the project results. This can be attributed to several actions taken:

- New Tools for Health has focused on distributed health and care applications resulting in more powerful and also more consistent activities.
- New Tools for Health has hired permanent staff with business and medical experience.
- The initiative has established new processes, among them an insights generation process that has allowed entrepreneurs and companies to get in touch with medical and social care professionals and get insights into the unmet needs of the different stakeholders. From an industrial and commercial perspective such a process is key

to identify and shape the right value propositions. Entrepreneurs and companies that participated in this process expressed their appreciation and stressed the positive role that New Tools for New Health played in orchestrating the process.

- The initiative also established a new project management process, which comes into play once a value proposition has been identified and its exploitation has to be executed thoroughly. In this framework New Tools for Health employees can serve as project managers or consultants to support the member organizations.
- New Tools for Health for has implemented a professional venturing process together with the business incubator of the university LEAD and the governmental company Almi.

11 ventures have been created in the reporting period, which is a convincing outcome of the actions taken. The success of these ventures will depend on whether sufficient capital from private investors can be attracted to fund them or alternatively larger companies can be convinced to take a stake in them. An overall attention point from a commercial perspective is the relatively small number of mid-sized and multi-national industrial companies in the initiative, especially from the healthcare industry, as otherwise venturing might be almost the only possible commercialization route for industrial products of New Tools for Health. It is not certain whether start-ups and small companies would be prepared for scaling up to potentially thousands of users in the region. In several cases, partnering with larger companies might be required.

Regarding the products that have been conceived by the members of the initiative, it can be observed that not all of them are cutting edge from an international perspective.

- Various pill dispenser solutions are already available in the markets.
- In the field of dietary programmes the start-ups will have to compete with large companies as well as other ventures (Weight Watchers, eDiets, SlimWorld, Nutrisystem, etc.).
- Telemonitoring solutions for heart failure patients are already commercially available for many years (Honeywell, Philips, Bosch, Tunstall, etc.).
- In the area of pressure ulcers monitoring ventures will have to compete with the medical bedding industry (Hill-Rom, Völker, etc.).
- Personal Emergency Response Systems for elderly people are commercially available worldwide and innovative Fall Detection systems have been introduced recently (Philips, Tunstall, etc.).

We recommend the initiative to carry out a competitor analysis for each of the fields of activity and to either identify the right to win on the long-term or to partner with one of the leading players.

From a research perspective a similar analysis should be carried out in order to get a complete overview of the most important research initiatives world-wide (examples are the European projects HeartCycle on heart failure management and Metabo on Diabetes). The recently created Linköping Biosensors and Bioelectronics Centre should be strengthened and gives the opportunity to excel in a specific field of research. Another opportunity for world-class research exists in the field of ICT enabled services

for distributed healthcare building on the capabilities of the Santa Anna IT institute, the University of Linköping and the Swedish Defence Agency.

The biggest asset of New Tools for Health from a commercial and international perspective is the fact that all stakeholders of the medical and social care value chain are taking part in the initiative. It is a great opportunity that apart from industry both cost bearers (county council and municipalities) as well as medical and social care providers (such as Leanlink) are involved. We recommend establishing Linköping as one of the pilot regions for home healthcare in Sweden and even Europe. Larger scale trials will anyway be required to prove the cost effectiveness of many of the New Tools for Health solutions. With all stakeholders being part of the initiative it would be possible to take a holistic approach and conceive new models of care at the same time as the corresponding procurement and re-imbursement rules. The Whole System Demonstrator project in the UK (with nearly 6000 participants in Cornwall, Kent and Newham) can serve as an example of such an approach. In this project that had been initiated by the British Department of Health, integrated health and social care services are tested that are supported by assistive technologies like telecare and telehealth. As significant financial investments would be required, it is recommended to develop such a plan together with VINNOVA and the regional government.

4.5 New Tools for Health after 2014 – A Systems Integrator

Initially it was not easy for outsiders like the evaluators to ‘see the New Tools for Health system’. But the detailed inquiries with representatives of the ‘system’ actors have made it clearer.

New Tools for Health clearly plays the important role, probably unique in comparison with other ‘Distributed Healthcare’ systems, as the ‘network broker’ or ‘system integrator’. It connects Healthcare customers and patients in the system initiative called ‘Distributed Healthcare at Home’.

This needs clear definition so that New Tools for Health can communicate even better the key system elements to the internal system members and, more importantly, to external actors such as possible inward investors or customers elsewhere in northern Europe.

The system consists of the following main sets of actors:

- Start-up businesses and SME’s
- Larger Service Provider Firms
- Intermediaries (mentors, incubators, finance etc.)
- University and PRO (public research) Research Teams
- Healthcare/Homecare Market

In future, this system requires External Integration with:

- Other Healthcare Networks (e.g. Healthcare Technology Alliance; Santa Anna; NovaMedTec)
- Other Clusters and Partners outside/inside the region (e.g. Smart-phones [Mobile Heights; Media Evolution] Food Academy – Region Skåne; Visualisation [Linköping; Malmö, Göteborg]).

This enables New Tools for Health to engage more fully in the Grand Challenge for Future Health initiative in Sweden and EU Grand Challenges in Healthcare and Ageing by cross-fertilisation of relevant knowledge to stimulate innovation and realise the potential of domestic and overseas markets.

4.6 The Way Forward for New Tools for Health

4.6.1 Preferred Future

By 2015 to be acknowledged across northern Europe as a lead centre:

- A “hot spot”
- A research/teaching/symposium/conference/business development centre with two interrelated core business areas:

1 Addressing loneliness and isolation amongst the elderly, with a focus on distributed healthcare.
   - Responding to two of the EUs Grand Challenges, Healthcare and Ageing
   - Developing integrated, seamless services designed around the needs of the elderly
   - A learning and product development centre for whole-system, multi-disciplinary, independent living
   - A teaching centre attracting students from Sweden and beyond, both undergraduate and post-graduate
   - Active engagement by not-for-profit organisations and companies

2 Developing home-based mobile ICT healthcare solutions that have market potential beyond the region.
   - Recognized as a commercial test-bed, a lead adaptor, a whole system demonstrator, for assistive technologies such as telecare and telehealth
   - Building on Santa Anna IT and NovaMedTech; and drawing on the Swedish Defence Force’s interests
   - Close links beyond the region, e.g. with Mobile Heights

4.6.2 On Moving Forwards

Points for consideration:

- The regional healthcare system is, and will remain, a key driver as the demanding customer on a European scale for innovative procurement.

- Larger customers need to be more closely involved in the initiative and its projects, supporting customer driven open innovation product development.
- The initiative also needs to involve the more established SME's from within and beyond the region. These are the businesses that can take a central role as systems integrators, building on products/services that are available from within the region and beyond, adapting and integrating them.
- Evolving governance of New Tools for Health: while the triple helix concept remains very valid, emphasis now needs to move from the originators of the initiative: the county council, the municipalities and the university. It is recommended that business led sub-groups reporting to the Board and including Board members be established to drive the two core business areas.
- New Tools for Health needs to place more emphasis on collaborative pre-competitive projects, rather than working with individual companies, particularly supporting systems integrators and ICT intensive solutions.
- There is an urgent need to revisit the New Tools for Health branding and website as part of a substantive and business-led internationalisation effort. New Tools for Health needs to be placed more firmly on the European map through symposia, conferences, media releases, inward visits by key journalists… The region needs to be professionally promoted as a "hot spot" to attract business, talent and finance.
- Start integrating New Tools for Health with the activities of Nova-MedTech, Santa Anna and the Swedish Defence Agency with immediate effect. Do not wait till 2014!
- Process leadership is needed for this next stage in New Tools for Health's development with competence in (1) healthcare and (2) experience in business development with an international orientation.

5 ProcessIT Innovations

ProcessIT Innovations (ProcessIT) is a collaboration centre in northern Sweden. The strategic concept of ProcessIT is to bring together the functional process and engineering industry in the region with ICT (information and communication technology) services in universities and industry. The aim of ProcessIT is to reinforce existing primary industries and develop the region's ICT-industry to an internationally competitive position. This concept meets the challenges faced by today's knowledge-intensive, high technology primary industry with the extensive knowledge developed by the region's ICT services. Process IT's vision is therefore to establish in the area a leading European R&D centre in ICT for primary industry.

5.1 Achievements and Challenges

Based on the information provided in the report and presented at the meetings an impressive list of achievements has been reached. From the view of the review team most important ones are commented below.

Management of ProcessIT – well functioning and organised

The organisational structure of ProcessIT developed over time and has now reached a well functional level: To start with the Executive Management with two full time experts at Umeå University (UMU) and at Luleå University of Technology (LTU) in order to cover the whole region. Four local R&D offices and officers, two in Lulea and two in Umea keep close contact with the companies – SME as well as the big companies - and universities and to collect project ideas. The executive management meets regularly every second Monday, and every 4 weeks with the R&D officers, because of the long distances mostly on the telephone.

The Industry Advisory Board is evaluating the incoming proposals for R&D Projects. They meet twice a year.

The Steering Board consists of representatives from public administration, industry, and academia. There is only one representative from public administration (head of the board), two from universities, and 7 from industry. This structure underlines the strong business oriented strategy of the initiative. It is noticeable that large companies dominate the board, SME are under represented. The Steering Board meets six times a year whereof four time in a telephone conference and only two times face to face.

ProcessIT's Project Development Model: Strong and established business model for R&D-projects resulting in impressive list of projects and solutions for industry

The Project Development Model of ProcessIT developed over time and it is now a well-established and accepted tool for exploiting ideas and developing them into business oriented R&D projects. Based on ideas that are collected from the big companies pre-

studies are formulated, and in the next step feasibility studies and finally R&D-projects, when recommended by the Industry advisory board.

From experience it can be said that one R&D project results out of 5 pre-studies. To build good R&D-projects out of pre-studies is always a challenge and in the future there may be a lack of good projects.

Unique knowledge broker function in mining and pulp and paper, linking knowledge to company needs, the plants as test beds, unique learning between GlobalCo and SME's

The main aim of ProcessIT is to functions s a broker and matchmaker for the mining and the pulp and paper industry with the local/ regional suppliers, and the universities. In this respect, ProcessIT works very well. Especially the R&D officers play an important and very fruitful role.

In general, regional collaboration is also characterised by knowledge sharing. There was one example presented to the evaluation team that fulfils this expectation perfectly. In one of the SCOPE projects Obbola SCA collaborated with Fältcom on real time measurement of water properties. The results were later offered for sharing with the other six mills in the region.

Strong regional support and commitment, important for long term funding

We saw also strong regional commitment. Funding from county municipalities and structural funds is more than double of VINNOVA funding. In 2010 the amount of cash by the EU Structural funds, the County councils and the municipalities was more than 14 MSEK (10 MSEK Structural Funds), the funding by VINNOVA nearly 6 MSEK.

Secondly, ProcessIT is also embedded in strategies of regional stakeholders. The regional growth strategy of Region Västerbotten is focusing on 3 strategic areas; one of the areas is "Applied ICT" where ProcessIT is a part. ProcessIT is also partner in the "Baltic Sea Region" project.

The municipality of Umea is actually setting up a new marketing strategy in which ProcessIT is mentioned as a part of the automation industry.

At LTU ProcessIT has become a strategic area, and at UMU ProcessIT is very much connected to the UMIT Research Lab.

Commitment from participating companies

Also the commitment of the participating companies is high. In 2010 14,3 MSEK were spent, most of it as in kind. Most of the expenses came from Algoryx Simulations, Oryx (both SME), Adopticum (Research institute) and SSAB.

Creating linkages and collaboration between UmU and LTU

ProcessIT has linked researchers from UMU and LTU and the other universities (Mid Sweden University and Swedish University of Agricultural Science). Research teams were built to carry out research in process automation.

Important in influencing the collaborative development at university (UMIT)

Since 2005 researcher were working together in projects initiated partly by ProcessIT. As a result of these collaborations a multidisciplinary institute for visual computing was established which combines the expertise of mathematics, computer science and physics.

ProcessIT funds UMIT Research Lab in forms of projects together with industry. Other funders are the Baltic foundation, Umea municipality and UMU.

Creating strong position within EU-networks (e.g. Artemis)

Academia in the region is obviously quite strongly connected to the European academia, as can be seen by participation in projects financed by the European Research Framework. A strategic key project is PROCESSIT.EU, an international project that is certified by ARTEMIS Industry Association. ARTEMIS is an association for R&D actors in embedded Systems founded in 2007 in order to continue the work of the European technology Platform It has established the "ARTEMIS Joint Undertaking", a Public Private Partnership with the European Commission, as a 10-year R&D funding programme on embedded systems

In the driver seat for establishing a Swedish agenda on process automation

At least, ProcessIT is leading the commission that develops the formation of the Swedish agenda in the area of process automation. Results will be reported in the beginning of 2012.

5.2 Raising the Ambitions!

ProcessIT has performed well over the last three years and the Evaluation Teams sees a huge potential for the initiative. Therefore the initiative needs to raise its ambitions.

5.2.1 Move from a Strategic Plan to a Strategic Agenda

- A Strategic Plan…identifies the priority activities to be undertaken within currently available resources, carefully balancing income with expenditures.
- A Strategic Agenda…is not constrained by the current availability of resources.
  - A Strategic Agenda highlights the priority activities that need to be addressed in upgrading the clusters competitiveness and then seeks to find the resources for implementation.
  - Resources could be from public agencies, from academia and/or from the private sector; resources could be the financial commitment by others to the agendas initiated by Process IT.
  - A Strategic Agenda has severe stretch ambitions.
- In raising the ambitions ProcessIT needs to handle five challenges:
  - Taking ICT SME's globally
  - Develop the scope and strategy of ProcessIT
  - Stress to world class research

- Balance exploration and exploitation
- The Future of ProcessIT

5.3 Challenge: Taking ICT SME's globally

A core aspect of raising ambitions through the Strategic Agenda is internationalisation. Components for the internationalisation strategy include:

- Strengthening links between Process IT and actors supporting internationalisation regionally and nationally, including Internet Bay, Export Council and Invest in Sweden.
- Piggybacking on the existing international linkages that have been developed by the large integrators (such as ABB, Komatsu) and on the academic linkages that have been developed by local universities internationally.
- Carefully identifying target niches and markets leading to participation in trade fairs, inward visits by potential customers and journalists and websites orientated to an international clientele.
- Developing strategies to lever B2B contacts from international collaboration projects such as Artemis.
- Linking globally with other clusters to support B2B contacts and for benchmarking/bench learning.

5.3.1 Turning the Strategy into Action

- Establishing a Board appointed Task Force for internationalisation that takes responsibility for developing the strategy and the short-term action agenda for engagement.
- Membership of the Task Force to include:
  - An already exporting SME in the Chair of the Task Force
  - At least one ready-to-export SME
  - Export Council or another export supporting actor
  - An academic with international connections from Forestry/ Pulp & Paper and another from Mining
  - An academic with international business experience with an interest in running exporter training courses
  - A process team member.

This task force needs to be comfortable with learning-by-doing, not paralysis-by-analysis

5.4 Challenge: The scope of ProcessIT

5.4.1 Define strategy on Regional and National level

As ProcessIT has evolved one of the challenges is how to handle more parties, more complexity. There is a risk that the resources might be scattered and spread ” in all

directions" instead of achieving cutting edge and world class competitiveness that really would boost the business growth.

By the good results achieved so far, attracting more actors to join the network, it is now not only possible but necessary to raise the ambition and align the individual projects and activities to an overall defined strategy in order to use the resources wisely and achieve best possible results, both on regional and national level.

So far the focus has been set on Mining and Pulp&Paper. It would be of help to develop and define the focus further, both in business and technology (like a matrix).

It is commendable how the project results have been made available by members in the ProcessIT cluster as "share wares". It is most valuable when new knowledge can be shared by as many as possible – "the more the merrier". It would be valuable if new knowledge could be known even outside the cluster of present ProcessIT-members and if possible be made available to other companies in the region and to other clusters.

Strategies recommended to develop further:

- Technology strategy
  Define "cutting edge" competence, skills – strengths in a regional, national and European perspective. Where are the strengths today? Where to be tomorrow?
- Business area strategy
  Mining and Pulp&Paper will most likely continue to be in focus, but there might be relevant to possibly review and modify focus when seeing the wider picture.
- Networking / business growth strategy
  How to handle the growing cluster? How enable more ideas and more business growth? Find a structure to upscale

The strategies need to be on both regional and national level.

Regional level:
Make sure focus areas are defined and that there are clear criteria for making priorities in order to meet the ambitions and objectives: 1) define strategic focus areas and 2) how to strengthen them

National level:
The National Agenda is a wise initiative by ProcessIT, enabling the region and Sweden to make maximal use of high technological position in world competition. Map and involve different cluster initiatives, clarify their respective focus/strengths – define strategy. Involving trade associations would be an efficient way to reach groups of companies in strategic focus areas.

5.5 Challenge: Stretch to world class research

The scientific and technical quality of the ProcessIT programme has improved and specific competence areas have been strongly solidified over the past 3 years. This, however, is not well reflected in the report or other materials offered during the review though some indications of this could be harvested from the project presentations.

Simply, it is difficult to determine from the published materials what are the unique competency areas involved in ProcessIT and how the quality of research in those competency areas is evaluated. We could neither observe how the project guarantees that improvements in the scientific and technical quality of the research are steadily made and such evaluations form part of the project assessment. No specific scientific or technical criteria were offered how the projects are evaluated during their launch or during their termination.

In addition, it is not clear how strategic investments and decisions are made with regard to strengthening and expanding competency areas and how different competency areas are organized into complementary pools that could be used to leverage more innovative and complex project undertakings (for example, how world class knowledge of optical vision can be integrated with visualization; or knowledge of control systems could be integrated with process studies). It was not clear what new research areas / domains or technical competency development have been started or initiated as part of the ProcessIT, or whether the research domains have remained same throughout the last 6 years when the project has been running. Has the project led to new strategic investments in research domains and education? It was neither clear how the committee or steering committee as a whole evaluates the status of the competencies and launches new strategic research directions based on an analysis of gaps or opportunities. Such assessment should, however, be part of the process of building world-class competency cluster.

To address these challenges the evaluation of committee recommends the following:

- Set up quality criteria and targets for specific competency areas and also determine how improvements are evaluated in each competency area
- Establish systematic ways to evaluate and measure scientific and technical research and integrate such evaluations as part of the project assessment and portfolio management
- Nominate an outside science / technology review committee to carry out evaluations and audits of the research and to provide systematic feedback for improvement; ask the steering committee to report to the board for example biannually
- Communicate clearly the scientific quality criteria within the Process IT community and enforce their use in evaluating project and research groups
- Develop maps and structure competency areas across different domains (Scope, Gram) and evaluate the current and “good to have” competencies across pressing and demanding challenges in each industry domain; If significant gaps are observed seek to develop strategic plans for new competency areas that should be fed into University strategic plans
- Seek to augment current competencies by collaborating with emerging scientific and industry networks through EU/Artemis or other relevant communities (e.g. IEEE groups focusing on process automation, control systems or vision)

5.6 Challenge: Balance exploration with exploitation

The evaluation group was impressed with the efficiency and innovativeness of the current research project model, which can be viewed as an exemplary implementation of the idea “factory as laboratory”. The ProcessIT group has built an excellent knowledge brokering capability to match problems of industrial practice and related needs with the available research capabilities in the university. This has led to a steady stream of practice oriented research projects that provide value to the participating companies in different industry clusters. It also offers an effective way of matching available knowledge with pressing industrial problems. In a sense what we see is a knowledge-brokering network for carrying out industry-oriented projects, which can flexibly and with relatively low set-up cost exploit existing knowledge.

Such exploitative focus within the established “industry cluster” offers several immediate benefits such as:

- It offers an efficient way to carry out diverse and multiple short term improvement projects across the cluster and share the related results thus offering value to a large number of participants
- It enables the participating companies to learn how to carry out collaborations with universities and to constantly question their current practices
- The generated knowledge is close to what organizations already know and it is easily understandable and shareable
- It offers immediate value for the companies and generates steadily small variance yields (low risk of participating)

Alas, this model comes with some risks that the ProcessIT group should be aware. In particular, it does not lead easily to trying out high risk and totally new approaches to process automation problems. Accordingly, there are several potential drawbacks in this approach that needs to be balanced by careful project selection and competency development. In particular the approach will:

- Make it more difficult to establish totally new breakthrough products which would have world wide application and offer a baseline for new product offerings
- Makes it difficult to integrate and create new type of radical knowledge that comes from unexpected and random combinations of knowledge and new problems
- Rarely leads to diversification and search for lateral knowledge and new knowledge combinations
- Rarely leads to new significant knowledge discoveries (indicative of this is the fact that it was difficult to pinpoint any specific and truly novel knowledge discoveries during the project as reported in the distributed materials)
- Difficult to excite top-level academics and align the research projects with appropriate incentives for them.

In short, in the long term the project model, unless challenged and balanced with visionary new ideas and technology push, may result in competency traps and few radical innovations and related capabilities.

To address these challenges the evaluation of committee recommends the following:

- Develop criteria to evaluate project portfolios that take into account and recognize the need to initiate radical and high risk projects
- Seek actively new combinations of and views to address process automation domains through novel integration of different knowledge through new types of project portfolios or carrying out discovery days to find out new domains of knowledge
- Develop architectural and technology road maps and seek discontinuities; organize technology review and assessment workshops (a la hype curves) and seek for new technological opportunities and feedback from research groups, universities and different research and development units in the industry
- Collaborate with research and technology steering committee to expand research horizons; invite visiting top scholars in specific fields for visits and lectures

5.7 Challenge: The Future of Process IT

Introduction

Process IT has developed well in certain directions since its interim evaluation in 2008. Particularly impressive has been the work of the Process IT management Team in building up a catalogue of some 500 large and SME system-integrators in the target region of the initiative. As is mentioned earlier these are Process IT's market. They are mainly in mining and pulp & paper but the net is beginning to be cast wider – to energy, creative visualisation, medical etc.). However, more than that, partner firms are a large plus SME 'system area' of companies. These enable 'learning by innovating' for Process IT projects through acting as a kind of 'external test bed'.

The International Evaluation Panel were of the opinion that this was the 'unique strength' of Process IT, which in a world of lean management and open innovation is an invaluable asset to the region and its firms. Mention has been made elsewhere of the desirability of moving upwards from the mainly incremental innovation implied in 'learning from industry' without losing the value of the 'system area' that Process IT so usefully connects. However, the Evaluation Panel was struck by the need, expressed by firms and stakeholders for Process IT to ensure its survival beyond the end of the VINNVÄXT funding period. Furthermore, strengthening ambitions towards occasionally more 'radical' than incremental innovation requires valuable time.

5.7.1 Reflecting on the Future

Sensibly, perhaps, process management and the board at Process IT have awaited receipt of the International Evaluation Panel's deliberations before setting off with a formal future profiling exercise for the initiative. Whether or not this is the case we formed the strong impression that little had yet been done to formulate strategy on Alternative Futures for Process IT from which a preferred option might be appropriately selected. In the debrief after the Panel's interviews it was evident that there was enthusiasm to set such a process in motion.

Accordingly, it is by no means clear as of the time of the evaluation, September 2011, that the future of Process IT has been secured. Indeed, it would be fair to say, and was accepted by the debriefing team of Process IT that there are a few confusing signals around the strategy of other key institutions about the kind of commercialisation activities that are Process IT's core competences. Thus the university sector expressed interest in hosting the initiative but one key player, Umea University, is evolving an apparently different commercialisation strategy from the mainstream. This could be exciting but as explained, it was not obviously compatible with Process IT's way of working.

Clearly there is commitment for a continuing future for Process IT from the regional and local governmental stakeholders in the region. We feel reassured after discussions with exemplar firms that they are committed to maintaining and developing the funding of Process IT projects, which they see to be of fundamental value from its network brokerage functions. Moreover, despite their arduous reporting requirements, EU and national funding bodies may be expected to look reasonably favourably on this unique regional asset. However, the International Evaluation Panel were of the view that more clarity is desirable regarding the future juridical position of Process IT.

5.7.2 A Task Force for the Future

Accordingly, the Panel strongly suggests that a 'Task Force for the Future of Process IT' be established relatively quickly (i.e. within 2-3 months). It should be formed from a sub-set of the board experts and process management team, with one to three outside bodies (for example; national, trade association, regional industry outside mining and pulp & paper). It is not for the Panel to have any preference, but some that could usefully be investigated-ted include the following juridical forms:

- Public-Private Partnership
- Private Company
- University host
- Government host
- RISE
- Others

6 Triple Steelix

The vision for Triple Steelix is to be the leading innovative region in Europe for advanced steel, steel products, industrial service and processing. The Triple Steelix cluster consists of about 700 SME's, 7 steel producing companies, manufacturers of mechanical equipment for metal forming and industrial IT, 13 municipalities, Dalarna University and MIKRAB (research institute), regional actors as IUC Dalarna, region of Falun/Borlänge and Stiftelsen Teknikdalen (foundation for regional development) and the regional authorities. The initiative for development of this cluster into an innovation system was taken by Jernkontoret, the Swedish Steel Producers' Association.

6.1 General achievements

In setting the scene for the discussion on the challenges for Triple Steelix and the Way Forward the Evaluation Team, as an introduction, likes to underline some important and general achievements by Triple Steelix that will be elaborated further in the memo:

- Excellent and motivated process management adding value to the actors – but stretched staff
- Strong regional mobilisation and governance
- Triple Steelix has a very strong regional support
- Broad net of contacts among SME – database with information on 400 companies
- Well connected, many partnerships with the actors in the regional innovation system
- Great trust building/social capital among the actors
- Strong arenas for (open) innovation
- Strong position in 3D roll forming
- Important examples of innovation and commercialisation

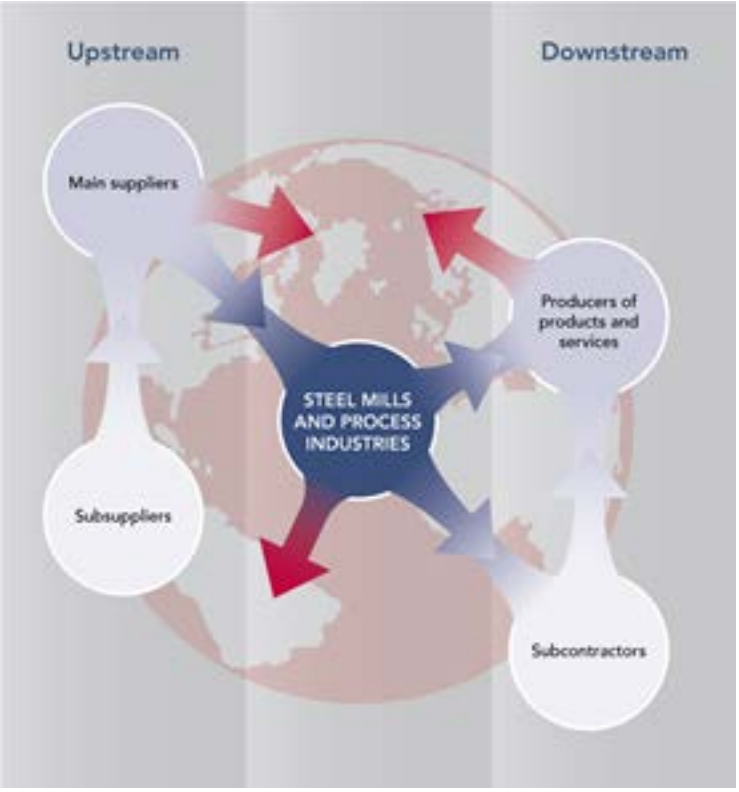
6.2 The knowledge base

6.2.1 Results, Achievements & Challenges

Commitment of the three universities

Triple Steelix have been able to get the commitment of the three universities in the region. This is very important because it is the place where the companies and the initiative should take the resources needed to achieve and maintain a leader position; they are in some way Triple Steelix´s knowledge base for the future.

Figure 6.1 Triple Steelix – upstreams and downstreams companies



Challenge: The universities should have in Triple Steelix a double objective, from one side they have to provide skilled staff for the companies, well prepared for the innovative in process the SME's needed (mainly in the upstream side) and for the creative demand of a SME that need to produce added value products (down-stream side companies). On the other hand they should also provide a technological and a scientific excellence that can be used for the breakthrough innovation that the big companies (steel mills and process industries) need in their globalized markets.

Linkages between companies and universities (e.g. Degree projects at universities)

A good communication between companies and university has been achieved. We talked to passionate people who linked between companies and universities. They visit the companies in its area, listen to their problem and help them to find solutions. There are 50 students making their degree project at companies active in Triple Steelix.

Challenge: To maintain this communication and support and to take advantage of the knowledge it is necessary to organize and plan more strategic actions in the future. Actions should be taken in order to involve more companies in the same sector, or in difference position in the value chain creating synergies among them.

Social capital

Social capital can, like physical and human capital does, increase the productivity of companies and/ or regions. It refers to the fruits of social relations that are based on trust

and confidence. In this respect, Triple Steelix is very strongly developed initiative. The evaluation team had the impression that the members of the initiative know each other very well and trust each other. In the future this asset has to be kept and developed further.

Metal forming laboratory

The metal forming laboratory created at Dalarna University will contribute to the increase the linkage between companies and university and it is a tool necessary to develop research and innovative projects in the area of metal forming.

Challenge: Create hot spot knowledge area in which the laboratory should specialize. The Roll forming centre is clearly one.

Roll forming technology

The region is well known in the world because of this technology. The prototype installation in metal forming laboratory is unique in Sweden and there are only two others in Europe. This could be considering a good example of the potential of Triple Steelix that could detect a field in which some companies in the region are strong and help them to cooperate to become leaders.

Challenge: Finalize the 3D technology and go into the market. Looking for sectors in which this technology could be successfully applied.

Clean Production Centre

A further good example for strengthening the knowledge base in the region is the Clean Production Centre. The aim is to make the steel production environmentally more efficient and thus more profitable. The Centre is located at Ovako (Leading producer in Europe of long special steels) in Hofors. Beside Ovako also Sandvik, other companies, and the University of Gävle are participating. Triple Steelix serves as a principal.

Challenge: There is great potential to become a strong area in a future.

Gender equality

Until now women are not well represented in the workforce of the steel industry. This is also true for the industries that are members of the Triple Steelix initiative. One example for Gender Mainstreaming is the project K2. One activity is the establishment of a course in Leadership Development for women. A group of women in leading positions in various steel companies in the Bergslagen region meet regularly under professional leadership. Other activities are advertising good examples of gender mainstreaming. Another example is the project “Gender perspective for Attractive Work” (GATT). The aim is to engage and motivate the participants to look above traditional perspectives. Industrial partner of the project is Dellner Couplers AB.

Challenge: Real results in term of more women in the companies and even more in high position.

Process Innovation in supply chain companies

Different actions consisting in training sessions and in innovation projects have been developed during these years and the companies are happy with the support received by Triple Steelix. But it seems to us that the actions do not follow a clear strategy. It is good to get the trust of the companies to start with this system based on a concrete needs and demands of the companies who ask for it, but there is a risk in becoming a fireman.

Challenge: A strategy is necessary that orients the process innovation to the more extended needs inside the companies. The knowledge in formation already gained from the companies (data bank) should help to detect this common need and create:

- A training planning for the short time needs (e.g. lean manufacturing, internalization, new business model): Process innovation
- Innovation project in cooperation for the medium time demands (new products development, process optimization): Development
- Research planning in connection with the universities for a long time needs: Applied and business oriented research

R&D projects

Few R&D projects have been funded during these years. The fact that Triple Steelix spends some amount of its budget for R&D projects is in line with the notion of the VINNVÄXT programme as long as project funding is not dominating. Triple Steelix is not a research programme, but we consider those projects as essential to have a long-term vision of the future trends in the sector we would like to gain a leader position.

Challenge: Triple Steelix should explore these trends and their consequence for the companies in the region. This could be done by contacting other organization in international forums, assisting to participate in international fairs, but mainly talking to the big companies to develop Triple Steelix's strategic agenda.

Another action that should be done in future is to encourage and help SME's to start research project oriented to this trends using the university as a base. The big companies should contribute to it by integrating the SME in its research activity (e.g. RFCS projects).

The university should contribute to the creation of research agenda identifying and matching the knowledge hot spots in the region with the future trends; this analysis will allow establishing the university research lines.

Knowledge of the companies

A good knowledge of the companies has been gained during these years.

Challenge: Organize the knowledge by sector, needs, and markets demand in order to maximize the results of future the TSI action. This will be a great input for the creation of the strategic agenda that TSI will need for the future.

6.2.2 The way forward – to strengthen the knowledge base

Triple Steelix has done a very good job in strengthening the knowledge base of the region in the field of advanced steel production and products. In order to promote this process further we see some fields of action.

Triple Steelix as an enabler/ matchmaker

Firstly, we want to stress the point that Triple Steelix should maintain and enlarge its current role as an enabler and matchmaker. This applies both to the SME which are mainly acting as main and sub suppliers to the local big firms and to downstream SME which are act on neighbouring small markets

- In our view Triple Steelix should in addition to that encourage big companies and SME to collaborate in pre-competitive R&I projects. The various test beds and research facilities are good environments in order to expand these activities. This would not only strengthen the knowledge base of the companies that are collaborating. It would also generate new knowledge that could be applied by other partners in TSI. Thus, the initiative will be more attractive also to those who are not yet part of the initiative.
- In line with this idea big companies should also think about the notion to share their considerations on future trends and on know-ledge needs with SME. Thus, SME can much easier prepare them-selves for the future challenges as a supplier.
- We also think that there is some knowledge in SME that has not yet been exploited enough. Thus, the data bank of SME could serve as an excellent starting point for the better use of the knowledge.
- At least, it has to be emphasised that Triple Steelix should maintain offering “soft skills” for SME. This has proved itself.

Internationalisation

- In order to strengthen and to enlarge the knowledge base of Triple Steelix one major task is to put more effort into attracting knowledge from outside the region, and especially from abroad, than it has been done so far. There are several actions to be taken:
- Without any doubt, the international standing of the universities has to be improved. The steps forward are: identifying the knowledge ”hot spots” of the region in international benchmarking and comparison, identifying potential international universities and research institutes and sounding the potential for cooperation.
- There are already some European projects going on. However, we did not see any projects of universities in EU-Framework projects. Increased participation in European knowledge projects is desirable.
- Raising the international awareness of Triple Stelix is also needed. There has been some progress in that respect, notably the website and the presence on Facebook.

6.3 Internationalisation of Triple Steelix

6.3.1 Vision and Triple Helix's strategic priorities

Primary vision: A global centre of excellence for advanced steels and steel products

Firstly, this reflects that Triple Steelix can now raise its ambition to position itself as a world-leading centre for advanced steels and advanced steel products.

The primary onward focus for Triple Steelix is in supporting the internationalisation of downstream products and services, the major business growth opportunity for the region and where Triple Steelix can have substantial impact.

Secondary vision: Europe's innovation centre in industrial services for steel processing

Secondly, within Europe Triple Steelix has the opportunity to become acknowledged as the centre for innovation in advanced steel manufacturing.

Triple Steelix's second priority is developing opportunities for upstream suppliers, offering a second but less significant business growth opportunity.

6.3.2 The Way Forward

Six years into the development of the clustering initiative, Triple Steelix is now ready to build on the solid regional base that has been firmly established to more boldly engage globally.

The development of Triple Steelix's internationalisation strategy now needs to be at the heart of the initiative. There is a need for a further development of the focus, strategy and how the initiative is structured to support this development

Internationalisation Strategy Elements

- The International Strategy is THE strategy for the further development of the initiative, permeating all activities.
- Research is needed to comprehensively identify Triple Steelix's global competitors, who may also be collaborative partners. There is a need to proactively identify and connect with lead universities and R&D centres globally; this strong initiative does not need to engage with second tier players. The lead clusters will also provide opportunities for benchmarking and bench learning.
- The priority target markets need to be identified and nurtured with regular two-way personal visits. The BRIC countries are likely to be included amongst the priorities.
- Identify opportunities for the local firms to collaborate in target export markets: joint market development and promotion, trade fairs? Joint sales efforts? Freight negotiations? Collaborative in-market R&D?
- Two-way international investments need to be developed, (1) attracting lead processors and added-valuers to the region and (2) facilitating engagement by local companies in establishing offshore facilities in priority markets.

- Establishing and integrating academia with preferred centres outside the region and beyond Europe. Attracting PhD's and participants for short-term technical courses.
- Developing the Triple Steelix brand so it achieves broad recognition within target market, providing an umbrella for business and academic connections. Developing all communications with an international perspective including the website in relevant languages and an e-newsletter. Active in hosting international conferences and symposiums, trade fairs, and arranging visits for inward buyers and journalists.
- Implementing this internationally focused strategy has implications for Triple Steelix's governance and management team, with the need to add expertise with a strong international business competency.

6.4 Vision, strategy and focus

6.4.1 Achievements and Challenges

Triple Steelix shows it has made many achievements and met numerous challenges in an accomplished manner during the mid-period 2008-2011 as a VINNVÄXT initiative. Among these are a strengthening of the social capital among businesses in the special steels cluster, support for highly sophisticated roll forming equipment and process design and manufacturing SME's, a consciousness of the desirability to help large regional customers like Sandvik, SSAB and Outokumpu to continue to perceive the suitability of the region as a location, and helping integration of firms with the regional know-ledge base.

Since 2008 the self-awareness of the Triple Steelix cluster has also been assisted by the knowledge and information studies that have been conducted on its 700 firms, or a large part of them. This has given a model in which the 'system' has its large customer firms (e.g. listed above), supplied in large part by its product and process SME's, its steel services SME's and the two distinct sets of suppliers to them in a broadly tiered supply chain. However, these SME's also develop their own regional, national and global markets, especially where they are the upper segment of globally innovative firms. Much of our focus, and we think, VINNOVA and Triple Steelix' future strategy, will usefully pay attention to this emergent segment of 'smart system integrators' (SSIs).

This inevitably means paying attention to 'Internationalisation' issues not only by the Sandvik-type of large customer, which they are clearly competent to do, but the SSI´s and other capable SME's who may in future be helped by collaborating to compete in global markets. This means shifting the cluster presentation and promotion 'frame' from 'Bergslagen is Best' to 'Triple Steelix - Global Best in Class'. To do that, the self analysis of key globally best specialisms will need identification; hence 'Triple Steelix - Global Best for High Strength Steels'; 'Triple Helix - Global Best for Roll forming'; etc., etc. This also means reforming the governance structure of the cluster in relation to the new imperatives of:

- Securing adequate resources and support by NGOs (Investment, Export etc. agencies) to support evolution of 'Born Global' 'Mid-size Multinationals' among the SSI community and others.

- Securing the knowledge base on which the future evolution of the global Triple Steelix cluster continues to refresh its capabilities and competences. This means upgrading the regional knowledge base but also identifying global leader research centres elsewhere, including any outside Europe, with whom knowledge partnerships may be made.
- Securing an appropriate governance structure fit for the purposes described above.
- Securing the real time industry and market intelligence to understand the needs of the ’customer’s customer’ to support product and market diversification necessary to underscore long term economic and regional development. Greater market knowledge and thus certainty will underwrite business confidence and investment.

The following section elaborates on our thinking in regard to helping Triple Steelix achieve these objectives. The comments are advisory only and presume recognition that these issues are already seen as important by the Triple Steelix board. We are confident from our feedback sessions that there is a high degree of recognition that these are priority issues for the future. We further understand that moves have begun to, for example, integrate university research and teaching in a new joint academic structure (which we strongly approve) and refreshing the board to meet the newer, exacting challenges referred to above.

6.4.2 The Way Forward – Cluster Presentation & Promotion

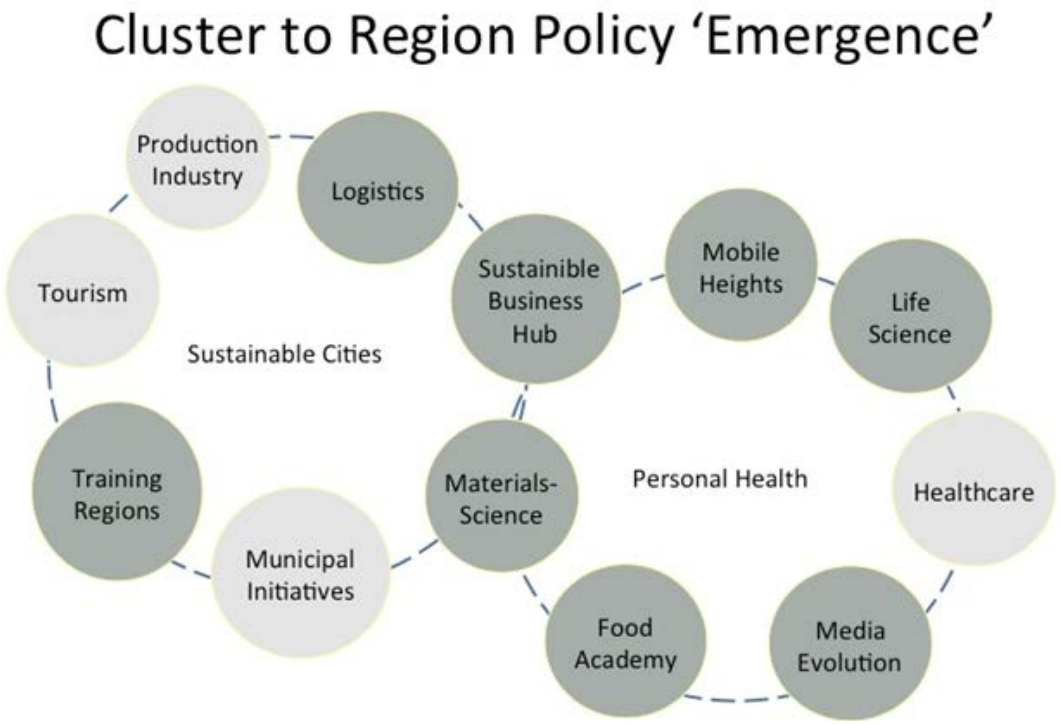
We have pointed to the importance that Bergslagen should now shed its strong inward focus somewhat in presenting and promoting itself to the outside world. This is to meet two aims of dynamic, accomplished clusters such as Triple Steelix has re-asserted that it is: first, to make firms from elsewhere want to co-locate in Bergslagen to access proximity assets. These proximity assets are nowadays one of the main motivators for inward investment and the Swedish Trade Board and, particularly Swedish Investment Agency should prioritise. Proximity for face-to-face interaction regarding idea exchange, design interaction, co-creation or co-manufacturing of pro-cesses, services or products are proven highly efficient – backed, of course, by digital infrastructures.

Accordingly global markets come to local specialists, bringing new jobs and new demand for Bergslagen and wider Swedish business. Contrariwise, specialists from Bergslagen´s high strength steel firms and SSI´s need to be pre-sent in booming markets, taking suppliers with them to Shanghai, Shen-zen, Seoul, Mumbai, Sao Paolo and other global special steel consuming global 'hotspots'. NGO, national, regional and municipal organisations need to be in partnership with focus on Bergslagens businesses to help introduce, present, promote and finance international partnerships in funded research, inward investment and foreign investment accordingly.

Crucially, leading edge business research also shows the as yet often untapped potential for innovation and the creation of innovative products and services from 'transversality'. VINNOVA published a report 'White Spaces in Swedish Innovation' that showed how Sweden is a world leader in beginning to join its regional clusters horizontally across industry interfaces to explore the innovative potential of the 'white spaces' between and among clusters, sectors and public facilities (e.g. healthcare) (se figure 1 below). This

needs to be prioritised regionally in Bergslagen by securing knowledge and business interactions among special steels cluster members and those in, for example, regional and national pulp & paper, energy, clean technology, and high-grade engineering partners. This can then be extended to similar cross-cluster alliances in global markets. Triple Steelix will then have elaborated a powerful 'matrix' structure of multi-level innovation and business partnerships worldwide. This will be of enormous future value to the regional and national financial 'bottom line'.

Figure 6.2 Region Skåne – linking clusters horizontally



6.4.3 The Way Forward – Cluster Analysis for strategic collaboration and partnership

It is now important to move beyond the helpful categories of upstream and downstream SME's and sub-contractors in relation to the 'Big 3' global players (plus others) in Bergslagen. We say this because we estimate very roughly that the more innovative SSI´s and other types of SME may do about 50% of business with the Big 3+ but about 50% on their own account as innovative, prototyped projects with companies abroad.

We believe part of the analysis and self-revelation of mechanisms for success in Bergslagen involves understanding the cluster's basic business model. This, we underline, refers especially to the SSI´s and other smart SME's that should be a future Triple Steelix priority to grow the cluster of 'Born Global' businesses and business partnerships. We refer to this as an 'Innovation Fledging' model. As we understand it, demand is expressed for an innovation. It could be locally, globally or academically inspired demand. Idea generation and prototyping occurs. The innovation 'problem' is solved; a customer agrees that if it 'works' he will buy. Investors are then found to invest in the development of a commercial innovative product (or service). Thus large firms

and their reputation are crucial to the trust and reassurance necessary to fuel the innovative process.

We were impressed at the way this model – broadly-speaking – underpinned two very sophisticated products we were presented with. These were roll forming process machine by Ortic and roll formed pipeork for Daimler by Hydroforming Design Light. In each case design and production involved partnership, in the latter case with a foreign global player of very high repute (Daimler-Mercedes).

We believe the segmented or niche capabilities of such SSI´s need to be teased out of the existing 'upstream-downstream' database that Triple Helix has evolved to more clearly demonstrate the capabilities and competence patterns, relationships and recurring partnership interactions at the single firm and firm partnership group levels to map the cluster's key lines of excellence. This can then be utilised internally in the cluster for helping prioritise the evolution of cluster knowledge needs to the regional knowledge base. But also to identify relevant knowledge excellence centres worldwide. Of key importance is that it will be invaluable to communicate cluster strengths to the world market, hastening proximity building of the two kinds identified in the previous section: i.e. into Bergslagen; and out to Shanghai etc.

Triple Steelix: Putting Local Capabilities to Work to Diversity into New Global Markets and Create Born Global Companies

As we describe above, the heart of Triple Steelix is found in its state of the art steel making and processing capabilities. And the region and its steel making and processing companies have no choice except to remain at the cutting edge of these technologies and production methods. Global competition is relentless and unforgiving; Triple Steelix and its companies have to date risen to this challenge, and will need to do so into the future.

Yet the future health of this industry may well be found in its cardiovascular system – those SSI companies that connect and integrate local capacities and capabilities into new collaboration, investment and business opportunities.

Figure 6.3 below sets the context for our discussion,

Figure 6.3 Triple Steelix and its knowledge and cluster linkages

That is unlocking the dynamism of the Triple Steelix cluster and its SSI companies that are vital enablers within and between clusters regionally and globally.

We know that SSI and SME companies from engineering services, automation, ITC, software and data management, and electronics companies have customers that intersect different industries and international markets.

While their initial success may have come from meeting specifications of demanding best in class companies found in the steel making and processing industries – the proportion of demand they generate from this sector may in fact decline as they expand into new markets. One of Triple Steelix's major challenges is managing this growth and transition.

Nor is this a linear process where they become disconnected from the steel industry as they expand. Rather as these SSI´s and SME's grow, diversify and enter new markets and become even smarter, they will also translate these newfound competencies into smarter solutions for the steel industry as a whole. Triple Steelix needs to both encourage and drive this virtuous spiral of technological advancement, diversification and long-term growth.

Let's build on our earlier example above. A local SSI related company might have 50 per cent of its strategic contracts and key accounts in the steel cluster. However the remainder of its contracts may be spread between the forestry, clean tech, high voltage and robotics clusters. In fact, it may even be a member of more than one cluster. Taking this a step further, working with a company in the robotics cluster to develop a solution for say Siemen's energy equipment destined for the burgeoning Chinese market, gives our local company direct involvement in what no doubt is a world class and, indeed, very smart project.

This technical experience and ’learning by doing’ is then embodied in meeting new and more technically demanding tender specifications found in future projects offered by the steel industry. As our SSI´s win these new contracts, they directly deliver a productivity dividend to the customer, encourage technology transfer and diffusion and, ultimately lift the performance of the entire cluster and with it the region.

Investing in Partnerships to Win New Contracts

In this context we believe local and international collaborations and specific joint venture arrangements become even more important – especially as large global companies and first and second tier national and regional companies (which may also operate in global markets in their own right) demand turn key solutions to reduce risk. This is not simply about getting the cheapest price, but meeting complex project specifications and timelines, and quality and environmental requirements.

The smartest of these SSI´s have the knowledge of the design, materials and scheduling requirements of their customers enabling them to bring suppliers and local companies with them. This strategic position (in the supply chain and design process) gives them significant influence as they work with first tier or lead companies with contractual responsibility for such turnkey projects.

These collaborations can in turn be translated into future bid vehicles for new projects from loose partnerships to consortia, mergers or the creation of special purpose vehicles (formation of a new company specifically established to undertake a large project with long lead times).

These collaborations can be deployed from breaking into new markets and developing new products and services to undertaking research and development projects. The key point is that collectively these companies have trebled the business opportunities available to them. In turn, they have direct market access to a vastly greater number of often global and best in class customers – with and between the sectors they operate in compared to a smaller and significantly more limited and, indeed, limiting field if they were purely working on their own.

Such market diversification both strengthens the underlying capacities and capabilities of the Triple Steelix cluster, and underscore long-term regional investment and employment growth through industrial diversification and access to a wider cross section of market opportunities. Ultimately this process supports the creation of born global start-ups.

Putting Strategic Industry Intelligence to Work

With this in mind, we believe the Triple Steelix cluster needs to take the next step to broaden its strategic scope to maximise business and investment opportunities available to it’s companies by reframing the type of industry intelligence it gathers from them – and in turn, their customers and other industries and clusters they do business with.

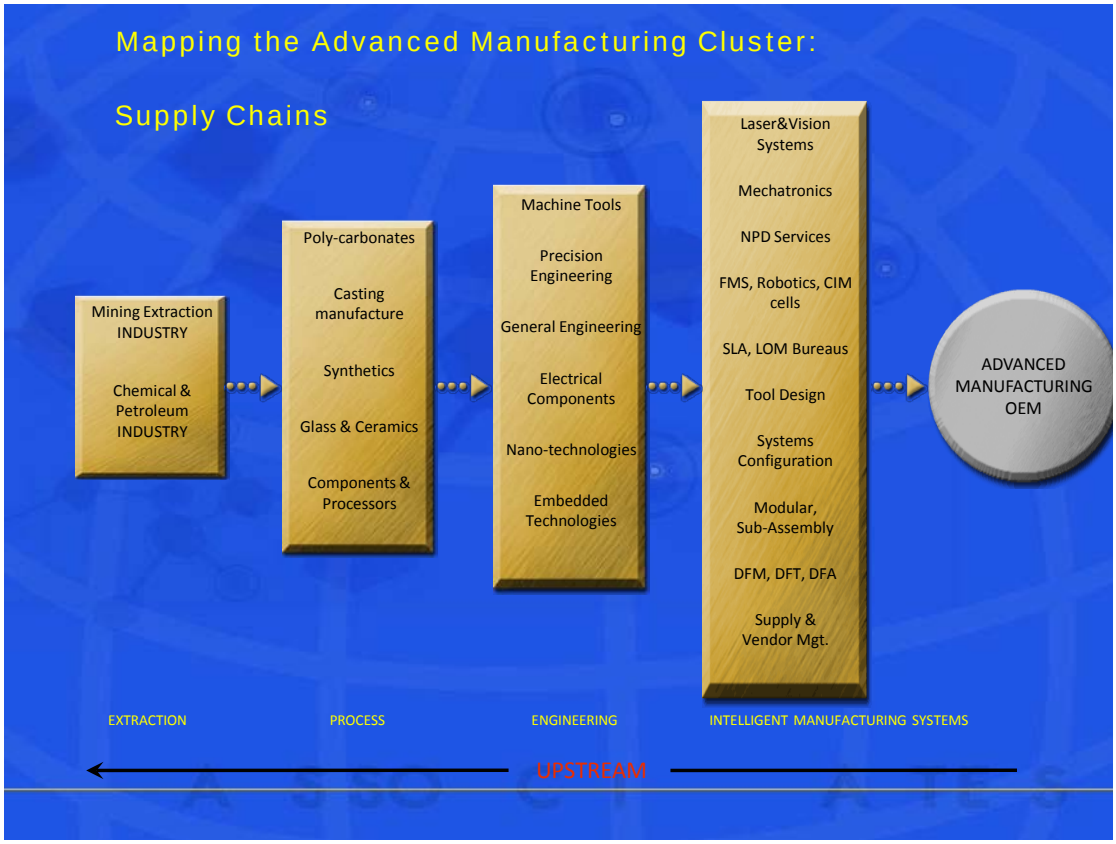
Figure 6.3 above can help to guide or inform the data gathering process and methodology. For instance: What proportion of the Triple Steelix’s compa-nies turnover

comes from other sectors or clusters? In turn, what proportion of this work (other clusters or sectors) is for regional, national or international contracts? Of these ”external” contracts, how much research and development is undertaken and what is the nature of their collaborations and joint venture or consortia arrangements?

Exploring this further, figure 3 below drawn from the book *Engineering the Future* for the Central Denmark Region illustrates the connections within the engineering sector, and pinpoints possible collaborations that can be created through the companies coming together and partnering through complementary engineering activities. For example SSI and SME companies cooperating together from precision engineering, laser vision systems, robotics and flexible manufacturing solutions to form a joint venture that can provide design/production capabilities or turn key solutions for industries from steel production to clean tech and beyond.

Understanding these connections means Triple Steelix can put to work the strategic industry it gathers to support the future business and investment aspirations of its smartest and most enterprising companies.

Figure 6.4 Central Denmark, mapping the Advanced Manufacturing Cluster



6.4.4 The Way Forward – Governance

These concerns should inform the evolution of an outward-looking board, responsible fundamentally for developing and approving strategy. We think the days when a lot of

representation on the board from local municipalities should now be over. However, a new and more specialised function for municipal representatives must be found among a new advisory group that helps secure all the resources (financial, personnel etc.) that Triple Helix needs to secure the more global focus it will evolve from tomorrow. Thus we see one space on the board for the leader of this 'Resource Sounding Board' element of a refreshed Triple Steelix governance structure.

Alongside 'Strategy' on which the 'Resources Sounding Board' will inform the Triple Steelix board could be two other important advisory groups. The first of these will concern the business partnerships being composed mainly of business representatives from the special steels, SSI and other SME representatives from Triple Steelix but also some firms from other customer, supplier or partner industries, as described above. It is also important if possible to appoint international representatives from overseas to inculcate an international perspective.

The third special advisory group will focus on the Knowledge Base & Communication. This will scan the world for appropriate knowledge centres, experts both in and related to the competences and capabilities of the Bergslagen firms. It will advise on how to think of the structure and patterns of these competences and capabilities in the 'system' of special steels firms in the region as a whole. It will also develop a communication strategy for both internal and external purposes.

Finally, the free spaces on the board will be filled with business representatives (apart from the governance position) from Triple Helix firms but also appropriate firms in related industries inside the region, outside the region or even abroad.

7 Conclusions

The concluding chapter summarises the evaluation of the five VINNVÄXT initiatives funded from 2004. The chapter contains four parts. First a comparison with the evaluation of the initiatives made in 2008 and comments on their progress. Secondly, a summary of the evaluation through a model to analyse the development of the cluster initiatives. The model is an attempt to capture key aspects of cluster development based on, among others, the criteria's and objectives for the VINNVÄXT programme. Thirdly, a discussion on the sustainability of the initiatives after the financing from the VINNVÄXT programme ends in 2014. Finally, a presentation of the recommendations from the evaluators for the initiatives and VINNOVA.

In 2011 evaluations of two generations VINNVÄXT initiatives were conducted, the initiatives that were appointed in 2004 (and evaluated in September 2011), and the initiatives that were appointed in 2008 (and evaluated in June 2011).[2] The model presented below in section 7.2, as well as the recommendations from the evaluators in section 7.4, are based on both these two assessments conducted in 2011.[3]

7.1 The evaluation in 2008 and the present situation

In this part of the report attention is focused, first, upon how the initiatives should be viewed in their response to the identification of achievements and challenges identified in the previous three-year evaluation conducted in 2008. Second the report focuses upon the extent to which initiatives were taking the form of well-organised innovation systems in which combination and re-combination of knowledge was facilitated and occurring as the key means of creating innovation after Schumpeter's definition of the process as: '.....new combinations of existing knowledge.'

7.1.1 Compliance with Recommendations in 2008

The main issues needing attention that were identified by the International Evaluation of 2008 were the following.

Strategy development

Evaluators had in 2008 underlined the need to develop strategic thinking in the initiatives. They emphasised the need for a more entrepreneurial approach to the initiation of new strategies and then rapid learning and adjusting from them grounded in a sound understanding of the initiative's competitive position internationally, not just nationally or even regionally, and based on open discussions with stakeholders. The

[2] 2004: Fiber Optic Valley, GöteborgBIO, New Tools for Health, ProcessIT Innovations, Triple Steelix and 2008: Biorefinerary of the Future, Peak Innovation, Printed Electronics Arena, Smart Textiles.
[3] The summary and recommendations will therefore, with minor changes, also be presented in the report of the evaluation of VINNVÄXT initiatives 2004.

needs to further develop strategies for knowledge development and innovation were stressed. Strategies should be based on analysis of challenges and demands in research and innovation from an international and competitive perspective in relation to both market penetration and university integration. Less focus on process and more framing of innovativeness of ideas to identify and give priority to R&D-projects would be welcomed.

Approach to Research & Innovation (R&I) System strategy and project portfolio

The evaluators raised questions and reflections concerning the strategic approach to R&I and the project portfolio in 2008. These ranged from the need to balance application and technology driven R&I and to integrate user and technology driven innovation thinking with more radical transformation and development of the industry at hand in the initiatives. In other words, initiatives seemed to be running on a very safe mix of relatively incremental rather than disruptive 'fuels'. The Innovation System evaluators underlined the need to think more in terms of innovation and less in terms of market-focused 'low hanging fruit' in the assessment of technology, especially by exploring the possibility of creating broader innovative *platforms* by cross-fertilising and integrating innovations from neighbouring fields to open up presently 'white spaces'.

Internationalisation

In 2008, the evaluators underlined internationalisation as an area for improvement for all initiatives, even if the specialist evaluators had a more positive attitude to how the initiatives handle issues concerning internationalisation. There was a need for the initiatives to improve the understanding of their competitive strengths globally – marketwise as well as academically. A strategic approach was therefore needed, also to identify and target hot spots internationally and then building relations and cooperation with strategically chosen collaboration partners.

7.1.2 Further Issues

Other specific concerns raised by the International (Innovation System) Evaluators referred to areas such as:

System Governance and the Role of the Board and Board membership

One significant issue concerned governance questions and the role of the board, which was in 2008 found wanting in at least two of the initiatives, ProcessIT and New Tools for Health. The evaluators emphasised issues concerning regional leadership and governance and addressed the role and composition of the Board as an important area for improvement. In the Process IT case the board was rather an 'old boys club' made up of what seemed to be an alarming number of retirees. The technical capabilities of ProcessIT seemed predictably out-dated in consequence, with little or no perception that solutions may lie outside the narrow confines of IT and in areas such as nanotechnology, sensors and visualisation. In New Tools for Health, the evaluators discovered that some Board Members never turned up to meetings, some came occasionally and that senior governance leaders from municipalities and health

administrations sent only juniors along as substitutes at meetings. This highly unsatisfactory state of affairs was reflected in the sense of ’drift’ and general lack of purpose to the initiative, subsequently reflected in several resignations of C.E.Os.

One responsibility of VINNVÄXT was to explore the idea of ’innovation systems’ that was only ten years ago rather new and experimental. Much of the responsibility for doing this lay in the innovative idea of the Dahmén Institute conducting more reflective evaluations to inform future, possibly more widespread applications of the idea, in Sweden and elsewhere. For the further development of the concept of regional innovation systems as at tool for growth and competitiveness interesting conclusions could, in principle, be drawn from the evaluations. However, there was no evidence that this was happening in any meaningful or useful sense. This the International Evaluation panel found tragic as it signified the failure of overall management to secure a coherent record, analysis and assessment of a pioneering policy initiative that has been a credit to Sweden. Accordingly, we consider that the extent this anxiety was attended to would be an important general litmus test of VINNOVA management of its original idea. Sadly, as will report below, things deteriorated rather than improved subsequently and there is little ’detached’ and ’reflective’ assessment of the history of the initiative accordingly. Probably, this is a contributory reason for the commissioning of this extra reports, since from the notes and memories of the evaluation panel, some record of an organisational innovation of some international significance may endure.

No ’One-Size-Fits-All’ Policy Implementation Methodology

One predictable, but nevertheless interesting finding that was clear even in 2008 was that the five initiatives implemented their strategic idea for growth and competitiveness in quite different ways based, among others, on regional differences in resources and mobilization. This also reflected differences in conditions for growth and innovations for different branches and knowledge areas. Furthermore, it echoed the state of policy knowledge at the time, the leading edge for which lay less with the untried active policy of seeking to promote regional innovation systems and more with the even more micro-level approach known as ’cluster-building’, a very different, more short-term, ’low hanging fruit-picking’ approach to improving market competitiveness for small businesses. Whatever, this review after six years’ experience of implementing regional innovation system-building concepts presents an opportunity for the VINNVÄXT-programme and VINNOVA to further develop the concept of regional innovation system as a tool to support the development of growth and competitiveness at a regional level. This was uppermost in the minds of panel members interested in and hearing of the ’policy learning’ experiences each initiative had undergone. By integrating experiences from the initiatives in the model or concept of regional innovation systems this could show itself to be a more differentiated and thus better instrument in designing policy activities and in supporting initiatives on a regional and national level. Fortunately, this hope and aspiration of three years ago was amply fulfilled, as will be outlined below.

'Technology Push'

At the time in 2008, some policy learning requirements were evident. Thus there remained, true to dominant 'technology push' thinking of the time, an emphasis on ubiquitous, ready-made solutions. Thus fibre optics, as evolved by US innovators like Corning Glass and applied in a dedicated manner by Ericsson was seen as being a 'future material' for which there would be an unending demand. The view on knowledge development and innovation was accordingly dominated by a focus on technology-based projects aimed at presumed market niches rather than being seen as frameworks for more systemic innovation that might bring about a radical transformation and development of the cluster. The VINNVÄXT aims of enhancing both competitiveness and sustainable regional growth thus called for attention to be given in future to how to balance and integrate these. This perspective was considered indispensible to a meaningful strategy for knowledge development and innovation as represented in the project portfolio for the initiatives.

Open Innovation

The evaluation of 2008, again reflective of its time, just a few years after publication of research on 'open innovation' highlighted the role of different forms this might take in the five initiatives. By 2011 there was considerable experience of the application frameworks for taking advantage of open innovation as users and suppliers, as well as its pitfalls. Tools and methods such as integrated one-stop test beds had once been important for supporting the development of 'technology push' applications, innovations and related knowledge development. But test beds can also have their limitations if insufficient thought is given to the context in which technological progress is embedded. As a case in point, once large telecom infrastructure firms had laid out the requisite new cabling, demand for routine technological application inevitably declined. Reframing technology applications is thus important and attractive for involving new actors and stakeholders on a regional, national and international basis. Accordingly, it is equally important for expanding the knowledge base and applications market for the initiative. So the panel was keen to see this strategic niche marketing aspect of VINNVÄXT develop over the succeeding three years, something that, gratifyingly, occurred to various degrees in the five initiatives. The role of tools for Open Innovation in the development of regional innovation systems therefore needed to be further developed and highlighted.

Resources and Exit Strategy

Already in 2008, several of the evaluated initiative had been successful in levering the resources from the VINNVÄXT programme through resources from other of VINNOVA's initiatives such as the Key Actors Programme and VINNCENTERS of Excellence. In some cases the initiatives were part of quite complex regional innovation system with several nodes and initiatives supported by VINNOVA programmes and other national and international funders. This raised questions concerning regional leadership or 'orchestration' and how to integrate different initiatives on a regional level supporting collaboration between different initiatives and avoiding competition between initiatives aiming at similar overarching regional objectives. It also raises questions on

how the different initiatives and programmes initiated on a national level by VINNOVA could be integrated both conceptually and in relation to the different initiatives that VINNOVA supported. In short the evaluation of the five VINNVÄXT initiatives raised questions about the systemic leadership from VINNOVA centrally, regarding funding and implementing different programmes on a regional and local level.

7.1.3 Evaluator Response in 2011

Several achievements could be clearly perceived by the International Evaluation Panel from its visits to the five VINNVÄXT initiatives in September 2011.

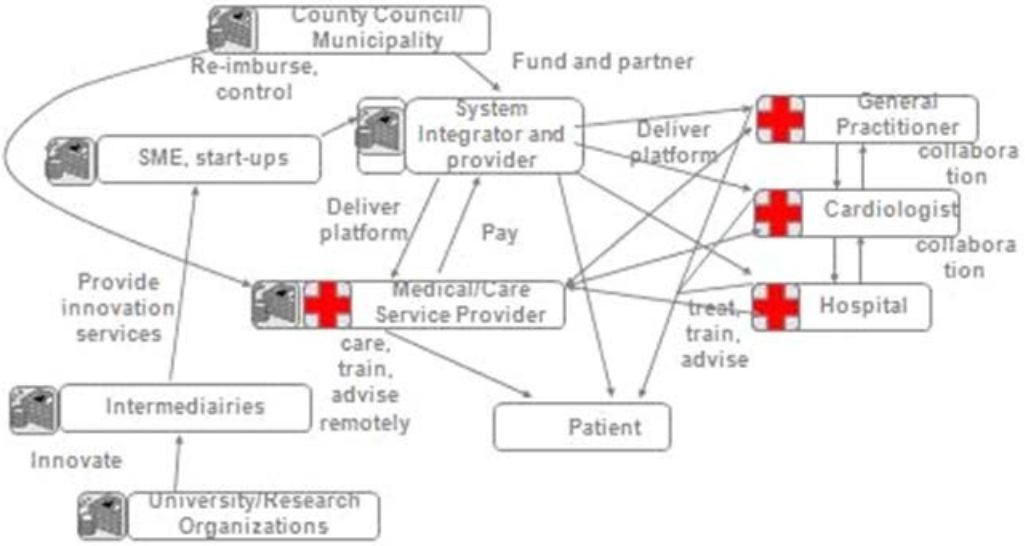
Strategy Development

On this, marked improvements were registered in all cases but the initiatives with the biggest ground to make up here were New Tools for Health and Process IT. Fibre Optic Valley, too, had broadened its perspective from telecom cabling and over-reliance on Ericsson but this has raised further evolving issues. Perhaps GoteborgBIO had made less progress in strategy development, having narrowed its focus unduly, perhaps, to dental implants and wound healing, echoing the downturn in biotechnology occasioned by the 'systems biology' revolution, but relatively buoyant markets in medical technologies. Triple Steelix was already well armed with technology strategy in 2008 but had evolved far more sophisticated product innovations because of 'open innovation opportunities' currently available and being taken. Returning to the two that had most strategic ground to make up: New Tools for Health was a sad case in 2008 but re-invigorated by 2011. Part of this success was because the very 'advanced idea' underlying the business model of HNV had finally been grasped by the key stakeholders, including university rectors and professors and the Swedish state. This was, namely, that the Swedish healthcare system was unaffordable and more healthcare would need to be provided, using digital and other innovative media with support technologies, not in the hospital or care-centre, but at home.

The cognitive lock-in suffered by such experts had finally come into alignment with prevailing macro-economic reality and HNV was making progress with innovative projects and entrepreneurship accordingly. It was possible to detect a model (Fig. 7.1) of its market potential and way forward from what had hitherto been an unclear, not to say slightly chaotic, picture of a complex reality. As noted, authoritative government statements on demographics, rising costs and declining public budgets finally 'shocked' holders of these presumptions into a condition of serious incertitude. At this point HNV gained sufficient legitimacy and institutional support to facilitate assembly of a regional healthcare 'stakeholder system' for procurement of innovations in personalised healthcare (Fig. 7.1). In this case, because the regional healthcare system is inordinately complex but lacking large firm providers of innovative solutions while start-up businesses are too small and specialised, the system initiator HNV must take on the catalysing and co-ordinating functions of regional healthcare system integrator. It commissions innovative solutions through innovation projects between hospitals, healthcare research and existing or start-up SME's while building relational capital with large, external firms with some relevant competence areas. However, so new is this

mission that relatively few large-scale personalised healthcare providers of the kind required are to be found anywhere. Accordingly, experimentation through exploratory projects, building alliances, as with Health Technology Alliance in Halland and absorbing its experience, and articulating hitherto unconcealed innovation demands are the drivers of this initiative.

Figure 7.1 HNV Regional Healthcare Stakeholder System for Innovative Procurement



Source: Drawn by Joerg Habetha, Philips Research

With respect to ProcessIT they too had discovered a business model or perhaps more accurately a ’business intervention model’ (BIM) that had worked to broaden out their business strategy. This worked according to Von Hippel’s notion of ’Learning from your Industry’ whereby the project team visited five hundred firms per year in the region to inquire about their innovation demands for the forthcoming year. This yielded up several new projects, cross-fertilisations and intra-regional as well as extra-regional business interactions and ’deals’. In most cases this as in the case of NTH had arisen from exploring their innovation market as a platform of customer needs rather than a narrow technology push solution. Accordingly, both initiatives that had ground to make up were healthier in 2011 than they had been in 2008.

Approach to Research & Innovation (R&I) System strategy and project portfolio

In the cases where a broadening of the platform base had occurred, particularly ProcessIT, and HNV but also FOV, where an as yet not entirely fulfilled aspiration to do something similar to ProcessIT by ’Learning from your Industry’. Triple Steelix already had quite a broad market platform for its special steels with only GöteborgBIO narrowing its field, possibly unnecessarily, according to the accompanying industry expert. Accordingly a new Business Intervention Model’ (BIM) could be discerned in

2011 in the first three initiatives that simply was not evident in 2008. It seems to involve the following elements:

- Identify clear market niches
- Understand R&I requirements of innovation users (mainly larger firms)
- Identify regional capabilities to meet home user requirements
- Establish ’open innovation’ joint project with university research, customer and supplier
- Filter out ’failing’ projects
- Customers implement successful projects

In the case of ProcessIT, this BIM was up and running in 2011, thus available for ’policy learning’ from the likes of FOV that had aspirations to do that but had unnecessarily narrowed itself into three specialist sub-markets each with a totally different geographical base. Instead it should look for synergies among users and solution suppliers, including ’system integrators’ in the way ProcessIT does. HNV was proceeding along similar BIM lines but hampered by a lack of homecare medical firms of the requisite scale to lead market entry. However attention was being devoted to partnership building with two large firms outside the region. In the case of FOV, as also with PEA in Norrköping, the presence of Acreo had proved highly disappointing in terms of market building. Acreo is a ’technology push’ organisation in an increasingly user-driven innovation world conditioned by globalising knowledge-based markets and their imperatives. It should be said that VINNOVA centrally has been remiss in not resolving programme-monitoring issues arising from the time of the Dahmén Institute.

Internationalisation

There remains some disappointment in this regard although some signs of opening up to overseas markets is evident. However, ’overseas’ here often means across the Baltic Sea rather than to Brazil, China or India. Thus in Triple Steelix, the leading pipe-maker, a systems integrator company – Hydroforming Design Light – was now exporting to Daimler-Benz in Germany. Of course, larger firms like Sandvik are present in global markets. But even here ’Bergslagen is Best’ was thought by the evaluators to be unlikely to make much of a marketing impact in Shanghai, for example. For Process IT there was a tradition of being open to the Finnish market, typically because the industry mix of the region overlapped and Finnish firms had bought Swedish heavy industry companies in the region. However, much remained to be done to attract distant foreign expertise in (with the exception of the Japanese machinery firm Komatsu) and identify markets overseas beyond the Baltic Sea Region and especially Finland. FOV showed little evidence of having devoted attention to overseas markets or attracting overseas firms to engage in inward investment activities. GöteborgBIO had ’internationalised’ most because many of its community of larger firms began as or were purchased by overseas companies. In this respect it was probably the most international initiative of all. It was considered possible that HNV might find an acceptable overseas partner in its home-based healthcare system but far more likely that Swedish lead market firms would be identified as satisfactory partners. In general, it can be said that neither the

management teams nor the businesses in these VINNVÄXT initiatives have made as much progress in internationalisation as was hoped in 2008. Naturally, universities, like Göteborg, Linköping and Umeå have extensive international research partnerships and student exchange programmes but these seem to have little impact on the overwhelmingly domestic focus of members of the initiatives, larger firms generally excepted.

System Governance

In each case system governance, in the sense of initiative process management and Board membership had improved. This was reflected in a generally improved strategic focus and orientation in each initiative, as described above. Triple Steelix had a good, supportive and committed board in 2008 and this tradition had been enhanced 2008-2011. For example an established board member makes one hundred firm visits per year in the area of his home base in what is a large region to ascertain innovation demand in the same manner as that practised in Process IT. This is proving an excellent way of keeping members committed, identifying research needs and developing future innovation projects in a BIM already described as 'Learning from your Industry'. Large customers and smart 'system integrator' firms can thus be put together with university researchers to maximise the proximity gains of regional innovation and its relational strengths and efficiencies, thus advantaging Swedish industry more generally. Such 'embedded intervention' creates an excellent platform for future expansion of markets overseas in 'BRIC'-type markets (also CIVETS – Colombia, Indonesia, Vietnam, Egypt, Turkey & South Africa). ProcessIT's system governance and that of NTH had probably improved the most. Both boards were now active and committed whereas they had hitherto been passive and apathetic. The FOV board also expressed commitment to continued support even after the ending of current VINNOVA funding. However, FOV is still not a well-established marketing organisation, probably too much under the wing of Acreo for whom 'markets' are sources of regular research funding rather than phenomena to be explored and exploited for competitive purposes. GöteborgBIO's system governance has always shown significant commitment, though dominated in the past by large players like Astra-Zeneca, Akzo-Nobel etc. Now, these are still active but, as in NTH, more voice is clearly being expressed by the academic stakeholders as the initiative changes direction albeit, narrowly, into the spheres of bone-related and wound-healing medical technologies.

Evolution of the Core Idea of Innovation System

Progress was registered on this in each case to varying degrees. Undoubtedly, NTH and to a slightly lesser extent Process IT had become 'systemic' in their outlook on their core task. For NTH this is exemplified in Fig. 7.1, and Process IT is to be congratulated on evolving its 'Learning from your Industry' BIM as described above. Unfortunately, FOV had responded to the shock of no longer being able to rely on Ericsson as a key partner, but had not been necessarily best advised in its strategy development by the Board or key stakeholder Acreo and had opted for a three-pronged approach based on sensors, broadband and digital services, each located in a specific and different settlement in the region. Accordingly, opportunities for transversality by cross-

pollination of knowledge were actually being hindered in what is an ideal field for crossover kinds of creativity – literally in the case of theatre and cinema technologies involving virtual content. Accordingly, it can be concluded that grasping of the idea of 'systemic advantage' has occurred where it was previously absent, mainly by good communication between process managers and stakeholders. This has also been helped by close involvement of university rather than public research organisation (PRO) teams. Even in Triple Steelix, where university research had to be significantly upgraded, signs of progress were to be observed in this regard. Here, the weak governance system-elements were Swedish national agency representative bodies like the Trade Board and Investment Agency who seemed passive regarding strengthening the initiative's overseas connections. Roll Forming and Clean Production research laboratories signify both commitment to a strategic perspective on the industry's possible competitive advantages, and recognition of the potential of global markets on the part of academe in supporting the special steels sector in Sweden.

No 'One-Size-Fits-All' Policy Implementation Methodology

Each initiative could be said to be evolving its own systemic solution to its specific context and expertise. However, beneath the surface, especially in the most improved cases. We can call this 'Learning from your Industry' model, which was outlined above – to repeat:

- Identify clear market niches
- Understand R&I requirements of innovation users (mainly larger firms)
- Identify regional capabilities to meet hose user requirements (SSI firms)
- Establish 'open innovation' joint project with university research, customer and supplier
- Filter out 'failing' projects
- Customers implement successful projects

ProcessIT was practising this model on the largest scale, claiming to have five hundred contacts with its market of firms, of various kinds, per year. Triple Steelix was doing the same thing on a smaller scale – 100 firms per year – that could usefully be extended by committed board members and process management getting out into the field in areas where that currently does not yet happen. FOV could usefully learn this approach from ProcessIT as they may have similar customers although different technologies. HNV had evolved its systemic innovation platform to a point where it could also usefully adapt this 'home-grown' VINNVÄXT BIM to the healthcare services industry. Even GöteborgBIO, in the midst of a substantial change of focus was looking to develop new links to, for example, Smart Textiles to broaden its knowledge and start-up base. More learning, testing and application of this BIM, suitably varied and adapted to industry and geographical potential and requirements could prove a winner for each initiative. The important thing is not to see it as a template to be religiously followed by all, but rather an inspiration to evolve further towards systemic regional innovation with a longer-term perspective than the market-focused cluster approach of yesteryear.

From 'Technology Push' to 'Open Innovation'

It was striking how much each business intervention model (BIM) had moved away from technology push thinking to meet new opportunities in open innovation. The latter was being inspired in ProcessIT by pressure upon large, heavy industry firms to engage in a further round of 'lean management and production'. This might range from demand driven innovation to develop systems for driverless mining trucks, on the one hand, to requirements to have 'visualisation' technology introduced to digital training or marketing programmes. This was a key force driving the role of Process IT management into a more 'catalytic' role of bringing together innovation customers and suppliers to interact in ways that could not reach a solution by application of 'off-the-shelf' technology. Rather, a complex problem-solving approach, often involving remote control of anything from driving trucks to testing for pollution effects in water, had to be brokered among research, system integrators and final customers. FOV had had to evolve towards broadband, sensors and digital services because its 'technology' was no longer new and independent but now embedded in complex solutions of which it might simply be one component. HNV had to create a market by bringing together system providers to create innovative healthcare solutions that were 'leaner' and cheaper then the prevailing 'hierarchical' welfare state model. Triple Steelix firms were, like ProcessIT companies, increasingly connecting to large customers on the basis of their excellence in, for example, and roll-forming components to order and to exacting tolerances. GöteborgBIO was moving in the same broad direction of stimulating research expertise to develop innovative solutions that would be marketed as a customised medical technology by a large firm to the national healthcare system.

7.2 A summary of the cluster development process

This section outlines a framework for the evaluation of Cluster Development and cluster initiatives that was developed by the International Review Teams for evaluation of the VINNVÄXT initiatives appointed in 2004 and 2008 respectively. Generalised reflections are also made in this section on the Team's findings.

The International Teams on the cluster initiatives took two comparative perspectives:

- The innovation stretch:
  - Knowledge base: academia
  - Knowledge base: firms, absorptive capacity
  - Commercialisation & Entrepreneurship
  - Equity finance: venture capital, angel funding
  - Cluster scale: potential regional impact
- The quality of the clustering intervention:
  - Governance
  - Strategic focus, including internationalisation
  - Process leadership
  - Connecting & catalysing; Leveraging the regional innovation actors

- Raising the cluster's profile

7.2.1 Innovation stretch

Knowledge Base: academia

'Academia' broadly refers to publically funded knowledge providers, including local universities, R&D institutions and test bed facilities. This perspective assesses the quality of the knowledge base at publically funded institutions that is specifically relevant to the needs of the cluster's firms.

Co-specialisation (rather than duplication) needs to be in place between the separate knowledge providers, and open tacit information flows between them. Further, strong clusters have deep knowledge within their area of specialisation. This is supported by strong academic links, often on a global scale, with an academic centre earning a position as a 'global hot spot' within it's competence area, attracting links with other knowledge centres, attracting students and attracting talent.

Comments:

Each of the cluster initiatives has a developed academic knowledge base; some are well recognised within Sweden, a few well recognised globally.

Some of the cluster initiatives are reactive, hesitant and unnecessarily cautious in making contact with potential external knowledge bases. There are benefits for many of the initiatives in becoming more systematically proactive in identifying global academic partners.

Knowledge Base: firms, absorptive capacity

This perspective explores the capacity of local firms to access, absorb, integrate, add value to, and commercialise locally developed technologies and processes, particularly innovations coming from publically funded research, including radical research. Such research is often science driven as it is aimed at expanding knowledge in a particular discipline. For it to be used by demand it requires an effort in identifying applications and incremental innovations that must be demand-driven. University spin-offs are one positive indication of user-driven applications in specialists and niche markets.

A further dimension is the position and role of the region in national or global value chains. In a globalised economy it is rather unusual that a single region – and the companies located there – would capture all activities of a value chain such as supply of raw material, product design, research and development, production, marketing and sales, etc. Most often, regions are elements of a national or a global value chain.

The regions, which play a dominant role in a value chain and are crucial for market success, i.e. which host the most important members (companies, universities, etc.) will benefit most from the value system. Value chains are not static; they are changing according to market needs and are becoming more specialised without necessarily being dissected. Strong initiatives will play a major role in their value chain.

‘Local firms’ includes investment and talent that is attracted to the region because of the quality and accessibility of the local R&D and technology base.

Comments:

A few of the cluster initiatives still remain science and curiosity driven. In a number of the clusters, academic activity is strongly market/needs driven. Some of the initiatives have very fragmentary regional value chains, are not able to bridge missing members, or fall below a ‘critical mass’. This calls for a strategic development focussing on the initiatives ‘growing out’ of the region by linking up with other, companies and academia globally.

Commercialisation & Entrepreneurship

Competitiveness and economic growth through innovation is fundamental to the VINNVÄXT programme. Therefore systematic activities for and support to commercialisation and entrepreneurship is important for the cluster initiatives. This covers a wide range of activities from supporting commercialisation and entrepreneurship in the forming of spin out companies from university as well as support for commercialisation of market driven innovations in existing companies, both global and mainly regionally oriented SME’s.

Comments:

The VINNVÄXT initiatives have made great efforts to support commercialisation and entrepreneurship. The Initiatives have made significant investments in both processes as physical arenas (e.g. test beds, prototype factories, business labs, etc. The challenge for the initiatives is to secure the flow of ideas that could lead to new products and services and/or new businesses. It also requires strategies how the investments made to promote the commercialization and entrepreneurship can be sustainable and managed in a more business-oriented way.

Equity finance: venture capital, angel funding

A key to the development of many clusters is the availability of equity finances for high growth SME’s, in particular the wide availability of venture capital and angel funding. Coupled with the availability of this specialist finance is board / management advice and high level contacts. As these are integral ingredients in lifting a firm’s capabilities, there are strong advantages if this finance is available within the cluster’s functional region.

Comment:

The difficulty of accessing formal venture capital funds is widespread in Sweden. However, a possibly more important informal market is developing, with high net worth individuals willing to take equity positions, especially in local firms that are geographically close. Most of the cluster initiatives could be more active in matching high growth companies with local investors.

Cluster scale: potential economic Impact

The VINNVÄXT initiative is fundamentally and ultimately about regional economic growth: upgrading local competitiveness, improving productivity, the growth of existing firms (from SME's to multinationals), and the establishment of new firms.

This perspective is a very qualitative assessment of the possible medium to long-term impact of the initiative on job growth; export growth, and growth in the regional economy. It captures the multiplier effect of the initiative as it acts on creating/empowering/strengthening the innovation processes and the actors involved, on the local cluster and on the broader local economy.

A Clustering Initiative should be able to present hard data to local politicians and others, demonstrating its economic importance to the local community.

Comment:

While very few of the cluster initiatives presented hard data on their economic significance, it is clear that at this point in time some are very small contributors to their region's economy. The Initiative may still be exploring an emerging technology, or have yet to substantively engage beyond academia.

Some few initiatives, even if they succeed with long-term double-digit growth, are unlikely to have anything more than a very marginal impact on their regional economy.

7.2.2 Cluster Initiative Quality

Governance

The activities, and therefore the membership, of a Cluster Initiative's Board are one of the main determinants of success. Clear and sound leadership is an essential.

The Board may have needed to evolve as the Cluster Initiative matures. Ideally the Board, by the third year of a Cluster Initiative, should be business led, with a business culture, notwithstanding the active participation of regional government, industry association/agencies and academia. The culture of a clustering initiative needs to more closely reflect that of business rather than that of a public agency or that of academia.

Senior stakeholders who are active within the cluster are required, ideally C.E.Os. from local firms. Board members need to be able to activate a broad agenda for a cluster, rather than looking after the interests of their own organisation. Amongst the Board members there needs to be a deep understanding of the cluster's market and technologies. Board members that have the ability to use their connections to bring in additional resources to support the Cluster Initiative are particularly valuable.

Comment:

Some of the cluster initiatives are now strongly business led with active and committed local business people, together with senior stakeholders coming from the local universities and local or regional public and private institutions – reflecting the triple

helix model – that are again pro-active, commit-ted and supportive. For others it still is an important strategic task to develop from a mainly regional and public sector driven to a business led initiative.

Strategic focus, including Internationalisation

The development agenda for any cluster is broad, and may include, along-side technology/R&D such issues as training and skills development; the availability of equity finance; investment and talent attraction; export pro-motion and internationalisation; the development of the cluster's identity; school-business links and university-business links.

Any Clustering Initiative's decisions on strategic priorities and their implementations needs to be data driven, especially when Board members have diverse backgrounds. Information and figures on the latest trends the industry and related industries' employment, profitability, export markers and competition, consumer patterns, revenues, regulations, as well as macro trends such as climate change needs to be available. In addition, the governance of the Cluster Initiative may benefit from benchmarking exercises that highlight competitors, as well as unique competitive advantages.

The steps that need to be addressed in upgrading the cluster's competitive-ness need to be transparently identified, not a few seniors deciding for the many stakeholders.

Comment:

This perspective takes into account the understanding demonstrated by the Board and the process team of the wider agenda facing the cluster, beyond just the cluster initiative itself; and the availability and use of hard data in determining this agenda.

Few of the cluster initiatives came through strongly on this dimension. Very few could present hard data on the local economy, the cluster itself or major competitors. Again, very few of the cluster initiatives could clearly articulate the steps that need to be undertaken to lift the competitiveness of their cluster.

Process Leadership

A cluster initiative, as a deliberate intervention, requires competent, dedicated and authoritative process leadership. Process leadership needs to be able to operate at a high level, and to have the support of the cluster's governance. In its role, process leadership serves the interests of the broader set of stakeholders involved in the initiative. Process leadership will more easily achieve its task if it shows an attitude towards good communication, networking and bridge building – within and beyond the cluster. Process leadership depends on a mix of factors: some more qualitative relate to having strategic focus, empowering others, good social skills, able and pro-active connectors with a relevant business background, but also basic ones such as full time and dedicated time for the task.

Comment:

Most of the cluster initiatives have strong, dedicated and enthusiastic management teams in place. A few have over-stretched leadership, spread too thinly; others have relatively junior executives in place, who will have difficulty in making a substantive impact.

Connecting & Catalysing; Leveraging the regional innovation actors

The individual components within a high performance cluster need to be well connected, with tacit information easily moving amongst firms, and between firms and academia. By the third year a Clustering Initiative is expected to be well set-up, and to have set in place the key elements to deliver on its strategic targets. As it gains momentum, the initiative becomes more visible in the local economy and with more connections the innovation process will simultaneously work through two dimensions – market-driven and university/R&D push.

Emerging clusters tend to be fragmented and at times dysfunctional due to weak connections. Mature clusters might have long-established links and routines that need renewing, but are hard to change.

VINNOVA's core funding should be leading to the commitment of other financing to the Clustering Initiative. This is one result of Connecting & Catalysing. A second important result is changing mind-sets within the cluster, including firms revisiting their own strategies as a direct result of the clustering process and collaborative engagement.

As the Cluster Initiative gathers pace, alongside the VINNOVA financial sup-port there should be evidence of funding coming from other local, regional, national or EU sources that further accelerates the development of the cluster.

The regional innovation actors that can bring additional resources to support a clustering initiative include among others:

- Almi
- Innovation Bridge
- Invest in Sweden
- Swedish Export Council
- Local municipality, regional council

Comment:

Some initiatives have been very successful in mobilizing further funding and resources, including EU sponsorships, as well as in securing the active support of very passionate, energetic, committed and high-level people.

Some of the cluster initiatives have yet to substantively change gear in terms of mobilising beyond an academic/test bed environment. Other initiatives are over dependent on VINNVÄXT and VINNOVA and could be vulnerable as Year Ten approaches.

Raising the cluster's profile

A successful cluster has a profile that attracts attention to the cluster in a number of dimensions:

- From well beyond Sweden's borders, facilitating international awareness and engagement by firms and academic institutions. The profile should be attracting customers, talent and new investment to the cluster.
- Within Sweden, the cluster's profile should attract increasing attention by national public agencies, banks and other support firms.
- Within the region, the cluster's profile should attract the attention of local triple helix leaders (politicians, academics and business) as well as school leavers and entrepreneurs seeking to start up a new business. Importantly, the profile should also capture the attention of neighboring clusters.
- Within the cluster itself, increased visibility should also help in building the social glue…the connections…within the cluster, and have positive impact through the cluster's stakeholders being proud of being part of the local cluster 'team'.

Building a cluster's awareness and image to the global level reached by a Silicon Valley or a Hollywood takes decades. But through coordinated PR and marketing, aligned around a core brand, significant progress can be made within the time frame of a VINNVÄXT initiative.

Comment:

Many of the cluster initiatives are still failing to reach out to a European, let alone a global audience. The names of some of the cluster initiatives remain appropriate only for a domestic audience; some of the cluster web sites are only in Swedish. While the cluster may well have firms and academic institutions that are active globally, this broad reach is not reflected in many of the cluster's PR and marketing activities.

7.3 The Sustainability of the VINNVÄXT initiatives

In this part of the report attention is focused on two issues. Firstly, the report is interested and concerned that each initiative, now nearing the last trimester of its funding has thought about and decided upon an 'exit strategy' for the future after the ending of the VINNVÄXT ten-year funding regime. Secondly, the report draws up general conclusions about the external management of the innovation system-building process at regional and sub-regional levels that the VINNVÄXT initiative represents, with several discussion points arising in consequence.

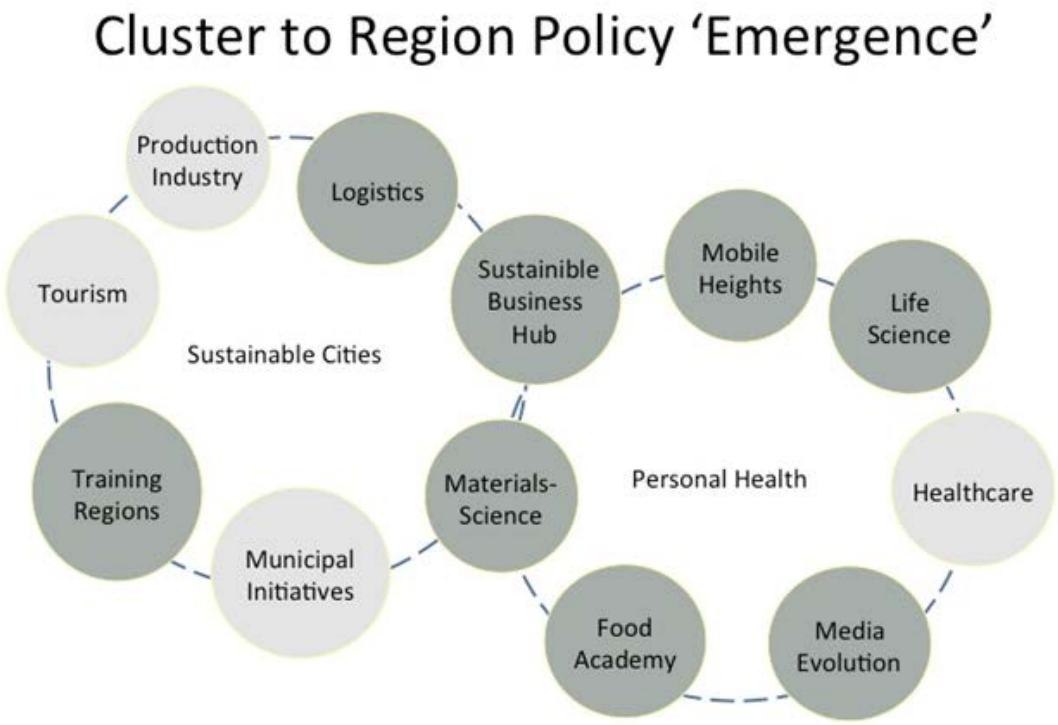
This involves two elements that build on and project beyond the assessments made in Section 7.1. The first concerns the underlying 'theory' of systemic innovation that has to be recognised following the gains in organisation described above towards a more 'combinatory' form of knowledge integration that the perhaps 'cumulative' and incremental 'technology push' model that prevailed when VINNVÄXT was being conceived about one decade ago. This involves the issues of grand challenges, systems integration, relatedness and transversal innovation that some Swedish regions already

display as the way forward in a globally pioneering way. Both Skåne (Fig. 7.2) and Västra Götaland regions show the way on this. The innovation model displays the following key features:

- It seeks to re-balance the national economy towards domestic industries that can do social good and create overseas markets. Examples include responding to 'Grand Challenges' like 'Climate Change'; the 'Healthcare' time-bomb; the 'Energy Crisis'; an 'Ageing Demo-graphics' problem and so on. This is the EU advisory on future regional economic development, misleadingly called 'smart specialisation' and better called 'smart stimulation'
- Existing local policy initiatives demonstrate 'emergent' properties when brought together to combine their related and unrelated know-ledge and expertise to tackle on or more of these 'Grand Challenges'. VINNOVA launched its 'Challenge Driven Innovation' initiative with >600 responses nationally in late 2011.
- Regions – utilising – a 'sounding board' methodology, identify the Grand Challenges for which they have the greatest policy and industry capability. Most regions can tackle two, maybe three such Grand Challenges. They are expected to tackle only part of a Grand Challenge not the whole. Thus 'Climate Change' may be met by a 'Sustainable Cities' 'platform' response. And one region's 'Sustainable Cities' expertise should ideally be different from but complementary to, any others in the same category. In that way regions build up elements of a national programme, which contributes to a coherent EU and global response.
- Regional industries, service providers and VINNVÄXT-type initiatives should see this activity as only one of a more general 'transversal' way of developing innovation support activities. Making connections with complementary firms and clusters elsewhere in Sweden and abroad is also a valid and valued business activity. Building knowledge and innovation 'platforms' is the ultimate aim and best means to achieving and realising innovation potential.

To varying degrees cross-fertilisation/cross-pollination linkages were beginning to be developed in the VINNVÄXT initiatives. Triple Steelix incumbents were beginning to explore possible knowledge exchange for innovation with partners in new markets like energy, clean production and process innovation. ProcessIT was similarly exploring innovation platform potential with firms in the energy sector. GöteborgBIO was partnering Smart Textiles, located elsewhere in the region, to develop through start-ups, the use of textiles in replacement body elements like vein grafts. Perhaps FOV and HNV were furthest from taking such steps but both could usefully seek to integrate with other clusters in different, as well as similar initiatives (HNV has an alliance with Halland's Health Technology Alliance in a similar field).

Figure 7.2 Grand Challenges: Cluster to Region Policy 'Emergence'



Of key importance to achieving such integration based on 'platform innovation' will be 'system integrator' firms that bring together different technologies, knowledge and expertise in the normal course of their business. Some of these had already emerged in initiatives like Triple Steelix and Process IT and they could be envisaged elsewhere – FOV, for example. Research and innovation projects to stimulate such transversality opportunities can be a priority, as happens increasingly in Region Skåne's evolving Regional Innovation Strategy. Examples of this are listed as follows.

7.3.1 Innovation Policy Business Models

7.3.1.1A: Innovation Twists (Preadaptations)

These require innovation 'fashion shows' where 'attractors' including both 'natural attractors' who are near to predictable, coming from neighbouring industries in the technical sense, and 'strange attractors' coming from largely unconnected industries, can meet and absorb knowledge spill overs from sectorial 'others'. These should be stages (theatre-style) or 'living labs' with 'red thread' narratives, 'storytelling' discourses and dramaturgies, as practised in Finland's 'Regional Platform Development Methodology' reported in VINNOVA's 'The Matrix' report. Fundamentally, firms in one industry or cluster are presented with accounts of useful innovations developed in a different industry. If this process sparks off some inspiration to adapt it in a new field, firms begin 'conversations'. These may be brokered by a third party from the RDA to provide 'neutral territory' and 'trusted third party' facilitation, which also serve learning and policy co-creation purposes from an 'innovation platform' point of view.

7.3.1.1B: Reverse Innovation

There may also be ‘reverse innovation’ business models like that discussed by Jeffrey Immelt, CEO of GE regarding General Electric’s EKG scanning machines for LDCs – targeting so-called ‘bottom of the pyramid’ markets - in BRIC-countries and elsewhere. Based on ’smartphone’ technology, these hand held scanners cost $1,000 compared to an MRI which costs $millions. It was so successful that it was adopted by US paramedics and police reporting patient data following car accidents in cities like Los Angeles, thereby discovering a new domestic market from exploring an overseas one.

7.3.1.1C: User Driven Innovation

There may also be user driven as well as reverse innovation or innovation ‘twists’ (preadaptations). Here twists can occur in supply chains depending upon the shift from global production networks (GPNs) to global innovation networks (GINs), for example. Such twists must be understood by RDA intermediaries working with and learning from cluster expertise in technological and business model transitions occurring worldwide. One such twist affecting Nordic former ICT leaders like Nokia and Sony Ericsson is that they pursued endogenous systems applications long after Asian competitors like Samsung, HTC and Huawei were pursuing Apple into the ‘smartphone’ market. As the Nordic countries have had to downsize due to the Asian and US competitive surge, firms like China’s Huawei have begun snapping up redundant telecom engineers by locating in their former strongholds, especially in Sweden. Huawei is a threat to the infrastructure as well as systems and handsets aspects of the mobile telephony market. But, basically, Nordic mobile telephony firms had low absorptive capacity towards such competition and remained locked-in to their proprietary technological path dependency for too long. Projects that improve ’absorptive capacity’ of Swedish firms will be highly valuable in offsetting such ’market failures’.

7.3.1.2A: Real ‘White Spaces’

If the former three points refer mainly to ‘innovative twists’, the next three refer mainly to ‘White Spaces’ (adjacent possible) explorations. First we may refer again to the notion of ‘Learning from your Industry’ in a context of ‘From Technology Push to User and Open & Collaborative Innovation’. Innovation development, production, distribution and consumption networks can be built up horizontally--with actors consisting only of innovation users (more precisely, "user/self-manufacturers"). Some open source software projects are examples of such networks, and examples can be found in the case of physical products as well. It may be concluded that conditions favourable to horizontal user innovation networks are often present in the economy. In these circumstances, the BIM demands that the regional agency, minimally, keeps a knowledge management system (KMS) of its large and SME ‘system integrator’ firms. Each year all are asked what solutions they need and these become the regional system’s initial innovation market for ‘exploration’ and ‘exploitation’ innovation projects. Thus, the ‘system’ learns through the process management team of the innovation needs and projected innovation projects in demand from specific types of large firm users, system integrators and the knowledge capabilities of regional start-ups and research laboratories. In this way, existing path dependences are exploited and

renewed with the possibility that new paths may open up in consequence. The transversality in this process is shown in research conducted for this report in two further Swedish clusters. The first is the ProcessIT initiative to supply innovative services to heavy industry (pulp & paper, mineral mining, energy) where the 'cluster' promotes innovation projects that are now typically on 'visualisation', positioning', automation and 'simulation' using serious digital gaming technology. This marks a change in these industries towards driverless mining and timber harvesting vehicles, the need for outsourcing and open innovation in Mark 2 'lean management' production systems and the rise of sensor-embedded control technologies more generally. Hitherto projects were far less 'systemic' requiring more one-off problem solutions. Convergence with another initiative, a 'cluster' of fibre optics firms (FOV) has simultaneously been moving from its origins, close to Ericsson in telecom cabling, towards cross-fertilisation of expertise in sensors, simulation and digital services to meet similar user-demand for advanced digital control services in similar heavy industries.

7.3.1.2B: Regional System-Integrator Knowledge

Among suppliers of software and systems-based services of the kind in demand from users in industries such as those just discussed – mining, metallurgy, forest products, energy etc. are mainly regional but some national and international firms that are precisely those 'hub' or 'pivotal' innovative systems-integrator firms discussed earlier in this report. In this knowledge distribution system, knowledge from regional research and system integrators is presented to regional firms individually or in partnership with one or two others. Theoretically, this is a process involving' learning about confidentiality', aiming to move gradually towards more 'open kimono' postures on the part of firms that are even today hyper-secretive. Eventually, a collective or sub-group 'showcasing' business model may be designed by the process management and/or regional innovation agency team(s) but a major trust-building process has first to be implemented. This filters into customer minds new business practices, new technical solutions, new opportunities for exploring 'White Spaces' according to those who occupy positions as the 'internal radar' of global innovation networks (GINs) are seeing, thinking about, understanding and proposing to move, if partners can be found, into new strategic niches. Here the role of RDA as innovation broker of solutions to final users in and beyond the region is also crucial – as 'orchestrator and 'storyteller'.

7.3.1.2C: Exploratory Projects

These are especially important for 'White Spaces' and Grand Challenges investigations as more strategic action lines than typical 'innovation twist' projects, discourses or narratives. They are, accordingly, funded across cluster interfaces within and between clusters either within Grand Challenge' 'emergents' or among clusters interfacing outside Grand Challenges invol-vement. This evolves as a collaborative business model and 'exploratory' innovation projects may later mutate into 'exploitative' ones.

7.3.2 Exit Strategies

The final thing, and second point in this section concerns what happens to the VINNVÄXT initiatives when the present VINNOVA funding regime comes to an end in some 3-4 years time. In most cases regarding the five evaluated initiatives, the International Evaluation (IE) Panel was reasonably satisfied that thought had, at least, been given by process leaders but we felt that sometimes Boards needed a gentle reminder. In FOV, where thinking was apparently least developed and where problems had arisen concerning over-spent EU Structural Funds transfer commitments, which itself had turned out to involve issuance of statutory redundancy notices to staff, the panel felt there should be a Task Force to engage in development of a FOV Market Development' strategy to secure demand for future FOV services. The commitment of local politicians to continue funding is clear but so it must be if all-important EU Structural Funds are to continue to be accessed according to match-funding rules.

In the case of ProcessIT the evaluators formed the strong impression that little had yet been done to formulate strategy on Alternative Futures for Process IT from which a preferred option might be appropriately selected. In the debrief after the Panel's interviews it was evident that there was enthusiasm to set such a process in motion. Accordingly, the Panel strongly suggests that a 'Task Force for the Future of Process IT' be established relatively quickly (i.e. within 2-3 months). It should be formed from a sub-set of the board experts and process management team, with one to three outside bodies (for example; national, trade association, regional industry outside mining and pulp & paper). It is not for the Panel to have any preference, but some that could be usefully investigated include the following juridical forms:

- Public-Private Partnership
- Private Company
- University host
- Government host
- RISE
- Other

Hence, we consider this matter urgent because we found the method of 'network brokerage' Process IT offers its existing and potential partners both valuable and unique that we have sought to give a little urgency to the priority of maintaining the function over the medium to long term. For Triple Steelix, lesser concerns should nevertheless inform the evolution of a more outward-looking board, responsible fundamentally for developing and approving strategy. We think the days when a lot of representation on the board from local municipalities was the norm should now be over. However, a new and more specialised function for municipal representatives must be found among a new advisory group that helps secure all the resources (financial, personnel etc.) that Triple Helix needs to secure the more global focus it will evolve, from tomorrow.

Thus we see one space on the board for the leader of this 'Resource Sounding Board' element of a refreshed Triple Steelix governance structure. Alongside 'Strategy' on

which the 'Resources Sounding Board' will inform the Triple Steelix board could be a further important advisory group. This will concern the business partnerships being composed mainly of business representatives from the special steels, SSI and other SME representatives from Triple Steelix but also some firms from other customer, supplier or partner industries, as described in ‘transversality’ discussion above (Section 4). It is also important if possible to appoint international representatives from overseas to inculcate an international perspective.

For NTH and GöteborgBIO sources of funding to replace/enhance VINNVÄXT funding that will also require establishing in line with the status preference agreed from the comparable BIM options. These include elements and aspects such as the following:

- Service income (i.e. selling services like information, tools and advice to GöteborgBIO client firms and organisations)
- Membership fees (i.e. charging firms variable membership fees according to size of member organisation – small fee for start-ups; medium fee for SME’s; large fee for large firms and organisations)
- Lobbying nationally to achieve changes in national funding regimes to allow for baseline funding for ‘transversal’ intermediaries like GöteborgBIO
- Regional funding (i.e. enhanced regional funding for lateral ‘cross fertilisation’ innovation support activities at platform ‘interfaces’)
- Other…..

7.3.3 An Expanded & Interactive Future

In all probability, NTH and GöteborgBIO will attract a basket of fee income and core funding support if they are clear on missions and functions, especially the new ones implied by the emergence of ‘iconic projects’ that depend on integration of knowledge from different sources in the new regional platforms of innovation being formed in the region. This future challenge constitutes one of the strongest factors in arguing for an enhanced status and funding regime particularly for NTH and GöteborgBIO. This is because the network broker function must now not only bridge interfaces within the complex regional system of Healthcare and Life Sciences, but also among that platform and other new platforms that, at least in Västra Götaland, have been identified as future regional growth engines. Identifying lines of exploration and exploitation across the interfaces of these sometimes related, sometimes unrelated industries demands an enhanced role and functionality for NTH and GöteborgBIO in future.

7.4 Recommendations from the evaluators

This section presents the evaluators' recommendations to VINNOVA based on evaluations of the VINNVÄXT initiatives appointed in 2004 and 2008.

7.4.1 Recommendations to the initiatives

Clarify the importance and potential of the industry to the region and nationally

The evaluation panel received the impression that in some initiatives the process management, and even more importantly the regional stakeholders, do not know the economic significance of the cluster to the regional economy. The knowledge and understanding of how the initiative will contribute to current and the future regional development is crucial. This will also help to strengthen the awareness of the initiative even when the immediate impact to the regional economy might not be very strong. The same applies to the relevance for the Swedish economy as a whole.

We therefore think that it would be helpful if the initiatives would present a document that gives a clear picture of the importance and potential of the industry involved to the region and to Sweden. This report should be based on quantitative figures (e.g. companies, turnover, employees as percentages, research facilities, etc.).

Systemic thinking and developed business models needed for the sustainability of the initiative

The review shows that all the initiatives are discussing about sustainability, i.e. about the time after the end of the VINNVÄXT funding. Crucial for viability is a convincing concept to keep the current members in the initiative, to extend the participation and to acquire new funding. We think that strategic thinking should comprise a systemic approach linked to a business model. Systemic thinking implies that innovation within a company can only be reached in conjunction with other complementary expertise.

We recommend the initiatives to keep this concept in mind. It will make them more and more attractive to companies when they offer possibilities for regional and national collaborations also “off the beaten track”. Interesting and successful examples of this were presented to the evaluators in some initiatives.

Business models also mean that the members of the initiatives will have to financially contribute to the initiative. According to interviews with companies we are quite optimistic in that respect. Companies will pay when an initiative makes useful offers. We recommend to the initiatives to investigate the need of the members thoroughly.

Internationalisation needs to be at the core of the initiative

As a result of the last evaluation visit in 2008 the review team underlined that internationalisation is crucial for the sustainability of the initiative. Compared to the last visit we think that the initiatives put a lot of effort in order to do international positioning.

However, still we came to the view that international position is unclear to some of the participants and even to some members of the management and the board. It seems that the mind-set is yet to be changed into thinking in international dimensions.

Also, international benchmarking is not everywhere seen as a permanent and systematic task. This should be implemented in the everyday work of the management and taken

for granted. Further recommendations are to include more internationally experienced (business) people in leading position. At least, branding and web site should be improved in some initiatives in order to be comprehensible to the international audience and to ease access for potential partners from abroad.

Strengthen the business dimension in governance board and process management

Some of the initiatives the review team saw are very much business led, and efforts for commercialisation are taking the centre stage of the process management. Other initiatives are in our view still too much focused on research.

We recommend strengthening the business dimension in the board and in the process management. Notably, the stakeholders are responsible for setting the course for future strategic orientation of the initiative.

Take the accumulated knowledge and experiences on innovation systems/clusters to a wider Swedish audience (regionally, Tillväxtverket, Reglab)

The process management teams have accumulated a lot of knowledge on how to create an initiative and how to keep it running. This cumulative and rich treasury of knowledge, the "tacit" knowledge of the people involved, stands out on a European scale.

Many the regional initiatives could now more systematically make their process knowledge more available for other initiatives in their region.

Diversity is more than Gender

The gender topic is addressed in most of the initiatives and is well implemented by projects that are supported by the initiative and by member companies and research institutes etc.

During the site visits it came more and more obvious that gender engagement is indeed an important topic but that it is not the only way in order to strengthen equal opportunity in business life, and to broaden the cluster's talent base. In some initiatives the question was raised in how far students and migrants from abroad – male and female – could be integrated into the initiative in a more sustainable way and thus become part of the regional labour force. This can be described to be a typical "win-win situation" for the region – as it improves the quality of the regional labour force; for the employer – as it stimulates cross-cultural behaviour and thinking; and for the individual – as it opens new opportunities. Thus, it is recommended that the initiatives should broaden out from the notion of "Gender Mainstreaming" to the notion of "Diversity Mainstreaming".

7.4.2 Recommendation to VINNOVA: Build on your Investment

The VINNVÄXT programme is a long-term and extensive financial commitment from VINNOVA, and this sustained commitment is applauded by the International Team. An important basis for our recommendations is therefore how VINNOVA can built on and leverage the investment made in the VINNVÄXT programme.

Inserting more competitive elements in the further implementation of the programme; rewarding the most competitive

The aims of the review team was – among others – to evaluate the progress the initiatives have made during the last three years and to assess the actual and the future potential for commercialisation.

In the course of the site visits the review team realised that some of the initiatives were more successful than others in this respect. For the years coming we recommend an increasing focus on those initiatives where the commercial potential is strong and, respectively, where the efforts of the process management for commercialisation were strong ("innovation stretch"). This could imply that the more promising initiatives will receive additional funding by VINNOVA for the next three years, possibly with some funding being moved from the less to the more promising initiatives.

Supporting the initiative more pro-actively – by stretching the ambitions

For some initiatives the evaluation team came to the view that the process management and/or the board did not fully appreciate that the clustering initiative was proceeding at a sub-optimal level, or if some of the stakeholders did appreciate this, they were unable to take the necessary action.

This would imply for VINNOVA to think about supporting struggling initiative more pro-actively, and earlier, in order to raise ambitions and performance. At times a short and sharp outside intervention is needed to generate change.

Use the Challenge Driven Innovation Concept to build on and link the VINNVÄXT Initiatives

The Challenge Driven Innovation Concept (CDI) is an innovation methodology that was developed by innovation practitioners. The idea is to enable companies to accelerate their innovation outcome by leveraging open innovation and crowdsourcing and thus tapping into external knowledge and perspectives.

The VINNVÄXT initiatives contain a rich portfolio of knowledge and experiences. This economic potential could be exploited even more effectively when VINNOVA creates a framework that encourages the initiatives, especially the process management, to pursue or to extend cross-fertilisation, open innovation and crowdsourcing.

However, in order to be successful the initiatives have to be very clear about their own expertise and about the expertise of the other ones.

The initiatives are "mini-VINNOVA's" and the hands on involvement of other parts of VINNOVA is a win-win

On our site visits we saw that the initiatives are acting like "mini-VINNOVA's" meaning that they are acting as the node for acquiring and distributing financial resources from other funds such as regional, national, and EU-funds, including other programmes run by VINNOVA. This shows that VINNVÄXT enables regions to attract additional funding.

Within VINNOVA, there could be tighter coordination amongst the different departments, aligned around the needs of the cluster initiatives.

Supporting more active learning and sharing between the initiatives

The initiatives are in our view eager to learn from other initiatives, from within Sweden and beyond.

Whilst there are already some workshops on the exchange of experiences, VINNOVA could support that process more actively and offer a platform for mutual learning. This could include workshops on generic issues such as process management, international benchmarking, innovation processes, venture capital, etc.

Tightening collaboration with supporting national actors, especially for the internationalisation of the initiatives

The initiatives need to place much more emphasis on internationalising their activities. However, it has to assume that they will not manage it internally. The resources of process management and the board members are limited given their task in keeping the initiative running.

We think the initiatives should be further supported by Swedish organisations such as the "Swedish Trade Council" which promotes international activities of Swedish companies. We recommend that VINNOVA could help and strive for collaboration with the trade council. In the evaluation 2008 the evaluation already recommended this.

A starting point in this respect could be to advertise regional innovation clusters on the web site of the Trade Council.

Establishing standardised web presence for all Swedish cluster initiatives, such as Kompetenznetze.de

National and international visibility on the Internet is crucial for the awareness and the international positioning of an initiative in international competition. To maintain a customer-friendly website is definitely one of genuine tasks of the initiatives themselves.

However, presenting a selection of the best initiatives on a web site that gives a standardised overview on the Swedish innovative networks can strengthen branding and international visibility further. The German "kompetenznetze.de" is a good example for that approach. The platform campaigns for the "best innovation networks" in Germany. Applicants have to run through an assessment process of an independent jury.

Supporting regional authorities learning on the development of integrated regional innovation systems, based on VINNOVA's learning from different programmes, such as VINNVÄXT

In the previous section we recommended that the initiatives should exploit their knowledge and their experiences on building and running innovations systems or clusters by sharing it with other initiatives within their region. At the same time also VINNOVA itself has accumulated considerable knowledge and experience in how to

support regional innovation systems, as is evidenced by requests to share experiences at international conferences and the on-going support in Africa.

Our recommendation to VINNOVA points into a similar direction. We think that the regional authorities that are considering supporting innovation initiatives in their region could be more comprehensively advised by VINNOVA, and through this VINNOVA assisting in raising Swedish competitiveness with a much wider approach.

Need for a more regional/client oriented work division

There seems to be a need for re-arranging the internal division of work at VINNOVA, specifically the allocation of the initiatives to the members of the VINNOVA team. The time may now be appropriate to have team member's specialising/focussing on different regions within Sweden.

Appendix 1. The evaluation team

The evaluation of the VINNVÄXT-initiatives was carried out by an international team consisting of experts with:

- Academic and/or business oriented profile with excellent knowledge about state of the art on innovative clusters and innovation systems
- Academic and/or business oriented profile with excellent knowledge about state of the art in the specific field for the initiative

The experts on clusters and innovation systems participating in the evaluation of all four initiatives were:

- *Philip Cooke,* University Research Professor in regional economic development, and founding Director of the Centre for Advanced Studies, University of Wales, Cardiff. His research interests lie in studies of Biotechnology, Regional Innovation Systems, Knowledge Economies, Entrepreneurship, Clusters and Networks.
- *Alexander Eickelpasch,* Senior Economist, German Institute for Economic Research (DIW Berlin), Germany. Fields of expertise: Evaluation of innovation policy, regional economics and service industries. Research and consultancy mainly for public institutions in Germany and abroad.
- *Ifor Ffowcs-Williams,* globally recognised cluster expert and CEO of Cluster Navigators Ltd, New Zealand. Cluster Navigators Ltd is a niche economic development consultancy, taking a cluster approach to the nurturing and upgrading of competitiveness agendas.

The following international experts were part of the evaluation team:

Fiber Optic Valley

- *Aleksandra Boskovic***,** Director at European Technology Centre at Corning Incorporated in France. Corning is the world leader in specialty glass and ceramics. Boscovic has a background as a researcher in fiber optics from Brazil and England
- *Luiz Carlos Guedes***,** Physicist with BSc, MSc and PhD at Rio de Janeiro Catholic University (PUC-Rio) and with long background as researcher, director and entrepreneur in the field of optical fiber sensors, especially applications for the oil industry. Presently researcher at PUC-Rio.

GöteborgBIO

- *Samuel I Stupp*, Director, Institute for BioNanotechnology in medicine, Northwestern University, Chicago, Illinois, USA with an extensive and long background in chemistry, material sciences and bionanotechnology.
- *Bengt Westrin,* CEO of Tarpoon Bioscience AB, PhD and Associate Professor at Lund University. Long background from biotech and pharmaceutical companies in leading positions since the early 1990-ies.

Printed Electronics Arena

- *Maria Teresa Arredondo Waldmeyer,* full Professor of Bioengineering at the Telecommunication Engineering Faculty – Technical University of Madrid (UPM). Presently, she is the Director of the Vodafone Chair and the Director of International Latin-America Affairs of UPM.
- *Joerg Habetha*, Dr, is leading the department for Personal Health Solutions at Philips Research. The department is running research projects in the field of home and personal healthcare, among them the European research project HeartCycle.

ProcessIT Innovations

- *Kalle Lyytinen*, Iris S. Wolstein Professor in Management Design, Case Western Reserve University, Ohio, USA with focus on radical innovations in information technology and how these innovations shape software development.
- *Lena Norder,* CEO for two trade associations the Swedish Automation Trade Association and the Swedish Electronics Trade Association. Long background in ICT development in companies and national agencies.

Triple Steelix

- *Rodin Godin* has long experience of executive level work in both government and university in Australia. Focus is on creating and driving the development of industry cluster both in Australia and in countries as Denmark
- *Maria Angeles Gutierrez* has a PhD in Mathematics from Basque Country University and with a long background in research and innovation. Now responsible for Technology in the Automotive Unit at Technalia Research and Innovation, the largest private institution for R&I in Spain.

The evaluations were arranged and facilitated by:

- *Peter Kempinsky*, CEO and senior advisor, Kontigo AB with long experience from working with innovative clusters and innovation systems in Sweden and internationally.

VINNOVA´s publications

December 2011

See www.VINNOVA.se for more information

VINNOVA Analysis VA 2011:

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