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REGIONAL INNOVATION POLICY IN TRANSITION

Reflections on the Change process
in the Skåne region

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Regional Innovation Policy in transition

Reflections on the change process
in the Skåne region

by

Arne Eriksson, ed
Marjolein Caniëls
Phil Cooke
Elvira Uyarra
Markku Sotarauta
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Preface

Region Skåne, with the support of VINNOVA is undertaking a long-term development work to strengthen the innovative capacity in the region. One type of supporting activities in the region has been to perform “Peer Reviews” as input to improve the innovation strategy.

The task for the group of peers behind this report was to act as one of two peer-review groups where this group was asked to reflect on systemic and conceptual aspects of developing a regional innovation strategy as a complementary perspective to the other group who presented their recommendations pertaining to the support system and the intermediaries in September last year.

The report concerns the context and content of a world class regional innovation policy as well as the leadership and governance issues involved for such a policy to be designed and implemented.

For the Skåne region to achieve its goal to be a top innovative region in Europe in 10 years time there are a number of challenges that have to be met in terms of regional innovation strategy.

Focus is on two questions. The first is what should characterize a high performance regional innovation policy in terms of rationale for policy and policy approach and the second is what demands such a policy put on regional leadership and more specifically on Region Skåne as a regional development organization.

The reflections from the peer team was presented for the stakeholders in Region Skåne March 9 and 10 2010.

This report presents the comments and recommendations on the ongoing change process.

VINNOVA supports this explorative work conducted in Region Skåne in order to find and develop methods suitable for supporting Swedish regions to set up regional innovation strategies and at the same time strengthen the regional leadership. Issues that are in focus both nationally and in EU. We found the ideas presented during the series of workshops about networks, dynamic capabilities and platform policies as a new concept very interesting and worthy of a wider audience than those that had the opportunity to participate at the workshops.

For Region Skåne the knowledge gained during the process and the policy implications presented in the report will be of big help in setting a world class regional innovation policy in the future.

From VINNOVA and Region Skåne we extend our thanks to Arne Eriksson, Marjolein Caniels, Phil Cooke, Elvira Uyarra, Markku Sotarauta and Johan Wallin for their contributions to our policy process.

VINNOVA in July 2010

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Editor's note

We were asked by Region Skåne to reflect on the policy transition in Skane almost a year ago. This report presents the comments and recommendations on the ongoing change process.

We have not had the time and the resources to conduct original and empirical research. Instead comments and suggestions are based on studies of existing documents about regional innovation policy in Skåne and meetings with people in the region. We are thankful for the time you spent sharing your experiences with us. We are also grateful for all the information and help received from Carin Daal and Lennart Svensson at Region Skåne and Göran Andersson at VINNOVA.

As chairman of the group I also wish to extend my thanks to the members of the group.

With this report we have concluded our mission.

Arne Eriksson
Chairman

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Summary in Swedish/Svensk sammanfattning

Uppdraget och arbetsprocessen

Inom Region Skåne genomförs ett utvecklingsarbete angående den regionala innovationspolitiken. En grupp av utländska innovationsforskare har inbjudits att värdera detta utvecklingsarbete. I gruppen har ingått Marjolein Caniels, Phil Cooke, Markku Sotarauta, Elvira Uyarra, Johan Wallin samt som ordförande Arne Eriksson.

Gruppen inledde sitt arbete i juni 2009 med en workshop med projektledningen för utvecklingsarbetet. Under hösten 2009 genomfördes arbetsmöten med företrädare för skånska kluster. En muntlig redovisning av preliminära resultat gjordes i mars 2010. Den slutliga redovisningen sker i denna rapport.

Gruppen har tagit den strategiska inriktning som Region Skåne har redovisat för innovationspolitiken i regionen som sin utgångspunkt. I den arbetsprocess som Region Skåne genomför har gruppens arbete varit en av två "peer-reviews". Den första gruppen genomförde sitt arbete i september 2009 och fokuserade på de innovationsstödjande organisationerna i Skåne. Vårt fokus är de skånska klustren och på tillväxtstrategier för dem och Region Skånes uppgifter i det sammanhanget som regional utvecklingsorganisation.

Vilka frågor behandlas?

Det utvecklingsarbete som genomförs i Skåne är även i ett internationellt perspektiv djärvt eftersom det som vi förstår det, handlar om att skifta fokus för det regionala utvecklingsarbetet från insatser i huvudsak i gränssnittet mellan akademi och näringsliv till ett systemiskt arbete med fokus på att vidareutveckla existerande kluster men också att stimulera framväxten av nya kluster i gränsområdena mellan existerande specialiteter; vad som benämns vita fält.

I Phil Cookes bidrag till rapporten diskuteras frågan om vita fält med utgångspunkt från en teoretisk i vilken begreppet relaterad olikhet (related variety) är centralt. Betydelsen av sådan har i sin tur att göra med att den växande betydelsen av att "ligga rätt" i de globala kunskapsflödena för att kunna utveckla s.k. konstruerade regionala konkurrensfördelar. Mot den har bakgrunden har också i en del regioner som Bayern och Midi-Pyreneé s.k. plattformspolicy introducerats. Denna bygger på att med matrisen som redskap söka ange samband mellan kluster och angränsande teknikområden.

Att arbeta med vita fält innebär att stimulera samarbete som är gränskorsande på flera sätt. Det betyder att det är ett innovationssamarbete som förutsätter en hög förmåga att hantera gränssnitt av olika slag. Hur det kan ske behandlar Arne Eriksson i sitt bidrag i anslutning till en genomgång av en begreppslig ram för forskargruppens arbete som

utformades inför gruppens bildande. Delvis samma typ av fråga behandlas även av Markku Sotarauta men med fokus på vilka krav som ställs på regionalt ledarskap.

Marjolein Caniëls och Johan Wallin beskriver med olika infallsvinklar vilka lärdomar som finns om den typ av strukturella förändringsprocesser som Region Skåne är involverad i. Holländska forskare har under längre tid utvecklat teorier och policymodeller för strukturförändring. Deras benämning är ”transition management” vilket är ett begrepp som även används av den holländska regeringen. Mer specifikt har forskarna utvecklat en idé om förnyelse genom experiment inom nya nischer. Den grundläggande tanken är att det finns starka blockeringar som motverkar förändring och som gynnar status quo. Det beror på s.k. regimer etableras genom en växelverkan mellan teknik, regler och konventioner. För att bryta de handlingsmönster som etableras inom regimer krävs medveten policy för att ”skydda” nya nischer i tidiga faser och för att skapa nya marknader t.ex genom innovationsupphandling. Marjolein Caniëls redovisar i sin artikel erfarenheterna från tillämpningen av denna strategiska nischpolicy (Strategic Niche Management). Denna policyansats är i grunden evolutionär dvs. uppgiften för policy är att säkerställa att det finns ett flöde av projekt och experiment som testar olika tekniska lösningar, affärsmodeller etc men att det till slut är marknaden som faller utslaget. Så det är en modell för gradvis förändring av befintlig struktur. I sitt bidrag tar hon även upp modell för radikal förändring som har likheter med det perspektiv som Johan Wallin anlägger. Hans infallsvinkel är att behandla de innovationsmöjligheter som skapas av klimatförändring, åldrande befolkning och andra stora samhällsutmaningar och i det sammahanget reflektera över storföretagens roll i den regionala innovationspolitiken. Perspektiven är kompletterande. De har sin plats i det här sammanhanget eftersom de konkurrensfördelar som ska byggas måste ha förankring i en gradvis uppgradering av de kluster som finns samtidigt som det finns s.k. Grand Challenges som föranleder ett behov av mer radikal innovation både vad avser produkter och tjänster som för att utveckla nya (affärs)system.

Systemtanken står även i centrum för Elvira Uyarra. Som sagt tidigare innebär den nya innovationspolitik som är under framväxt att ett systemperspektiv kommer i förgrunden. Vad detta konkret kan innebära är dock inte alldeles självklart. Uyarra introducerar tre olika tolkningar av systemidén. Hon skiljer mellan system som metafor, system som nätverk och system som artefakt och menar att alla varianterna finns med i den skånska policydiskussionen.

Uyarras diskussion om vad som kan avses med system för vidare till en policyslutsats om innebär att en systemansats för policy måste åtföljas av en ide om att fokus inte är på enskilda program och aktörer utan på sammansättning av åtgärder. Det är policy-mixen som är relevant såväl vad avser utformningen av policy som när det gäller genomförande.

I korthet betyder detta att de frågor som behandlas har att göra med systemsyn manifesterat i komplementära beroenden, hantering av gränssnitt samt lämplig policymix och ledarskap för den typ av komplex verksamhet som innovationspolitik

utgör. När det gäller den sista punkten avhandlas den som två olika delfrågor. Den första är vad som kännetecknar en modern regional utvecklingsorganisation. Den andra är hur kompatibla dessa egenskaper är med de som kännetecknar en produktionsorganisation som Region Skåne på andra områden än regional utveckling.

Bedömningar och rekommendationer

Utmaningar och tillgångar

Forskargruppens redovisar både allmänna bedömningar om vad som är kännetecknen för en innovationspolitik i linje med aktuell forskning och värderingar som är specifika för arbetet i Skåne.

Det skånska innovationssystemet innehåller följande styrkefaktorer enligt gruppens bedömning i ljuset av målet att skapa ett mer integrerat innovationssystem i regionen.

Utmaningar:

- Relativt liten intern integration inom klustren
- Begränsat antal aktiva företag även i väl utvecklade kluster
- Otillräckligt varumärkesbyggande av klustren
- Fragmenterat och suboptimalt stödsystem
- Storföretagen i regionen står ännu i alltför hög grad utanför den regionala innovationspolitiken
- Frånvaro av en klar regional innovationsstrategi

Tillgångar:

- En aktiv och kunnig regional utvecklingsorganisation inom Region Skåne
- Grundförutsättningar finns för systemiskt innovationssamarbet för att identifiera och fylla ut vita fält mellan kluster genom att regionen har branscher/styrkeområden med komplementära kunskapsberoenden och innovationssamarbeten och andra med sådan potential
- Det finns viktiga storföretag i regionen
- Goda internationella länkar, i synnerhet kan Medicon Valley nämnas
- Det finns ett antal kreativa klusterinitiativ inom högteknologi som Mobile Heights och Moving Media
- Det finns en outnyttjad potential för innovation i Skånes diversifierade näringsliv

Uppgradera befintliga kluster

Det finns enligt forskargruppen möjligheter att dra nytta av lärdomar från t.ex strategisk utveckling av nya nischer inom befintliga klusterområden som ett sätt att göra den regionala klusterpolitiken mer systemisk. Huvudbudskapet i Marjolein Caniëls artikel är detta men också att sättet att göra detta på är att arbeta projektorienterat, användardrivet och att lära av många små experiment så att de kan avbrytas eller växlas upp.

Vita fält – Transversal innovation

Som framgått tidigare har forskargruppen sökt att på olika sätt belysa hur arbetet med horisontellt innovationssamarbete, vita fält, kan utvecklas. Den metafor som Phil Cooke använder i sitt bidrag för att diskutera ”transversal innovation” är matrisen som konkret uttryck för plattformspolicy. I de tillämpningar av plattformspolicy som finns är huvudvarianten att matrisen beskriver teknologier och kluster. Så är det i den modell som den finska forskaren Vesa Harmaakorpi har utvecklat för Lahtiregionen. Detsamma gäller för Bayern Innovativ. Det viktiga är emellertid att matrisen bara ger en struktur för det processinriktade arbete som behöver utföras för att identifiera samarbetsmöjligheter mellan kluster. Bayern Innovativ genomför många sådana konversationer mellan teknikspecialister och marknadskunniga inom de olika klustren och med deltagande från forskarvärlden. En liknande process genomförs i den franska regionen Midi-Pyreneé varifrån Cooke tagit benämningen transversal innovation. Flera exempel finns i Cookes kapitel i denna rapport. En poäng i sammanhanget är sådana konversationer inte uppstår av sig själva. Det behövs någon animatör som orkestrerar en sådan process. Detta är en uppgift för en regional utvecklingsorganisation som Region Skåne. Och det är en uppgift som kräver förståelse både om hur samarbetsprocesser kan underlättas och sakkunskap på relevanta områden för att kunna fungera som ”samtalsledare”. Hur sådant arbete kan genomföras har studerats av forskare som specialiserat sig på ledning av nätverkssamarbete men även av strategiforskare som lyfter fram betydelsen av att på djupet förstå och söka påverka inblandade aktörers kognitiva ramar.

Det finns olika angreppssätt. Framsynsprocesser är en väg. I Erikssons kapitel diskuteras även det som kallas för designtänkande eller designinnovation. Dessa begrepp står för mer än ett processtänkande. De handlar om en entreprenöriell kunskapssyn som bygger på igenkänning av mönster och helheter och där beslut fattas på grundval av hur nya data förhåller sig till mönster eller visioner. Entreprenöriellt tänkande och handlande skiljer sig i väsentliga avseenden från analytiskt förhållningssätt eller förvaltningstänkande. Roger Martin som är en av de forskare som citeras talar om integrativt tänkande. Forskning om socialt kapital och särskilt om s.k. strukturella hål ger även den viktiga lärdomar genom att peka hur överbryggning och tillslutning av sociala nätverk hänger samman. Innovation är direkt kopplat till överbryggning, till ökad variation och olikhet och till gränsöverskridanden. Slutligen behandlar Eriksson också hur gränsöverskridande samarbete kan dra nytta av olika slag av s.k. gränsobjekt som kan vara visualiseringsmodeller, ritningar. Poängen är med sådana gränsobjekt är att de möjliggör kommunikation mellan personer med ”världsbilder”. Angränsande forskning handlar om s.k. tvåhända organisationer som kan förena operationellt arbete för att utnyttja den befintliga resursbasen på bästa sätt med ett utforskande arbete för att förnya resursbasen vilket sker genom att innovera och investera.

Radikal förnyelse – grand challenges

Vi har under de senaste åren sett en återkomst av efterfrågestimulerande instrument inom innovationspolitiken. Det handlar t.ex om innovationsupphandling. Ett viktigt skäl för detta är att bättre kunna möta ett antal stora utmaningar i global skala som i kraft av

sin omfattning också skapar stora möjligheter för innovation inte bara av enskilda produkter utan av sammanhängande system av tjänster, produkter, affärsmodeller och organisering. Detta är också en politik som i många länder spelat en betydande roll i den krispolitiken som genomförts. Inte minst gäller det program för att minska utsläpp av koldioxid. Ett intressant mönster är också att regioner spelar stor roll som skapare av testbäddar mm. Likaså har storföretagen en betydelsefull roll i sammanhanget. Johan Wallin beskriver i sin artikel hur de här stora utmaningarna har lett till en ny innovationsmodell där offentliga organ spelar rollen av marknadsskapare genom upphandling, regelutformning mm och storföretagen har en viktig roll som orkestratörer av resurskonstellationer eller ”affärsbaserade ekosystem”.

Här finns en potential för radikal innovation i Skåne som dock förutsätter att de ledande företagen i regionen involveras i den regionala innovationspolitiken mer än hittills synes ha skett. En annan förutsättning är att därigenom också bättre kunna analysera vilka förmågor som finns i det skånska innovationssystemet eftersom de förmågor som finns både ger förutsättningar och anger begränsningar.

Ledarskap och organisering

Forskargruppen menar att strävan bör vara att utveckla sådant tvåhånt ledarskap. Utmaningen är framförallt att kunna utveckla designtänkande eller entreprenöriella förmågor. Vad detta mer konkret ställer för krav på olika förmågor framgår av Sotaraus bidrag till rapporten.

Regionalt ledarskap handlar enligt Sotaraus om att säkerställa resiliens, uthållighet och konsistens i regionalt utvecklingsarbete. Det regionala utvecklingsnätverket bör övergå i en fungerande organisation som har förmågan att frambringa en vision om en annorlunda framtid för regionen. För att få genomslag bör nyckelaktörer utveckla sin förmåga att faktiskt kunna omvandla visioner och strategier från skrivbordsprodukter till ledningsverktyg. Fyra förhållanden är viktiga:

- att fördjupa den gemensamt ägda kunskapen både avseende policyfrågor och i sakfrågor
- att säkerställa institutionell flexibilitet vilket är förmågan till förändring hos ledande organisationer såväl som av systemet som helhet
- att utveckla ett innovationsperspektiv i alla läger inklusive policyvärlden själv
- att förstärka förmågan att utveckla tillitsfulla relationer och att skapa en övertygelse om ett brett ”ägt” gemensamt åtagande.

Utvecklingsorganisationer kan inte förvänta sig att nätverkssamarbete är självgående. Det ger inga gratisluncher. Framgångsrik nätverkspolicy kräver avsevärda investeringar både finansiellt och intellektuellt. Framgångsrikt ledarskap bygger på att den som har policyinitiativet har hög trovärdighet. I det här sammanhanget är det också viktigt att inkludera samhällsentreprenörer som står utanför den formella policyprocessen.

Som en metafor för en modern regional utvecklingsorganisation används i rapporten begreppet gränsorganisation. Det är en organisationsidé som bättre än någon annan kan förena nätverkslogik och utvecklingsperspektiv med nödvändigheten att kunna utkräva ansvar av offentliga aktörer. Detta sker genom att göra en boskillnad mellan det processorienterade arbetssättet och beslutsfattandet.

Kom också ihåg politikens begränsningar

Uyarra noterar sitt bidrag att begreppet "policymix" ofta används som ett samlingsbegrepp för en portfölj av ständigt ökande antal instrument. Tendensen är att använda ett statiskt och instrumentellt angreppssätt som underförstått innebär att instrument är utbytbara och kan väljas ur en verktygslåda av möjliga åtgärder. Uyarra noterar att det ofta är mindre intresse för att överväga hur olika instrument samverkar, förstärker eller motverkar varandra i förhållande till angivna mål. Hon betonar att policyinstrument är "trubbiga" och kan ge olika konkret innehåll även om de på en allmän nivå framstår som lika.

Dessutom uppvisar policy liksom innovationsförlopp stigberoende och stelheter som gör att existerande policymix påverkar handlingsutrymmet för framtiden. Framgångsrika program eller aktörer institutionaliseras och blir därefter ett arv att ta hänsyn till.

Det här betyder att Region Skåne i sin innovationspolitik förutom att ta hänsyn till den kunskapsmässiga och institutionella basen också bör ta hänsyn till den existerande policymixen och dess historia för dessa förhållanden påverkar nya mål för politiken.

Strategirekommendationerna i mycket kondenserad form

Bedömningar och rekommendationer sammanfattas här i mycket kondenserad form i fem punkter som inte alla har kommenterats i den här sammanfattningen.

- Konsolidera den regionala klusterpolitiken
 - Successiv utveckling av nischer
 - Projekt- och användarorientering
 - "Keep it simple stupid"
 - Systematiskt lärande
- Värdera förhållningssättet till de innovationsstödjande organisationerna med utgångspunkt från behovet av kontextualisering och professionalisering
 - Antingen integrera i klusterpolitiken
 - Eller som viktiga aktörer i den strategiskt intressanta sektorn av kunskapsintensiva tjänster (KIBS)
- Skapa insikter och förmågor att vara i framkant avseende innovationssamarbete mellan kluster – utforskning av vita fält
 - Förståelse för komplementära beroenden
 - Plattformspolicy
 - "Living labs" – prototyper och experiment

- Grand challenges – efterfrågedriven och marknadsskapande systeminnovation
- Ledning och koordinering: Både vårda och förnya resursbasen
 - Designtänkande
 - “Tvåhänt” ledarskap
- Nyckelförmågan: Hantering av gränssnitt i aktörsnätverk
 - Ledarskap i nätverk och ledning av nätverk
 - Förstå och använda gränsgångare och gränsobjekt i växelverkan Region Skåne som gränsorganisation

1 Introduction

1.1 Policy brief

Our policy brief concerns the context and content of a worldclass regional innovation policy as well as the leadership and governance issues involved for such a policy to be designed and implemented.

For the Skane region to achieve its goal to be a top region in Europe in 10 years time there are a number of challenges that have to be met in terms of regional innovation strategy. Here we will list the most critical of them and as far as we are able give advice based on what theory and our own experience tell us.

Focus is on two questions. The first is what should characterize a high performance regional innovation policy in terms of rationale for policy and policy approach and the second is what demands such a policy put on regional leadership and more specifically on Region Skåne as a regional development organization.

1.2 Work process

The research team has met three times, in June 2009, in September and in December. As noted above the workshop in September dealt with the issue of potential white fields or transversal areas of collaboration between Mobile Heights and Moving Media. A similar event with the clusters in Food and Life Science was planned in November but had to be cancelled. The team has also been briefed by experts from Region Skåne and also been informed about the cluster book by Jerker Moodysson and Martin Nilsson. Available information from Region Skåne about the innovation assessment (peer review I) has also been studied.

In our early discussion we came to the conclusion that our contribution to the development of a regional innovation strategy should be to take an analytical viewpoint with knowledge dynamics, relatedness and orchestration as keywords and to organise workshop(s) so that they could contribute to the exploration of “white fields”. We contemplated sending out a questionnaire to cluster stakeholders about “white fields” but decided not to do so.

The policy context and the issues adressed

Behind this report is a group of researchers invited by Region Skåne and VINNOVA to take part in the assessment of the regional innovation system in Skåne. Members of the group are Marjolein Caniëls, Phil Cooke, Markku Sotarauta, Elvira Uyarra, Johan Wallin and Arne Eriksson who was also the the chairman. The task for the group was to act as one of two peer-review groups where this group was asked to reflect on systemic and conceptual aspects of developing a regional innovation strategy as a complementary

perspective to the other group who presented their recommendations pertaining to the support system and the intermediaries in September last year.

To inform the further development of this ongoing policy process we decided to focus our limited resources to present and comment on current research on the topics referred to in the peer review and the action plan.

We do not comment on all these strategies. From different viewpoints the contributions in this report deal with the systemic view that is expressed directly and indirectly in the Action Plan.

More concretely this means that Elvira Yarra presents “Reflections on the innovation strategy of Region Skåne” based on an analysis of meanings and implications of the critical concepts system and systemic. She addresses the policy rationale(s) for such a policy approach and presents a number of critical points and concerns. Phil Cooke and Arne Eriksson both explore issues related the design and implementation of a platform policy and its relevance for transversal innovation. In her contribution, Marjolein Caniëls, presents a review of lessons from a Dutch policy approach – Strategic Niche Management (SNM) - designed to lead technical change and innovation into new paths that over time creates new technological regimes. Critical elements are experimenting and learning from this. SNM is also a point of reference for Johan Wallin but the focus of his paper is how Grand Challenges like ageing population, climate change and others might change the role of the public sector in innovation policy. Leadership and governance are critical aspects in innovation policy and Markku Sotarauta gives in his paper his view of the capabilities required.

The papers differ to what extent they address specific issues regarding clusters in Skane. Phil Cooke who has been working with clusters in Skane in other projects gives an overview of the different clusters and their relatedness. We had a good discussion on transversal innovation and “white fields” with Mobile Heights and Moving Media in the workshop in September. This is reflected in the papers by Marjolein Caniëls and Johan Wallin.

1.3 Discussion of peer review report and conclusions

Discussion in the research team about the peer-review report also influenced the direction of the work as indicated earlier. In general we found that the peer review group based their recommendations on a too narrow and incomplete view of what constitutes the regional innovation system by focussing only on the support system (the intermediaries). In addition we also noted that the peer review group framed their recommendations in managerial terms and to a large extent left out issues about policy content (and context). In conclusion we therefore found that we can make a contribution to the ongoing work in the region by adopting a broader view of the regional innovation system as well as on the rationales for regional innovation policy. By doing so we may, as has been indicated above, be able to address the issue of

transversal intersectional innovation that lies behind the notion of “white fields”. The point in relation to the peer review report is that the idea of filling/capturing “white fields” represents (radical) renewal in the innovation system that is much more challenging than closing gaps which is alluded to in report from the peer-review group. Our view requires content development and understanding of context and the co-evolution between content and context.

In our early discussion we saw five types of issues to be of interest. They are all of relevance for the future of the regional innovation system in Skåne and probably with different implications in terms of strategy and governance.

The first issue is how to maximise the regional impact of large research laboratories. An important content issue with very clear context implications is the establishment of the European Spallation Source (ESS) to Lund and the expansion of the existing MAX facility with MAX IV. The ESS, like MAX IV will be world class laboratories and they will together be a hub in the European research infrastructure. In addition they are also expected to have regional impact on industry structure and employment during the construction phase as well as when they are in operation. A study about the effects on regional development by PricewaterhouseCoopers commissioned by Region Skåne has been conducted. In that report there is an effort to find good examples to learn from. There does not seem to be that many. The perspective has also changed from finding arguments for a decision in favour of Lund to developing a strategic agenda of how to realise the regional potential of this huge investment. The specific problem in terms of strategy and governance with this issue is of course that there are very limited ties to existing activities/competencies in the region – this is an issue of not only white but “nonexistent fields”. In addition the ESS will not be operational until 2018-2019. In Richard Florida’s terms the long term regional impact will be highly dependent on how well the region succeeds in creating a “people climate” attractive enough to make researchers stay in the region.

The second issue we discussed briefly was “white fields”. Since this is already on our agenda we did not talk about so much in our discussion in the group. However, it turned up later when Jerker Moodysson and Martin Svensson-Henning made a presentation of the study they are finalising about clusters in Skåne. In that book they address the important issue of relatedness in a novel and interesting way.

The third issue concerned present clusters and other forms of industrial organisation like networks or business eco-systems.

The fourth issue was Grand Challenges.

The fifth was the role of Big Corporations in the regional innovation policy.

The discussion showed that these this framing of issues contains overlaps and dependencies such as between Grand Challenges and Big Corporations on the one hand and between the search for renewal (white fields) and present clusters on the other.

After some deliberation we came to the following conclusions concerning issues to address and character of our report. The conclusions were that we:

- saw a need to present a clarification about the concepts used
- interpreted the regional innovation agenda as one of scaling up ongoing cluster initiatives in a context of internationalised markets and knowledge dynamics and also increasingly with a focus on renewal of the regional innovation system symbolised by the notion of white fields,
- set out to give meaning to the notion of systemic innovation in concrete policy advice
- would not have much of new empirical data to support our analysis and conclusions
- in despite of that limitation should try to convey a coherent policy message concerning policy rationale and policy approach.

We present our comments and recommendations in two ways namely by author and by a thematic synthesis.

2 Thematic synthesis and policy issues

2.1 Major driving forces affecting the policy context in Skåne in the medium term perspective

China and other BRIC countries and Societal Grand Challenges will drive change

There are some major trends in the global economy that we find to be of great importance for the design of this program. The first is that the recent crisis has some features that most probably are of structural importance. The most important is that China and the other BRIC countries have established themselves as major players in the global economy both as markets and increasingly also as competitors even in knowledge and innovation intensive areas. Second, and as a consequence of increased global competition we can also see a case for transition in that innovation led regional economic development will be the best response to an economic context where constant disruption in markets and technologies will be the norm. A third factor which is not dependent on the recent crisis but on the long term resilience and sustainability of the Skåne region is the increasing necessity to find answers to a number of critical societal issues which are often referred to as Grand Challenges that are global in character and represent threats as well as innovation challenges and opportunities for regional renewal. It is interesting to note that a clear pattern in the crisis programs in many countries is the driving role played by city-regions as test-beds etc.

From push to pull

A key message in this report is the idea that we are moving from a world of push to a world of pull. This is message that is valid for business as well as for policy design and implementation. Some central features in terms of knowledge of that key message is that knowledge flows are becoming more important and that knowledge use will be more coupled with finding talent and be part of knowledge creation than with knowledge transfer and finally that an urge to become more innovative will make tacit knowledge more important than today. This is one aspect of why economic behavior will more be based on relationships and trust than on contracts and transactions. There is also an idea of design thinking and positive sum mindsets associated with this view from push to pull. And that change shows itself also in a shift from targeted push program to pull platforms based on modularization, user involvement and distributed knowledge creation and learning. All in all this points to a more dynamic economic environment.

Knowledge Dynamics – linkages, flows and interfaces are emphasized

From a regional perspective it is also important to note that researchers point to the fact that there is a territorial dimension in these processes. Phil Cooke summarizes how this affects the policy context in the following points:

- Firms, Sectors and Regions are in Transition on Knowledge Flow Dynamics
- Innovation involves Combinatory and Cumulative Knowledge Dynamics
- Regions with Opportunities for Combinatory Knowledge Dynamics are Advantaged
- ‘Related Knowledge Variety’ defines that Advantage
- Distributed knowledge networks in ‘open innovation’ platforms are key to economic well-being
- Policy at regional level is in need of focalising on supporting platforms
- Such platform policies are ‘joined-up’, flexible and involve ‘distributed governance’

He also shows how this new paradigm differs from a traditional paradigm where innovation is coupled with proximity.

Table 1. Transition to Territorial Knowledge Dynamics (TKDs) Paradigm

	Traditional paradigm: Innovation and Proximity	New paradigm: Territorial Knowledge Dynamics
Unit of change	Innovation	Knowledge dynamics
Mobilization of new knowledge	Punctual (technological trajectory)	Permanent
Knowledge articulation	Cumulative trajectory	Combinative dynamic
Territory	Spatial division of activities/labour	Multi-local knowledge networks
Regional Governance	Regional coherence between use and generation of knowledge (cluster policy)	Capacity to take part in multi-local dynamics and anchor mobile knowledge

Source: Cooke (2010)

First, in Table 1 are contrasted in the first row a sector or cluster-type of practice focused upon innovation. This then transitions into more of a platform-type interaction involving less specialised and vertical knowledge dynamics. Knowledge exploration, examination and exploitation are more pervasive in the new paradigm than the old. In the latter they had to await R&D lab outcomes in most cases. This is particularly relevant for the discovery of *Cumulative Knowledge & Innovation* which has been traditional for sectors and even clusters (although clusters may be precisely ‘transitional’ forms) and *Combinative Knowledge & Innovation Dynamics* typical of the emergent and evolving ‘platform’ knowledge flows model based on ‘related variety’ of inter-industry knowledge spillovers and lateral absorptive capacity among firms. Whereas intra-corporate spatial divisions of labour placed routine assembly industry at peripheries and management headquarters in core-regions, knowledge dynamics under knowledge economy conditions are multi-locational, distributed and innovation is more ‘open’ because cognate to norms associated with public ‘open science’ than in the older,

‘closed innovation’ model. Accordingly, regional governance moves away from the localised ‘container’ model of knowledge geography even associated with clustering towards distributed knowledge platforms with pronounced ‘global antennae’.

The distributed character of innovation and governance

The factors that were referred have also further impacts on the character of innovation and governance. The distributed character of innovation is reflected in co-production between users and producers, orchestration and integration of business eco-systems (clusters and innovation systems). More frequent research collaboration and co-authoring of academic articles are also signs of this. Co-creation of knowledge at the interface between users and knowledge producers is another. From a governance perspective this means that there is need for governance structures that are broad and are capable to orchestrate horizontal cross-fertilisation between clusters. From these points follow that the key government/governance capabilities are the following:

- Visionary capability – influenced by foresight, networks, antennae
- Innovative capability – influenced by dis-satisfaction with status quo
- Networking capability – especially bringing in networked governance
- Learning capability – influenced by openness of internal & external networks
- Leadership capability – influenced by confidence, consensus & capabilities in general.
- Resource configurations – related to envisioned policy prioritisations
- Social capital – of government, platforms, community and policy performance

Traditionally governance has been about distribution of power, responsibilities and forms for accountability in a polity. For some time there has been a process of devolution and decentralization to lower political and administrative levels in a national setting. In the EU there has also been a shift from national to the EU level. These parallel developments have been interpreted by many as a response from policy makers to the fact that the state centrist mode of governing has lost both legitimacy and the ability to deliver collective goods due to a range of reasons. Among them globalization and the emergence of the network society are often referred to. But these drivers for change have also led to a more radical shift in governance based not so much on the formal distribution of power across levels of society as on exploring ways to improve the capacity to solve shared problems in a no one in charge society by acknowledging complexity, the need to mobilize stakeholders and the capacity for problem solving based on self organization in more or less stable networks. By including business, academics and civic organisations in this kind of multi stakeholder processes arises a need for governance that takes account of different action logics, type of control and forms for accountability. The list of capabilities shown above illustrates the capabilities required for distributed governance.

Dynamic Capabilities as sources of competitive advantage

Following Richard Baldwin globalization can be seen as a new dimension of specialization manifesting itself in task competition and unbundling of value chains meaning that competition is no longer between industries and firms but between tasks/functions. An example is that India has made knowledge process outsourcing one of its targets and is developing relevant capabilities for this new type of clustering defined by what a firm or business unit know rather than by what product or service they offer. This change is also reflected in an increasing interest in how-strategies (Teece 2008) i.e. strategies with a focus on processes (=learning) and dynamic capabilities which is interesting since cluster strategy inspired by Porter is typically what-strategies with limited interest how the process of (re)positioning is implemented. (Co-)Specialization is driven by efficiency, exploitation or in general operational concerns. And it is clear that globalization has had a strong effect on operational cost-saving through global sourcing in value chains.

Operational efficiency is however a condition for survival rather than for success. There is also a requirement to offer customers products and services that they find worth paying for. This is no longer achieved by segmentation of markets. Customers have to be participants in the value creating process. Offerings include typically both hardware and software i.e. products and services. The ability to add services to the product is to a large extent the way to offer a unique customer experience at the same time as offering the product and the service as a package is a way to prohibit reverse engineering. This kind of customer or market perspective necessitates integrative capability because what is offered is often a solution to a problem. So what this boils down to is co-specialisation of assets and bundling these as capabilities (Teece (2009), Wallin (2006).

Baseline for Skåne

The challenges and assets of the innovation system in Skåne in relation to these medium term trends leads to the following interpretation of the “baseline” for the regional innovation policy.

Towards an Integrative Regional Innovation System in Skåne

We may summarise the challenges and assets of the prefigurative Skåne regional innovation system as follows:

Challenges

Relatively low internal integration within clusters
Small numbers of active firms, even in well-populated clusters
Inadequate branding of clusters
Fragmented and sub-optimal innovation support bodies
Absence of clear regional innovation strategy

Assets

An active and informed regional development agency
Industries that show some innovative overlaps, and others with potential
Existence of some important global firms
Good international links, notably Medicon Valley
Presence of numerous leading edge creative and high technology 'clusters'

Major trends influencing policy transition

We want to stress already at the outset that we see collaboration both in terms of collaboration between different stakeholder groups in Skåne but also as vertical collaboration between different levels regarding both policy design and implementation. In other words we see policy both as a multi-stakeholder and a multi-level undertaking. These two policy dimensions differ in character in that the first is more based on problem solution and network organisation while the second reflects issues about resources, decision making and accountability. In short we see Region Skåne as a policy making organisation which is still a rather new situation for a regional body in a Swedish setting.

The recommendations in this report deal with this transition in policy approach with a focus on more general comments on the policy rationale, challenges with the new policy approach and tools and methods that might be used to sustain the transition process. We also have suggestions concerning policy design, leadership and governance for a systemic regional innovation policy. One challenge with the new policy approach is that systemic policy emphasizes the importance of an appropriate policy mix. This concept is discussed in the chapter by Elvira Uyerra and is also highlighted later in this condensed version.

There is emerging evidence that matrix or platform policy is a policy approach well suited for this kind of transversal innovation, see Phil Cookes chapter.

Answers to these questions are important not least with respect to their implications concerning leadership and governance. In reaching those answers we as researchers are influenced by our beliefs and theoretical stance. Even within the innovation "domain" there are different basic views and approaches about the nature of the social world and its relationships that differ not least with respect to how change occurs and which factors may drive change and transition.

So called evolutionary theory has been influential in innovation systems research. The casual mechanism is variation, selection and retention and the casual agent(s) are agents in a population. As Frank Geels shows in an article in Research Policy there are other

ontologies as well that are relevant to transition. His discussion is in relation to one particular transition approach namely Strategic Niche Management (SNM) which he describes as a crossover between evolutionary and interpretivist theory. This means that SNM attach more importance to actors and actor networks than pure evolutionary theory does but not so much room for action as does the researchers working with dynamic capabilities as their framework. In this report Marjolein Caniëls discuss how SNM might be applied in Skåne for a successive change of clusters but also how more radical change might be supported by using lessons learned from the literature on radical innovation. Radical innovation associated with so called grand challenges is the perspective in the chapter by Johan Wallin. So these two authors address issues relating to type of change from slightly different perspectives.

In addition to evolution Geels mentions Rational choice, Structuralism, Interpretivism/ Constructivism, Functionalism (systems theory), Conflict and power struggle and Relationism, see table and further comments in chapter 3 where his discussion will be used in relation to a conceptual framework used in the design phase of this peer review. The point here is to discuss the questions raised but also to use his list to position the different articles in the report.

The article by Elvira Uyarra in this report is similar to Geels in its approach but differs in that her interest is in discussing the issue of systemness whereas Geels takes transition as his starting point.

Systemic means not one single program but a stress of policy mix. That together with network character emphasizes the issue of governance or orchestration. However it is also important to stress the interdependencies between a consolidation of cluster policy and this new policy approach.

This leads to our key message being that Region Skåne should adopt a strategy that balances exploitation (cluster policy) and exploration (transversal innovation). In the literature this is referred to in terms like ambidextrous leadership and design thinking and the argument is that exploitation and exploration are interdependent but have very different characteristics so it is a challenge to exercise this kind of leadership.

For Region Skåne it is important to note that this both-and message not only is valid for the economic development policy. It is also a leadership capability required for Region Skåne as a whole when it comes to managing health care, regional transport and innovation policy within the same organisation. Therefore we present some ideas of how collaborative governance might be aligned with “ordinary” leadership.

An important aspect of both cluster policy and transversal innovation policy is that content has to be contextualised. We recommend that Region Skåne address the future of the intermediaries or the support system from this perspective. To this point this has not been so much a system as a number of often underfunded project oriented organisations. We can see two alternative ways to contextualise these activities. One

way is to align them with the cluster policy. The other is to reflect on them as knowledge intensive business services.

Transversality is by definition associated with management of interfaces and the crossing of geographical as well as cultural boundaries in a region like Skåne. For that reason and because of the importance of boundary spanning we present ideas of how to develop capabilities in that field including the concept of boundary organization as a way to organise development/explorative activities in Skåne.

2.2 Strategy options

Policy in transition

Region Skåne is strategically in transition mode from an innovation policy based on stimulating commercialisation and spin offs to a systemic regional innovation policy. The focus on commercialisation has implied a research park and incubation context. To this has gradually been added a range of cluster initiatives. The emerging systemic policy is focused on knowledge dynamics, related variety and exploration of new business opportunities at the intersection between present clusters and the technologies and skills they are exploiting. A signifier for this new policy stance is Region Skånes goal to facilitate the identification of “white fields” i.e. new business opportunities in-between existing clusters that can be tapped into through design thinking and collaboration. We find this policy transition to be in line with our views.

Up to now the basic rationale for the regional innovation policy has been to stimulate entrepreneurship and especially the commercialization of research. Activities have been designed to compensate for market failures notably as regards venture financing. One result of this policy is the existence of a large number (51) of intermediaries.

Another and more structural line of policy has been to initiate or be responsive to cluster initiatives. There the rationale for policy is a mix of market and systemic failures. This is the line of policy that is advocated in the Action Plan. The policy is to be broad, systemic, platform based and “co-produced” in that users and other relevant stakeholders will be invited to participate. What does this imply in terms of strategy options?

Not least because capabilities evolve over time there is a need to consolidate the present clusters and cluster initiatives. In parallel to that renewal should be achieved by continuing work with transversal innovation (white fields). The platform approach can be a foundation and an integrative mechanism for this double track strategy. The concept of relatedness is important in this context both as an enabling and constraining factor. It works as an enabling concept in that relatedness as a proximity concept makes communication easier; there might be more of a “common language” (Boschma). Relatedness also points to technological and competence interdependencies between clusters. These are the bases for (dynamic) capabilities. Capabilities are bound to specific organisational settings and change slowly. This means that from this

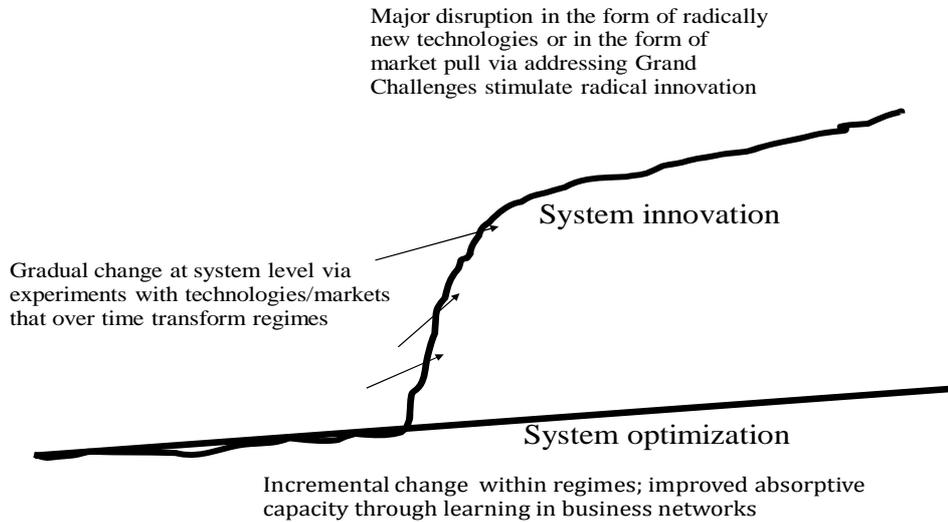
perspective relatedness also works as a constraint since viable new cluster initiatives have to take into account both the market and the capability perspectives.

From the discussions we have had in the research group with cluster actors and regional developers it is clear that the priority given to white fields goes hand in hand with stressing the importance of user involvement in the innovation process. Implicitly the issue of user involvement touches on a couple of other very important issues from a policy viewpoint. The first is the issue of what kind of innovation contexts and outcomes that are assumed to exist. Are innovation efforts being developed for well defined markets or for situations where there a market do not exist so developing it is part of the innovation challenge? This is closely related to the issue of what kind of innovation we are thinking of; is it incremental or is it radical? One line of reasoning is that user (driven) innovation results in incremental innovation on existing markets whereas radical innovation requires deep technological understanding in combination with creation of markets and possibly even as the Roberto Vergantis claims an innovation of meaning.

In strategy terms this lead to an important issue in a transition perspective namely to what extent is a result of evolution of the consolidated clusters of the present and to which extent it is a result of radical change to create new “systems” of interrelated products, services and business models. Dutch researchers have framed this in terms of system optimization and system innovation, see fig 3.2. How to assess these two alternative ways to try to break with the constraints of the past and the present depends on the policy context. Given the strength of the drivers that will affect the policy context in the medium term it would not be advisable to only rely on gradual change. In addition to discussion about Strategic Niche Management which is a method to view system change as evolutionary we therefore also present experience from methods and approaches to address radical and system innovation. In a policy setting much of the discussion about Grand Challenges is framed in terms of system innovation.

Figure 1. Strategic options for Innovation Policy - regime improvement and/or system innovation

Two complementary tracks: System innovation and system optimization.



Technology is a key driver in Strategic Niche Management and regimes change gradually. From time to time in history regimes have been made obsolete by breakthrough new technologies enabling so called disruptive innovation once the new technologies have been coupled with new business models and/or organisational forms. From an innovation perspective the issue is if societal challenges we face globally can be turned into market shapers and enablers for radical innovation if they are acted upon also from an innovation perspective. So what is playing out is a “game” between the approaches to accommodate the need for change within the existing dominant logic and novel approaches to design and implement system innovation.

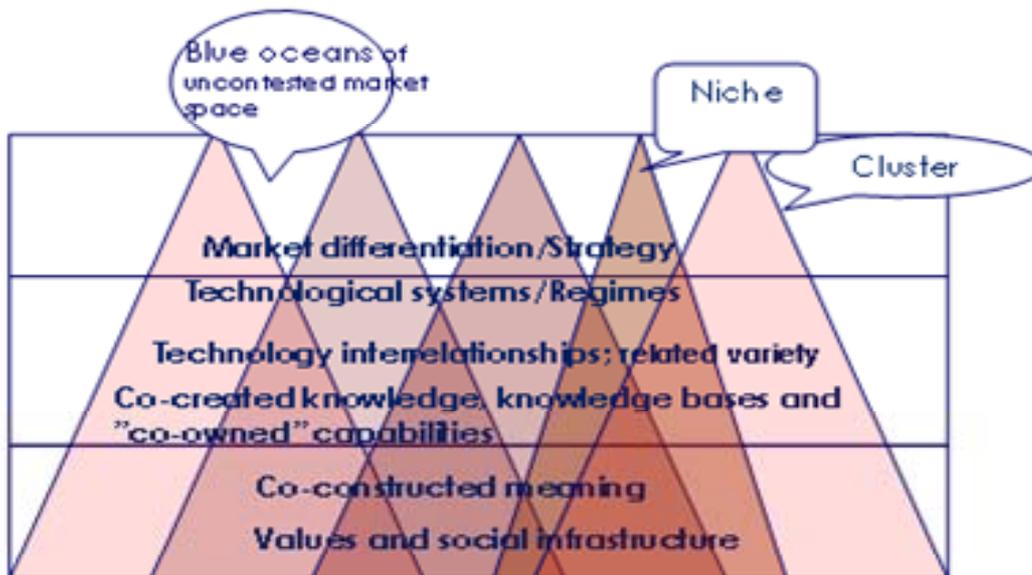
To create collaborative value there has to be interaction and integration among partners that have complementary capabilities. Realising future prospects rather than shared cost structure shape the character of common efforts.

Reference has been made to the Big Shift with China establishing itself on the global economic scene with India to follow making Asia the driver of change in the world economy. At the same time there are a number of major societal challenges with transformational potential that needs to be dealt with. Foremost of these is probably the transformation to a low carbon dioxide emission society. Ageing and its impact on health care is another. As a consequence of these change drivers John Hagel och John Seely Brown predict that the economy will be in a state of constant disruption. Their conclusion is that the only answer to near constant disruption is near constant innovation. There are also indications that when society faces large scale change Governments can reclaim some of the authority that have been lost during the last couple of decades. So called Grand Challenges present therefore not only threats and

opportunities from an innovation policy perspective but give also Governments an important role as smart regulators, market shapers and “transition managers”. It is interesting to see that in many countries this also have put city-regions in a central position as testbeds and innovation orchestrators. From that perspective it is not surprising that Region Skåne define Grand Challenges as a priority/opportunity in the Action Plan.

A strategic issue for the design of Grand Challenge initiatives is to organise a process that explores the value creating opportunities related to Grand Challenges or the uncontested market spaces between clusters. Exploring the market potential of Grand Challenges requires foresight and also a design of a foresight process that enables cross-cultural exchange. The assessment of potential is to a large extent conditioned by present capabilities. New capabilities are developed through reconfiguration of existing expertise and through investment in research and other forms of expertise. Relatedness is a keyword. As far as Grand Challenges or system innovation is concerned this process is a mix of top-down and bottom-up. It is also a process that involves business, knowledge providers as well as public agencies.

Figure 2. Specialisation and Interdependencies in an Innovation System



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Described this way the matrix approach require analytical capabilities to find structural holes and expertise in the management of networks which leads over to the issue of leadership and governance. An important final remark is that working with cross-fertilisation is dependent on work with clusters. The reason for this is based on a key lesson from studies of social capital namely that the existence of bridging social capital which is what we associate with transversal innovation is determined by the existence of

bonding social capital. So social capital based on the strength of strong ties paves the way for social capital based on the strength of weak ties.

Recommendations – condensed version

1. Consolidate the regional cluster policy

Methods/Tools

- Strategic niche management
- Evolutionary change through new niches
 - Keep it simple stupid

2. Review the approach to the support system from the viewpoint of contextualisation:

- integrate in cluster policy – consolidation and specialisation
or
- see as part of the strategically important Knowledge Business Intensive Service sector (KIBS)

3. Build insights and organizational capabilities to be at the forefront of exploring white fields

Method/Tools

- Exploiting relatedness
- Experimenting with Living labs -
- Grand challenges – demand driven systemic change

4. Governance and leadership challenge: Both exploitation and exploration

Methods/Tools

- Design thinking
- Discovery Driven Planning
 - Ambidexterity

5. Excellence in the management of interfaces: The concept of boundary organization

Capabilities

- Leadership as a team effort based on bundling of complementary personal capabilities
 - Understand and use the interplay between boundary objects, boundary spanning and boundary organization – from transition to sustainable change
-

2.3 Recommendations – expanded version

Policy approach – a new focus on transversal innovation without giving up cluster policy

The Action Plan defines platform policy as an approach for the future innovation policy in Skane. One reason for this approach is to facilitate transversal collaboration and innovation at interfaces. The Regional Platform Method developed by Vesa Harmaakorpi is an early example. Another early example of matrix or platform thinking is presented in a study by a group of researchers headed by Phil Cooke in a report titled *Constructing Regional Advantage*. This is expressed as follows in a final recommendation in the report:

”While rigid sectoral policies at the regional levels can be at risk in a globalised competition, a platform approach offers a context better equipped to exploit multipurpose and generic technologies. Therefore, policy platforms, which help articulate an array of instruments from several policy domains, will facilitate the formation of necessary capabilities in regions without existing capabilities to construct regional advantage”.

Most recently VINNOVA has published a report titled *The Matrix – Post Cluster Innovation Policy* that address this new policy approach from the perspective of transversal innovation.

In general this use of the two-dimensional matrix is probably also a result of the realisation that systemic policies inherently see the policy content dependent on some type of “context marker” like industries, clusters or regimes. In evolutionary terms context is often the same as selection environment. Policy content is defined by the policy rationale(s) of two sorts namely market failures and systemic failures. The latter can be exemplified by capability, communication or co-ordination failures. In a study in the Skane region in Sweden content – the rows in the matrix – were defined by using functions of innovation systems as defined by Swedish and Dutch innovation researchers.

In his contribution to this report Phil Cooke presents examples of the application of the matrix approach for promotion of transversal innovation, see chapter 5. Cooke argues that fundamentally an appropriate model is one that is not only reactive to external shocks, as many are, but one that shows capabilities in the proactive dimension. Such a model is found in Bayern (Bavaria) Germany. The core of that is first a cross-tabulation of industries and technologies in order to find the inter-disciplinary and inter-industry innovation potentials of ‘related variety’ in the regional economy. Secondly, this analysis opens for a large number of ‘conversations’ facilitated between neighbouring sectors concerning technological applications and resulting innovations. Hence, *Bayern Innovativ* initiates business-driven project co-operations across disciplines and branches, taking into account the latest results from the scientific community. Over the past decade the agency has forged new pathways and created a portfolio of cooperation

platforms and networks that have generated an extended, sustainable network structure. Both the platforms and the networks are in demand at regional, national and international levels. The matrix approach is also used in Lower Austria, north Jutland and Marche in Italy. Unlike the BI approach that in Lower Austria is thematically formed into a matrix policy structure by infusing each member cluster with the common goal of enhancing 'sustainability'. There are nowadays five key clusters evolving and receiving support around the theme of eco-innovation. Two further variations on matrix or transverse innovation methodology are practised in north Jutland in connection with the interaction between energy suppliers, engineering industry, renewable energy producers and the agro-food industry, and Marche region, Italy, in connection with a new Nautical cluster, on the one hand, and an eco-community, on the other. It is important to understand that the north Jutland exemplar emphasises more the successful identification of the Green Economy by firms than the leading role of governance and policy in achieving the described outcome. Nevertheless, the role of government has to be recognised in three important ways. First, early renewable energy experimentation and production were subsidised by consumer grants that enabled firms to be able to produce and sell new products like wind turbines to individual consumers, notably farmers. Second, more recently the new regional governance system in Denmark, with devolved control over regional budgets of the national User Driven Innovation Fund is a stimulant to this innovative network in local district heating and cooling systems, for which there is a rapidly growing global market. Finally efforts by localities of up to 50,000 people to become entirely dependent only upon renewable energy have borne fruit.

In Marche the desirability of further transversal knowledge transfer for innovation and facilitation of policy, especially given the current global economic crisis, was identified by the trades unions, and co-operative movement representatives amongst others. This is a clear field in which the regional administration in general and SVIM (the regional development agency) in particular took a leadership role armed with the vision of Marche not as a series of disconnected industrial districts or clusters but as a platform of integrated and innovative industry. To take on this function would imply three key things. First, the region, especially SVIM became catalytic to regional innovation as the sole agent with the necessary legitimacy to invoke meaningful conversations about transversal innovation prospects at both general and detailed levels. The Technology Centres, which are dedicated to the four main regional clusters of Agro-food, Domestic Appliances (and Domotics, i.e. Domestic Robotics); Furniture; and Footwear & Leather were a key resource in the further examination of transverse innovation prospects with individual groups of firms or value chains. Second, SVIM developed a methodology suited to the character of Marche industry and economy culture so that unnecessary interest advancement through knowledge appropriation occurred. Important here was introducing 'rules of the game' to help often highly individualistic family business owners allay fears of confidentiality of intellectual property being infringed. Third the region and its agents were able to secure the support of the financial actors for this new Nautical Cluster venture.

Lessons from strategic niche management and studies on radical innovation

Central to the concept of SNM is the view that technology policy must contribute to the creation and development of niches (protected spaces) for promising new technologies through experimentation with new solutions within the dominant technological regime. It is needed to initially shield new technologies from market conditions, in order to help them overcome the innovation inertia that emanate from the existence of an incumbent dominant regime. The regime comprises "... the whole complex of scientific knowledge, engineering practices, production process technologies, product characteristics, skills and procedures, established user needs, regulatory requirements, institutions and infrastructures" (Hoogma et al. 2002, p. 19). In turn, the regime is embedded in a wider contextual 'landscape', which consists of societal factors that can change only slowly over time, such as demographics, political culture, lifestyles and the economic system (Raven, 2005). Innovations with radically new features do not rub well with socio-technical regime characteristics. Their successful development, market introduction and diffusion require simultaneous adaptations in all major parameters of the regime.

The whole process of SNM can be viewed as a laboratory experiment, where the niche is developed under special settings and step-by-step diffusion can take place into real-world conditions. If successful, the transition is made from technological niche to market niche. Experiments and niches are born through networks of organizations and people interested in the development of a specific application. Within the experiments there is room for interaction and learning about the innovation, and about stakeholders' preferences and attitudes in relation to the innovation. In addition to experimentation and learning, SNM authors have pointed up the importance of network formation and convergence, and alignment of actors' expectations. Together, these three processes are seen to interrelate closely, and be mutually reinforcing (Raven, 2005, p. 43). In this way, all parties (including producers, users and policy-makers) are involved and can contribute to the diffusion process. See the box for an explanation of the niche development process.

Box: Niche formation process

The various SNM authors have a shared view on the nature of the *niche formation process*. It is seen to consist of three sub-processes that are interrelated and mutually reinforcing (Raven, 2005, p. 43). Firstly, niche formation revolves around experimentation-based learning on the possibilities and constraints of the innovation, specific application domains, its acceptability, suitable policies to regulate or promote it, and so on. At the same time, social actors themselves change their views and align their expectations about the new technology over time. People's expectations become more specific and consistent (Hoogma, 2000). To sum up, Kemp *et al.* (1998) say that "experiments are a way to stimulate articulation processes that are necessary for the new technology to become socially embedded" (p. 190).

Secondly, niche creation is widely seen to require the development of a co-operating actor network. According to Hoogma, it will be conducive to success when actors' motivation to participate are not centred on short-term financial gains (2000, p. 84). Furthermore, the composition of the network is important, and this may need to change or expand over time in order to facilitate niche growth. The role and activities of incumbent partners may also change over time (Kemp *et al.*, 1998, p. 191).

Finally, niche formation is meant to match the promises held out by the innovation and the stakeholders' expectations about it, with the needs in society that the innovation is meant to satisfy (Kemp, 1998, p. 190). The participating actors in the network should share a common core view about where they are going with each other and with the technology. Actors' strategies, expectations, beliefs, practices, visions, and so on, must go in the same direction (Hoogma, 2000, p.85).

Caniëls present in her contribution a list of cluster growth inducing actions. They are summarised in the following.

An attitude of openness and flexibility on the part of all actors in the experiment is essential. Actors must also strike "... a [continuous] balance ... between protection and selection pressure" (Weber *et al.*, 1999, p. 40, pp. 56-57, italics added). On the one hand, they must ensure sufficient protection, so as to avoid the experiment coming to a premature end due to competition from incumbent technologies. At the same time, coddling should be avoided. It creates unrealistic expectations, induces inertia, and allows unproductive experiments to keep running (p. 77). One can *learn from failed experiments as well as from successful ones* (Weber *et al.*, 1999, p. 40; Brown *et al.*, 2004, pp 199-200). Actors must be encouraged to come forward to discuss the problems they experience. Moreover, experiments should be used to *challenge every assumption about the new technology*. It is helpful to *seek out independent external evaluators* to assess the progress in the experiment (Weber *et al.*, 1999, p. 76).

The management of the actor network assumes great importance in the SNM literature. First, it is necessary to ensure an *effective constellation of stakeholders* who connect effectively with one another. A triangular set up has been found to be particularly effective, composed of (i) innovating firms along with (ii) supporting actors such as researchers, technical advisers, consultants or extension officers, and unions, whose interactions are driven by (iii) endogenous development potential of the new technology as needed by the local constellation. Users have a special role to play among the stakeholders. Accordingly, users must be actively involved in the experiment on a regular basis. User involvement does not come about spontaneously. Opportunities for voicing their concerns and ideas must be built into the design of the experiment from the start (Weber *et al.*, 1999, pp. 42-3).

The radical innovation literature goes beyond this, by emphasizing the importance of diversity on the individual level within the actor network as well. The more unfamiliar the market, the more important it will be to involve commercially-oriented R&D staff and senior management from participating firms, leading members of the technological community, experts from related markets, and potential users (Rice et al., 1998). Furthermore, people who join the niche network from the side of the participating firm(s) should form cross-functional teams (Bonner et al., 2002; O'Connor and McDermott, 2004).

Monitoring potential barriers to effective co-operation between the actors is crucial. The *actor network must be managed dynamically*. After the initial start up phase, niche expansion will often require the involvement of specific new actors. The existing actors in the network need to adjust their work and interactions accordingly (Kemp et al., 1998, p. 191). The *network for an experiment should be driven and guided by a network manager* (Weber et al., 1999, p. 39), whose role is to co-ordinate the process, essentially ensuring that the network partners adhere to the principles already outlined above. It is mentioned that any actor, be it a public policy maker, a regulatory agency, a local authority, a private individual, a company, an NGO, an industry association, a citizen group, or a special interest group can play this role, depending on who is best suited for the particular task at hand (Kemp et al., 1998).

The radical innovation literature also yields some important suggestions for the cluster manager, whose management role remained rather unspecified in the SNM studies. The manager must ensure that the participating team members are to be actively involved at an early stage at the determination of the project's operational controls such as goals, budgets and schedules (Bonner et al., 2002). The manager should also organise regular professional conferences and meetings at which data are presented for the technological community's reaction, and to gain potential customer interest through early market probes.

The SNM literature tends to elaborate on the role of public policy makers as a party who shape the context of experiments conducted by others. *Policy makers should assume the role of enabling actor and catalyst*, rather than regulator or technology sponsor (Kemp et al., 1998, p. 191). A final recommendation for successful niche formation is to *keep the momentum* going. Raven, who compared different experiments in the field of biomass utilisation, noticed that the more successful ones were characterised by a continuous development pattern, whereas a discontinuous trajectory was visible in the case where no new market niche emerged.

The radical innovation literature provides clear guidelines for top management. The role of top managers should be one of indirect management of these processes. They should put in place the right organisational structures, incentives and a good research climate, leaving sufficient flexibility for the project implementers to get on with their tasks ('orchestration'), endorse the innovative results that come up from within the organization ('retrospective legitimising'), and act as mediators and decision makers in

conflicts between project champions and critics ('judging and arbitration') (Day, 1994, p. 151). Others characterize this role as catalyst, encouraging, sharing and integrating (Bonner et al., 2002).

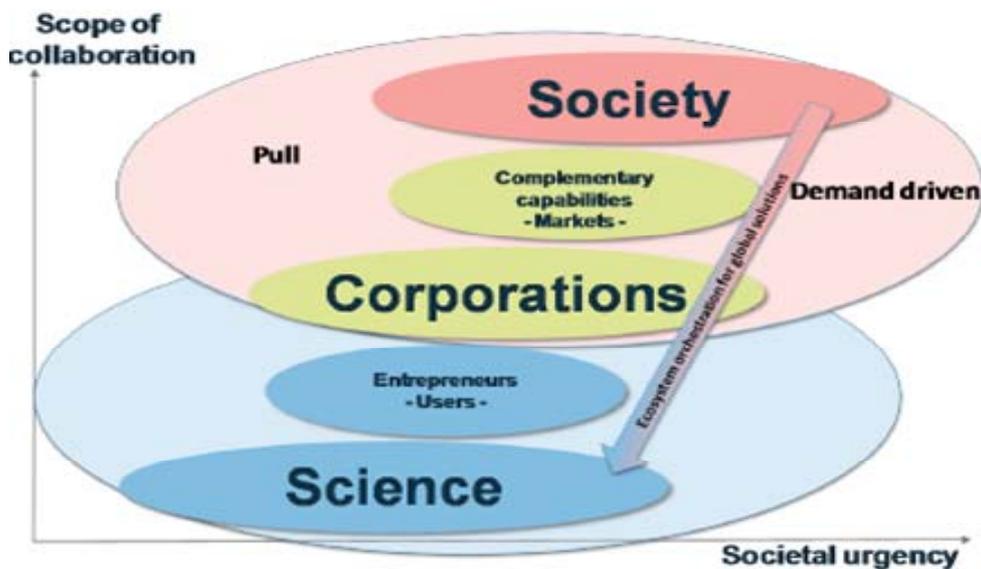
Relevant for SNM is the fact that probing and learning not only occurs within the boundaries of individual firms, but that it also involves competitors. Some firms practice vicarious learning, waiting for a pioneer competitor to take the lead with market tests and learn from its mistakes. A similar idea underlies the SNM approach, which advocates the simultaneous establishment of several parallel experiments and niches focused on the development of alternative solutions for the same problem.

Grand challenges – business ecosystems

The policy approach that has evolved regarding Grand Challenges is a policy mix of research funding and demand side management via public procurement which is highlighted by Johan Wallin. He argues that this would then ask for a demand driven innovation approach, illustrated in Figure 3. The context here is the business ecosystem.

As Figure 3 indicates the starting point here is the identification of the demand, a clear societal need, which is universally recognized. This perspective has also recently been advocated by Professors Pisano and Shih (Harvard Business Review, July-August 2009).

Figure 3. Orchestrated solutions



This general model is then applied on Mobile Heights. The conclusion for Mobile Heights is that different approaches are needed for different forms of innovation initiatives. However, in light of both international comparisons and the recommendations by the peer review group it seems it is important to consider how competitive ecosystems can be formed with the innovation support from Region Skåne.

Ecosystem orchestration is closely related to the concept of dynamic capabilities (Teece et al. 1997; Winter, 2003; Teece 2007; Teece 2008). When taking an ecosystem perspective on innovation, one has to expand the discussion on capabilities to not just relate to firm-specific capabilities, but also to how firms together are interacting, wherein the complementary capabilities of the firms enable co-specialization, based on which the collaborating firms are stronger compared to a scenario in which each would just pursue its own individual strategy. (Laamanen, Wallin, 2009)

When taking the ecosystem perspective on capabilities one needs to consider how a firm's entire *constellation* of co-specialized capabilities is morphed over time (Rindova and Kotha, 2001). This viewpoint is different from the focus on individual capabilities or shifts of attention allocation emphases between different operational capabilities since it puts the attention to the capability system as a whole, partners' capabilities included (Afuah, 2000).

Considering capability constellations adds new perspectives when designing national innovation policies. The notion of co-specialized capabilities is not meaningful if one takes the cluster approach. Co-specialization is a way for some selected companies within the cluster to form an orchestrated ecosystem, wherein competitiveness enhancing co-specialization should take place over time. For a MNE, with its headquarters and a disproportionately big part of its workforce still in its home country, the question of how to design a co-specialized, orchestrated network is not primarily about how to organize around exiting domestic technologies. Instead the key question is how to orchestrate global resources and capabilities to better serve customers in the most important markets (Wallin, 2006). The notion of ecosystems puts the focus of governance of innovation policies into a different perspective. Small countries will have to identify, which are those playing fields where they can provide truly competitive global solutions. Here the question is about seeing what complementary capabilities the country possesses, and with whom these capabilities could form a solution, which would also strengthen the competitiveness of the selected partners. Most of these activities will be carried out by companies, but regional innovation policies and governmental actions can also be used to support networking, and fund different types of research activities that are needed to identify and build those technologies and capabilities that best would fit the new emergent needs. A problem that Wallin points to is however that the peer review group in their SWOT analysis highlights that *Industry and business leaders are not involved in strategy and action plans for innovation* (p. 8).

Where is the place for the intermediaries and the support system in this systemic policy?

The rationale(s) for the systemic innovation policy Region Skåne has decided on differ from the rationale for the present policy approach to some degree. The peer review report presents some ideas of how consolidate the present fragmented and often underfunded set of network of intermediaries. Several of the intermediaries are already working in a cluster context, others are more functionally or geographically oriented. Making the support system an integrated part of the policy mix for cluster development would therefore be a possible option for the future. Another might be to look at the support system as providers of knowledge intensive business services (KIBS). A dynamic “KIBS-sector” is strategically important for a region like Skåne. It would be relevant to know to what extent the support system is competing with and/or complementary to the services that offered by private companies in the region. The knowledge about KIBS required to make that assessment would most probably be useful in any case.

Regional leadership

Regardless of organisational concept there are basic requirements as regards leadership that should be satisfied. Sotarauta describes in his article the leadership capabilities that are required for managing these types of complex processes. In his view can the leadership challenge be summarized as follows: the resilience, persistence and consistency of regional development work should be secured. The aim ought to be a) to deepen the pool of commonly held knowledge (explicit and tacit) both in substantial and policy matters; b) to secure institutional flexibility (the ability of the systems and key organizations to change); c) to develop innovation capacity in all walks of life (also within the policy community itself) and; d) to increase the capacity to develop relations of trust and reciprocity and to create a sense of a widely-held common project. A more detailed list of points is as follows.

The responsive capacity of regions requires competent leaders alongside effective innovation systems and policies

Development agencies should not expect to gain free lunches through networks. Successful network policies require considerable investments in the process, both in terms of financial and spiritual resources. The credibility of the policy initiator is extremely important and attention should be paid to gaining such credibility.

In communicative and interactive regional development networks the conscious construction of collective strategic awareness is one of the key elements both in ensuring strategic focus, and the density and integration of development networks.

Even though being loosely coupled a development network ought to be able to join internal and external resources and competences together in the creation and implementation of their own collective development strategy.

The many institutional and other obstacles blocking development processes and networks should be systematically analyzed and removed in order to make the changeover to a new development path possible. Such obstacles may be prevailing thought and action patterns, organizational structures, administration, fear of losing acquired advantages, conflicts between organizations, etc.

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Key actors in the regional development effort should be regionally well-known and respected individuals. The combination of enthusiasm and authority that they embody is likely to transmit a positive and regionally anchored view of the project to the network and more widely to the general public. However, they ought not to expect that their institutional position translates automatically into authority and influence in the network. Respect needs to be earned.

Visionary leadership and concentration of representative authority in the regional development network should be balanced with openness, transparency and goal consistency to guarantee the credibility and educational self-renewal of the network.

The key actors in the regional development network should include visionary individuals capable of fostering consensus around a common vision for the development process. Managers in the regional development network should have the skills to observe, understand and act on opportunities promptly as they open up in the development process, such as adopting new modes of development work and funding.

If there is an uncritical outlook on the spirit of the time, the promotion of regional development may end up being hollow development rhetoric with some fashionable catchwords. Consequently, many actors may lose their faith in the development process and momentum may be lost.

The capabilities and skills of the key actors should be continuously developed to be able to see different things as "stakes" in the promotion of regional development and to utilize them in cooperation with other actors.

The regional development network should solidify in a functioning organization the capacity to bring forth a vision of a different future for the region. The mechanical formulation of vision and strategies is not sufficient but key actors should develop their skills and abilities to make better use of use visions and strategies as tools in leading processes.

Regional leadership and innovation governance - Region Skåne as a boundary organization

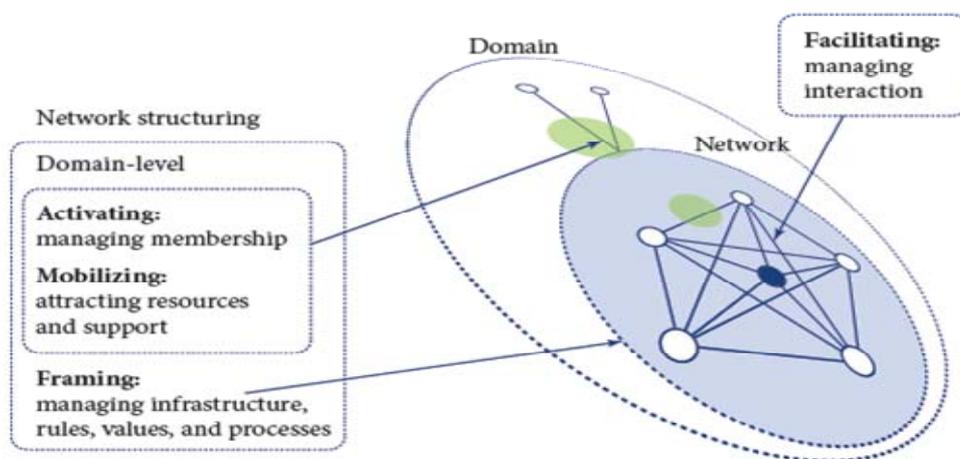
One of the strategies in the Action Plan is to develop systemic governance. The core of that process has so far been the so called systemic meetings which in a sense involve boundary objects. The sounding board for this the project may also be seen as part of this new leadership. The international peer review group suggested the creation of the Skåne innovation council, representative of the diverse stakeholders of the region. If we consider systems of innovation as complex systems, the risks of governing complexity need to be accounted for.

The analysis of the international peer review group see efforts in improved coordination as the solution of the perceived gaps of the innovation support system. They suggest the creation of a new body for leadership and governance – the Skåne Innovation Council–performing a number of functions (convener, broker and collective voice). We are not convinced that this a good organisational solution. Such suggestion fails to question whether any of those functions are or could be performed by existing organisations such as Region Skåne. It falls into the trap of suggesting a new organisation to perform new activities, and underestimates the difficulties association with the ‘coordination’ or ‘fit’ of that new body with existing structures.

From our perspective on leadership and governance it is obvious that Region Skåne must have a central position when it comes to regional innovation strategy and regional innovation governance. It is not advised to separate strategy from leadership and governance in collaborative governance. The reasons are that Region Skåne must take that position in order to be authoritative in a traditional governing perspective but also to gain credibility from a network management point of view. It is also obvious that the economic development leadership as we have pointed out have to rest on somewhat different capabilities and mode of operation than responding to the managerial demands associated with health care, regional transport etc.

Originally, boundary organizations are organizations that sit, at least metaphorically, in the territory between science and politics—interfacing or bridging the pursuit of scientific research with policy decisions and public action. Conceptually, boundary organizations were initially analyzed structurally, as organizations that sit on the boundary between science and politics and that are, thus, subject to the authority of each. The underlying idea was to find an organizational concept that allowed for exchange and collaboration across “cultural” boundaries while preserving integrity. In its mode of operation boundary organizations use many of tools and procedures used by network facilitators or orchestrators, figure 4.

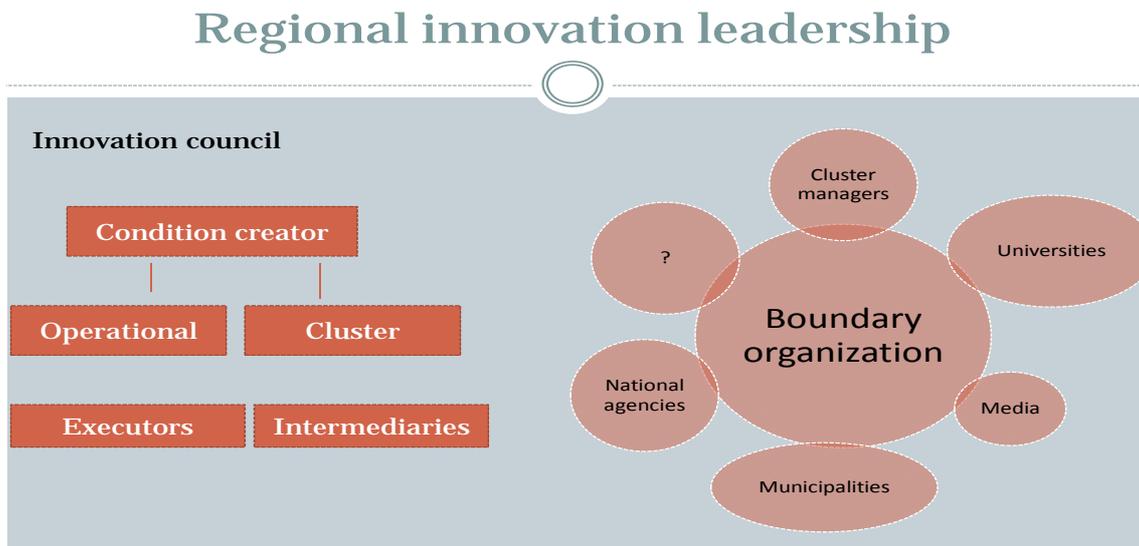
Figure 4. Brokering functions



Source: SUCCESS Report WP 2

Figure 5 shows a comparison of how we perceive the the proposed innovation council compared to a boundary organization. One major difference is that the boundary organisation operates basically as a “forum” without operational activities. Its role is to provide a forum for strategically important future oriented conversations and negotiations aiming at commitments where all parties also have to make concessions.

Figure 5. Regional innovation leadership acting as a boundary organisation



Compliance with agreed commitments is enforced by reputation mechanisms. Boundary organisations have proven to be useful in facilitating collaboration between actors with divergent or conflicting interests.

Boundary organisations share the interpretive flexibility of boundary objects, see chapter 3. They are flexible in use, bridging divergent worlds while preserving elements that are distinct to each. But they differ from boundary objects in their durability. Because they are more durable, boundary organizations enforce a confrontation of interests that is rarely seen with boundary objects, which can be ignored, lost, or made irrelevant. Studies show more precisely what it is that boundary organizations do—they provide an enduring organizational bridge across different worlds by requiring adjustment of practices in the domains of governance, membership, ownership, and control of production, but without requiring the parties to concede on their divergent interests.

One study shows that as communities and firms created boundary organizations, they differentiated the interests that could be pursued collaboratively from those that diverged. By identifying and confronting where their interests diverged, both parties more precisely clarified the boundaries that separated them. Clearly defined boundaries, coupled with both parties’ adaptation of their organizing practices, not only defined the role of the boundary organization but delineated a new triadic role structure. Boundary organizations transformed social relations because they brought unexpected allies together.

Collaboration between open-source community projects and firms was accomplished by delineating boundaries across organizing domains to form a relatively durable boundary organization. These three characteristics—adaptation around key organizing domains, delineation of interests, and durability of structure—help distinguish boundary organizations from other conceptual frameworks for collaboration.

We have not presented this mainly as a teaser to reflect upon. Its potential strength if further concretised would be to anchor regional leadership in Region Skåne and at the same time allow for organizational learning and improved capability to exercise the both-and leadership we are advocating.

Spanning boundaries – managing interfaces

One of the points in Hagel and Seely Browns list of factors influencing the Big Shift is a shift from transactions to relationships. One of the reasons for this shift is that interchanges between actors in an innovation system are becoming more difficult to define in contractual terms which is the basis for transactional exchanges because interchanges involve knowledge and other intangibles. Higher specialisation together with collaboration also increases the importance of managing relationships and interfaces.

An effect of this change is that analyses and management of networks have increased in importance. Relationships show interdependencies between actors. Social network analysis (SNA) has become a tool in cluster and innovation policy to shed light on network characteristics. The analysis of value networks in Skåne performed by Verna Allee as part of the assessment of the regional innovation system is one example of that type of analysis. One objective of social network analysis is to clarify which type of role(s) people play in the networks they belong to based on the strength of their ties to other members of the network in order to know about two aspects of social capital namely brokerage and closure (Burt). The shift from transactions to relationships is also analysed from a knowledge management perspective where concepts like boundary spanning and knowledge gatekeepers are used to denote what is called brokerage in the social capital tradition.

The context for brokerage in an innovation system context is that the bridging involves inter-organisational boundary spanning or boundary crossing. These are the terms used in the knowledge management and organizational learning literature for brokerage. Burt analysis is about network structure and network position. The knowledge management approach is more focused on collaboration and coordination. There is also the idea of boundary organizations that use boundary objects as a tool in their network management. The capability to manage boundaries between knowledge domains and between different types of actors is critical for exploring white fields.

There are limits to how much systems can be managed

The comments and recommendations in this report are all rooted in some idea of what a systems perspective means. As we have mentioned to act systemically is also what Region Skåne is aiming for.

Elvira Uyarra shows in her article that the systems concept can have several meanings. And this is as she says, not unproblematic, as different interpretations will suggest different (implicit or explicit) implications for policy design. Systems has been used as a *metaphor* to help understand the role of (national) institutions that were perceived to influence the rate and direction of innovation. As a metaphor such a view constitutes a loose framework rather than a clearly articulated term. The second way to perceive systems is as *flows, networks and linkages* stressing relationships and interaction and learning. This is the meaning that often is implicit when clusters and regional innovation systems are the object of policy. The third meaning is to see systems as *artefacts*.

According to Uyarra this use of the term systems reflects an ambition to understand all important determinants of innovation. Potentially this is a view of great policy interest since the system can be defined in terms of functions, roles and thus becomes open for policy intervention. This view of the innovation system lies at the bottom of the type of functional analysis that was made within this project last year and it is also reflected in the value network analysis made. Since this type of analysis have been performed in Skåne it is worth noting that Uyarra claims that these approaches can be reductionist and static, treating the 'system' as the sum of its parts and abstracting a context-specific, historically determined and ever-evolving cast of actors and institutions into a snapshot-like depiction. When operationalised, such approaches concentrate on inventories or checklists of components (some of which may be relevant and explanatory, some just 'noise' - see Radosevic, 2002) and on the quantity of system interactions, rather than exploring the quality of interactions, institutions, processes and actors, understanding how they and the roles they play in the system evolve over time. Finally the systems concept can also be used as in complex adaptive systems where emergence becomes a problematic term from a policy perspective since emergence as a result does not comply with controllable linear cause-effect relations. This complexity aspect has also been referred to in the work in Skåne. She also notes that in policy formulation, the region needs to not only take the knowledge and institutional base of the region as starting point, but also consider existing policy mixes and past policy history (including actors and initiatives that may have hardened or become 'institutionalised'), for they will enable or constrain new policy goals.

Uyarra also notes that a systemic approach builds on complementarities between reforms/measures. A key message from a systemic approach is that the effectiveness of innovation systems depends on the balanced combination of creative capacity, diffusion capacity and absorption capacity (Veugelers). A decentralized policy approach implies more possibilities of adaptation to local specific needs in order to better align the

various complementary local actors. Flexibility of policy measures is needed at the various administrative levels, especially between national and regional levels. Nevertheless, coordination among the various policy levels is important. The progressive opening of national programs, cross-fertilization measures, and international mobilization of human resources need to be promoted. The idea is to facilitate cooperation and to boost diffusion and uptake of knowledge by increasing the efficiency of the resources used. Here she makes the observation that the Skåne region aims to be the most innovative region and tackle grand challenges, but it is unlikely that this can be achieved by region action alone.

Both the action plan for innovation and the recommendations of the international peer review refer to the economic integration of the Öresund region. The peer review group notes that “the potential of the region geographic location is clearly underexploited”. Probably not enough efforts are directed towards strengthening such integration and there is a risk that regional innovation system view may not be sufficiently inclusive of the assets available through integration in the Öresund region. The benefit of operating in that wider regional context is noted by Phil Cooke in his assessment of MediconValley.

Well-developed skills and competencies are needed within the policy world itself. Inventiveness and creativity in policy building will be enhanced if policy makers can access experiences of other countries, provided these are presented in their context and evaluated properly. Benchmarking exercises involving policy makers should be conceived as “learning-by-interacting” exercises rather than “diffusion of best practices”. In addition, STI policies need to be supported by monitoring and evaluation practices, which then feed back into the policy process. Finally, involving stakeholders in policy making is necessary. This emphasizes the importance of an appropriate governance system for policy. When formulating policies, the region needs in according to Uyarra to not only take the knowledge and institutional base of the region as starting point, but also consider existing policy mixes and past policy history (including actors and initiatives that may have hardened or become ‘institutionalised’), for they will enable or constrain new policy goals.

3 The conceptual framework and some implications for management of interfaces

Arne Eriksson

3.1 FORM, KNOW and DO define the content

In the introduction reference was made to a conceptual framework with some influence on the peer review design. That conceptual framework was also used in the initiation of this specific element of the peer review process. What follows is a relatively brief presentation.

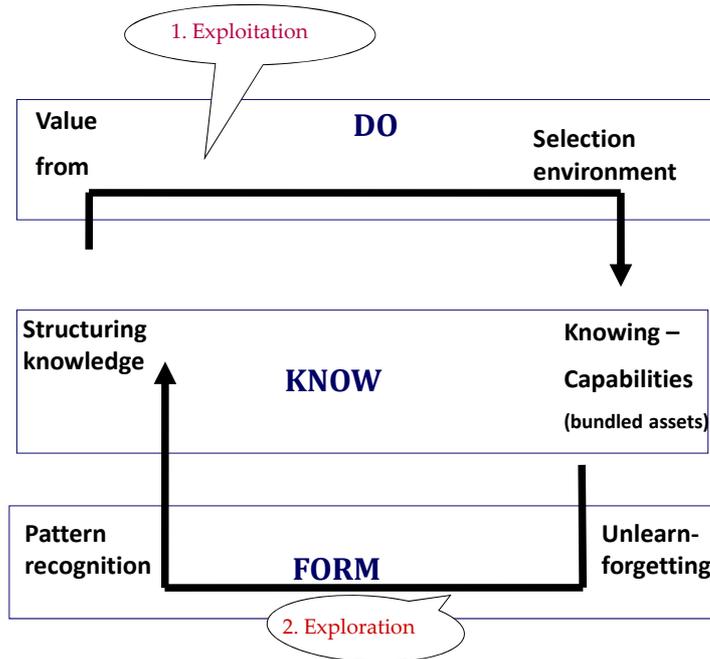
In a knowledge based economy value creation is dependent on both scientific knowledge and tacit knowledge. Likewise important is to establish those organisational and institutional frameworks that provide platforms for knowledge to be used and diffused in an efficient and innovative manner. In the following I outline a schematic framework with three keywords with respect to value creation, innovation and economic growth. These are DO, KNOW and FORM. They are interrelated. The relationship between action and knowledge may seem obvious for the reasons given above. The emphasis on FORM which reflects cognitive and cultural aspects is perhaps not so obvious. The reason is that I share the view of knowledge as an interpretation or filtering of data. With that definition of knowledge it becomes particularly important from an innovation point of view to discuss the conceptual and perceptual filters we apply as individuals but also to discuss how the individual interpretations are shaped by cultural factors, type of social worlds, etc. Innovation is by many seen as a result of taking many perspectives into account and of cross-fertilisation across knowledge boundaries. This means that the formative issues also have to deal with how personal knowledge can become shared through interaction, collaborative learning and collective sense making.

The KNOW dimensions are two. On the one hand it is knowledge resulting from a process of filtering, interpreting and representing data. On the other it is knowledge in use as routines and (inter)organisational capabilities and as embedded in products and services. I have recurrently pointed to the importance of understanding and taking note of epistemological differences with the respect to innovation. Another issue that is much discussed is how knowledge is made useful which is the topic for the discourse about different innovation models. (That discourse is of interest since it seems to have come to a situation where it is back to where it started. I refer to the recently awakened interest in the linear model of innovation.)

The DO layer is about decisions and actions and the bases for those in terms of intentions and strategies and contextual assumptions and implications. To DO also requires the necessary capabilities to deliver on the decisions taken but also to sustain dynamic change. The focus here is primarily on dynamic capabilities.

Figure 6 shows the tasks for regional innovation policy in a stylized format structured around the three key properties of an innovation system just mentioned. An innovation system must allow firstly for the formation of new ideas, new patterns and re-configuration of capabilities; secondly, it entails very clearly a knowledge dimension and thirdly it must have the capacity to deliver new innovation and value i.e transform intangible knowledge into tangible value. The classical definition of innovation is that it is a combination or reconfiguration of existing ideas and resources in novel ways that reaches wide use. The first stage of an innovation can therefore also be understood in terms of pattern recognition and as such it is a personal and cognitive construct. This construct is a result of searching and scanning- in short exploration. Transformation of this construct into tangible and marketable hardware and software takes place in a process where knowledge passes through the knowledge funnel. This is a process of structuring information in a process of codification and abstraction. Knowledge has its highest potential value when it is codified and therefore possible to diffuse and use. Codification is also a requirement for intellectual property protection. But even if new knowledge is not protected by IPR it is important to note that to be able to use new knowledge one has to share the experience that makes heuristics “true” and later on make investment in learning to gain access to the “codes” or algorithms that makes it useful at least initially, i.e. in the upper left corner of figure 6. It is also worth noting that the steps from patterns to codified knowledge make it possible to decouple knowledge from its context. Some would claim that this decoupling changes knowledge into information since its interpretative element is removed. The decoupling is, however, temporary for by using knowledge it is again embedded in various ways. The notion of absorptive capacity refers to the capability of an organisation to do this. The transformation of knowledge to knowing is also what communities of practice and the development of routines are about. In other words for knowledge to have impact in the real world it has to be embedded in products, technologies or organisational routines.

Figure 6. The DO-KNOW-FORM Framework



 Arne Eriksson

To DO – make a decision, use a technology, co-produce a service- is an act where knowledge as a cognitive and intangible construct is impacting on the tangible or real world; where it becomes an asset in value creation, where it is a building block in capability building and where it is again contextualised. Due to its focus on knowledge use and diffusion innovation policy has a strong focus on the interface between KNOW and DO. That is the domain targeted by innovation policy via programs for commercialisation of research results. This is also the domain given attention to in the literature on open innovation. The interface between knowledge and its use in the material world is important from several points of view. First it is an interface where the strategic management literature lends great importance to leadership and strategic intent while evolutionary theorists emphasize the importance of selection and retention. Second, it is of vital importance for economic development policy to have a view on the context in which policy measures are supposed to operate. This assessment starts already in the knowledge formation stage in order to get direction for refinement of the original idea or pattern. Selection environment is a term used in evolutionary theory. In everyday language it translates to market characteristics and economic conditions in general, laws and regulations, norms and attitudes, technology. The selection environment sets the constraints for the use of new knowledge and the implementation of innovation. It is the same environment that shapes the opportunities for innovation. How that happens depends on the ability of decision makers to evaluate these structural aspects but also on the other hand to find those topics and measures where strategic intent can change such environments. The selection environment differs of course between clusters or eco-systems. Third, this phase of the process can be used to generate new ideas of how to realize opportunities by directed search along the left down

diagonal. Success depends on how strategic intent transforms and is transformed by the opportunities and constraints associated with the selection environment. The selection environment is a mix of factors. Some are slowly changing and long term like formal and informal institutions and are more directly linked to market structure like technology, supply and demand conditions.

For policy purposes and also because of the contextual aspects of knowledge it is important to note that the abstract notion of a selection environment in practice refers to structural concepts like clusters, business ecosystems, technological regimes or innovation systems. Taking that type of analytical perspective is often associated with a multi-level perspective and often with a focus on some notion of a meso level. One example which will be further explored later is between technological landscapes, technological regimes and technological niches in what is called strategic niche management. The relationship between clusters and (regional) innovation systems can be seen in the same way.

The process from idea generation to knowledge structuring to use and diffusion of knowledge and its impact on the material world is called the social learning cycle (SLC) by Max Boisot who has worked with that concept since it was presented in *The Information Space* in 1995. It is conceived as moving around in a three dimensional space. The phases of the SLC is described in the box.

Box 1. Six Phases of SLC

1. Scanning

Identifying threats and opportunities in generally available but often fuzzy data – ie, weak signals. Scanning patterns such data into unique or idiosyncratic insights that then become the possession of individuals or small groups. Scanning may be very rapid when the data is well codified and abstract and very slow and random when the data is uncoded and context-specific.

2. Problem Solving

The process of giving structure and coherence to such insights – ie., codifying them. In this phase they are given a definite shape and much of the uncertainty initially associated with them is eliminated. Problem-solving initiated in the uncoded region of the I-Space is often both risky and conflict-laden.

3. Abstraction

Generalizing the application of newly codified insights to a wider range of situations. This involves reducing them to their most essential features – ie., conceptualizing them. Problem-solving and abstraction often work in tandem.

4. Diffusion

Sharing the newly created insights with a target population. The diffusion of well codified and abstract data to a large population will be technically less problematic than that of data which is uncoded and context-specific. Only a sharing of context by sender and receiver can speed up the diffusion of uncoded data; the probability of a shared context is inversely achieving proportional to population size.

5. Absorption

Applying the new codified insights to different situations in a “learning by doing” or a “learning by using” fashion. Over time, such codified insights come to acquire a penumbra of uncoded knowledge which helps to guide their application in particular circumstances.

6. Impacting

The embedding of abstract knowledge in concrete practices. The embedding can take place in artifacts, technical or organizational rules, or in behavioural practices. Absorption and impact often work in tandem.

The social learning cycle describes a change process that over time leads to transitions. Ontologies (=what the world is like) differ how they perceive change and how it can be explained, see table 2. The framework presented here is a crossover between evolution and interpretivism which explains the importance attached to FORM. According to Geels this kind of crossover between ontologies exists also for Strategic Niche Management.

Table 2 . Characteristics of transitions in different ontologies

	Default orientation: change or stability	Explanation of transitions
Rational choice	Stability (equilibrium) or incremental change	Difficult. Require exogenous impulse (price changes) followed by gradual adjustment (of resource allocation)
Evolution	Dynamic stability(incremental change along lineages) and radical change (speciation, niches, competition)	Endogenous change(radical innovations) and/or exogenous changes in selection pressures
Structuralism	Stability	Difficult. Changing ideologies and belief systems often remain exogenous
Interpretivism/Constructivism	Ongoing change and sense-making	Radical change through endogenous second-order learning processes (change in cognitive frames)
Functionalism (systems theory)	Stability (system equilibrium)	Difficult. Requires exogenous shocks, followed by gradual adjustment
Conflict and power struggle	Stability (powerful actors suppress change), incremental change ("reform to accommodate protests) and radical change (overthrow by challengers)	Endogenous struggles between incumbents and challengers
Relationism	Continous process (change or reproduction)	Unclear. No distinction between radical or incremental change. Focus on micro-processes and local projects.

Source: Geels, Research Policy 39 (2010)

The success of innovation is of course not just a matter of intent. There must be capabilities that support strategic action. To KNOW and to DO is thus to possess structured knowledge but also to command the skills required to make use of knowledge and transform it to knowledge in action; i.e. capabilities and routines. Another way to put it is that these are the requirements for knowledge to be absorbed and to have an impact on value creation. Over time operational routines become obsolete. This may be due to external and/or internal perturbations. A new learning cycle starts with unlearning and forgetting and the activation of search and problem solving routines. The social learning cycle can be divided in two major parts namely an exploration phase and an exploitation phase. Exploration requires variation. Exploitation destroys variation. It must be stressed that the social learning cycle is an aggregate of many

individual and organisational learning cycles. This also means that there will always be an overlay of learning cycles in different phases. So, the social learning cycle can therefore also be a means of a richer understanding of the issues involved in balancing exploration and exploitation.

Together the SLC and the analyses of niches and regimes give a picture of a knowledge and innovation landscape and may help to put the ideas of what we want to focus on in developing a platform model in a broader context. Ronald Burt's idea of structural holes and his analysis of bridging and closure fits well into Boisot's framework. From an entrepreneurial and innovation perspective the analysis of weak ties and structural holes is very helpful in understanding the necessity of diversity and a multitude of perspectives for exploration, innovation and problem solving. The critical issue is about variety (and selection?). Exploration rests on variety generation while exploitation rests on variety destruction. From a management point of view this calls for ambidextrous organisations (Tushman & O'Reilly) that have the capability to balance and integrate exploration and exploitation. Burt has shown the interdependency that exists between closure and bridging. In terms of the conceptual framework developed here these analyses point to the importance of understanding what takes place in an innovation system not only from a purely transactional viewpoint like transaction cost economics. There is also an urgent need to introduce variants of social network analysis into the picture not least to reach a good basis for policy conclusions that are relevant for innovation systems that are supposed to be characterised by interdependencies and interaction between agents in the system.

3.2 Balancing exploitation and exploration

A real challenge to be both managerial and entrepreneurial

The line of reasoning above is however not without complications. The challenge is that there are a range of tensions between exploitation and exploration that have to be managed. These are very well presented in a recent book by Roger Martin titled *The Design of Business*.

Conventional wisdom says that exploitation and exploration are hard to engage in simultaneously; most often organisations choose to focus on one activity to the exclusion of the other and to their own detriment. An organisation exclusively dedicated to exploration will cease to exist since there will not be funds available over the long term. On the other hand many organisations flip quickly from an early exploration base to the steady exploitation of that idea, never returning to exploration. The business that creates value only through exploitation will exhaust itself.

The differences between exploitation and exploration in table 3 can be traced back to a fundamental difference when it comes to how knowledge is perceived and justified. Martin uses the metaphor of the knowledge funnel to analyse the knowledge issue while Boisot & MacMillan use a similar analysis for an analysis of the epistemological

foundations for knowledge management. In Martins words is the exploration of a mystery the first stage of the funnel. Mysteries can take infinite forms. The next stage of the funnel is a heuristic, a rule of thumb that helps narrow down the field of inquiry and work the mystery down to a manageable size. It is a way of thinking about the mystery that provides a simplified understanding of it and allows those with access the heuristic to focus their efforts.

Table 3. Characteristics of exploration and exploitation

	Exploration	Exploitation
Organizational focus	The invention of business	The administration of business
Overriding goal	Dynamically moving from the current knowledge stage to the next	Systematically honing and refining within the current knowledge base
Driving forces	Intuition, feeling, hypotheses about the future, originality	Analysis, reasoning, data from the past, mastery
Future orientation	Long-term	Short-term
Progress	Uneven, scattered, characterized by false starts and significant leaps forward	Accomplished by measured, careful incremental steps
Risk and reward	High risk, uncertain but potentially high reward	Minimal risk, predictable but smaller rewards
Challenge	Failure to consolidate and exploit returns	Exhaustion and obsolescence

As an organisation puts its heuristic into operation, studies it more, and thinks about intensely, it can convert from a general rule of thumb to a fixed formula. That formula is an algorithm, the last of the three stages of the knowledge funnel. As understanding moves from mystery to heuristic to algorithm, extraneous information is pared away, the complexities of the world are mastered through simplification. The ultimate destination of a algorithms nowadays is computer code. The gain of understanding in the process from mystery to algorithm comes from picking out salient features of the environment and out them building a casual understanding. To create an algorithm from a heuristic judgement, possibilities and variety will have to be removed. The reward is a massive gain in efficiency. This is the process from FORM to KNOW to DO.

The distinction between exploration and exploitation plays out as exploration expressing a move across the knowledge stages of the funnel from mystery to heuristic and from heuristic to algorithm and exploitation as operating within each knowledge stage of the funnel by honing and refining an existing heuristic or algorithm. In Martins view very few companies balance exploration and exploitation by continuously looking back up the knowledge funnel to the next salient mystery and driving across the knowledge funnel, in a steadily cycling process. Those that do are what Martin calls design-thinking businesses.

Why then are so many companies falling into the trap of choosing either exploration or exploitation, rather than balancing both? That is the one of the questions that Martin

address in his book. The other is of course to develop the concept of design-thinking businesses and the arguments for why design-thinking is the key to balancing exploration and exploitation. In short the line of argument is as follows. The definition of design-thinking Martin presents is borrowed from Tim Brown of IDEO, leader of a very successful design firm. According to Brown design-thinking is “a discipline that uses the designer’s sensibility and methods to match people’s needs with what is technologically feasible and what is viable business strategy can convert into customer value and market opportunity”. In Martins interpretation an organization instilled with that discipline is constantly seeking a fruitful balance between reliability and validity, between art and science, between intuition and analytics, and between exploration and exploitation.

Boisot & MacMillan use the term discovery-driven planning with about the same meaning as design-thinking. They also associate exploitation with a managerial mindset and exploration with an entrepreneurial. The entrepreneurial mindset operates under conditions of novelty and uncertainty, where prior probability distributions, being nonexistent, can offer very little guidance. The managerial, by contrast, is constrained to seek justification from probability distributions and observed facts. The entrepreneurial mindset attempts to enact bold yet plausible hypotheses that create their own reality which also is at the core of design thinking; the managerial mindset acts on the basis of objectively verifiable facts. Boisot & MacMillan share with Martin the view that current institutional practice is heavily skewed in favour of the managerial mindset even though Martin calls this that reliability goes before validity. It is self-evident that if reliability and recurrence are important factors for decision making then innovation will be a victim. This “insight should increase our tolerance for higher levels of uncertainty, and encourage us to aim for bolder hypotheses, hypotheses that strike us as plausible on the basis of their innate coherence rather than on their correspondence with the facts. To repeat: correspondence with the facts is typically not on offer in the early phases of a genuine innovation. The facts do not yet exist” (Boisot, 2008, p 67).

This statement is relevant for our purposes because it gives a rationale for our recommendations concerning matrix approach to systemic innovation policy, strategic niche management, transversal innovation, Living labs and boundary organisations. The emphasis is on leadership and governance together with probing and experimentation within a systemic policy framework. The statement has also clear policy implications in that the now much favoured idea of evidence-based policy making is hard to align with how an innovative innovation policy should and could be developed. One of the strategies in the Action Plan is to develop systemic leadership. The previous discussion points to one critical aspect of this. Applying design thinking in a regional development agency also means that boundary issues of various kinds are inherent.

3.3 Spanning boundaries – managing interfaces

One of the points in Hagel and SeelyBrowns list of factors influencing the Big Shift is a shift from transactions to relationships. One of the reasons for this shift is that interchanges between actors in an innovation system are becoming more difficult to define in contractual terms which is the basis for transactional exchanges because interchanges involve knowledge and other intangibles. Higher specialisation together with collaboration also increases the importance of managing relationships and interfaces.

An effect of this change is that analyses and management of networks have increased in importance. Relationships show interdependencies between actors. Social network analysis (SNA) has become a tool in cluster and innovation policy to shed light on network characteristics. The analysis of value networks in Skåne performed by Verna Allee as part of the assessment of the regional innovation system is one example of that type of analysis. One objective of social network analysis is to clarify which type of role(s) people play in the networks they belong to based on the strength of their ties to other members of the network in order to know about two aspects of social capital namely brokerage and closure (Burt). The shift from transactions to relationships is also analysed from a knowledge management perspective where concepts like boundary spanning and knowledge gatekeepers are used to denote what is called brokerage in the social capital tradition.

The context for brokerage in an innovation system context is that the bridging involves inter-organisational boundary spanning or boundary crossing. These are the terms used in the knowledge management and organizational learning literature for brokerage. Burt analysis is about network structure and network position. The knowledge management approach is more focused on collaboration and coordination. There is also the idea of boundary organizations that use boundary objects as a tool in their network management.

Balancing as closing structural holes - interplay between bonding and bridging social capital to explore white fields

The literature commonly identifies three basic forms of social capital, following Woolcock (1998):

- *Bonding SC* which refers to relationships within or between relatively homogeneous groups. In the context of knowledge advancement, this may refer particularly to intradisciplinary or intraprofessional affiliations.
- *Bridging SC* referring to relationships within or between relatively heterogeneous groups. In this context, it refers particularly to interdisciplinary or interprofessional connections.
- *Linking SC* referring to relationships between people or groups at different hierarchical levels.

The conventional distinction between bridging and linking is that the former, refers horizontal connections and the latter to vertical ones within power structures. One can have bonding SC without bridging, but not vice versa. Almost any form of social life involves bonding, whether the basis for the bonds is predominantly normative or functional. Bonding may be tight or loose, but tightness or looseness does not itself tell us that much about the effects. Bonding has its limitations, for those who are within the group as well as those excluded. This is demonstrated in Granovetter's seminal work on weak ties (1973), which shows that employment prospects are helped more by knowing people with whom one has loose links than by those one associates with closely. In relation to knowledge generation and innovation, excessive bonding encourages groupthink, discourages new perspectives, and narrows the potential range of skills and expertise available to the group. Early in a network's formation, bonding will be particularly important to establish trust and ensure that there is an adequate sharing of norms and values, with the benefits this brings in terms of sharing of ideas, data, and so on. None of this needs to be explicit but it will be hard for collective knowledge generation to occur if a basic level of bonding social capital is not built up.

The value of bridging is, i.e. of making connections with people or groups that are dissimilar in their approach to knowledge generation, is that it can extend the range of ideas, expertise and contacts to which one has access and the range of opportunities for applying knowledge, commercially or not. It is therefore likely to be particularly important for those concerned with extending frontiers of knowledge, at least for parts of the process.

In this Skåne case this is especially relevant for the exploration of white fields. Ronald Burt's analysis of structural holes is of particular interest from this viewpoint. Structural holes open opportunities for entrepreneurs if they can be bridged. Two processes are involved in this namely brokerage and closure. Brokerage is about coordinating between whom it would be valuable but risky to trust. Closure is about making it safe to trust. The key to creating value is to put the two together, building closure around valuable bridge relations. Closure is valuable when it spans a structural hole.

More generally Burt defines a structural hole as a place in a network where brokerage could create value. A structural hole exists between two people or groups when either party is unaware of value available if they were to coordinate on some point. The structural hole refers to a missing element of coordination that would be valuable. The social-capital advantage of brokerage is manifest in recognition and resources. Brokerage across structural holes provides a vision of options otherwise unseen. New ideas emerge from selection and synthesis across structural holes.

High performing networks are those where network closure is high within the group (one clear leader or dense network connections) and the group's external network bridges structural holes in the surrounding environment (member networks into the surrounding organization are rich in diverse perspectives, skills and resources). This corresponds to what Burt has called structural autonomy i.e. people strongly connected

to one another, with extensive bridge relations beyond the group. This means that such a group has a strong reputation mechanism aligning people inside the group, and a strong vision advantage from brokerage outside the group. They have a creative view of valuable projects, who to involve, and they work together to make it happen. This is also a description of the basic skills requirement for Region Skåne in working with white fields. The point is that present clusters are where structural autonomy may be developed and the task at hand is to add the extensive bridge relations between those.

In summary, brokerage is about coordinating people between whom it would be valuable, but risky, to trust. Closure is about making it safe to trust. The key to creating value is to put the two together. Bridging a structural hole can create value, but delivering the value requires the closed network of a cohesive team around the bridge. Network entrepreneurs identify rewarding structural holes in a market or organization, and have an advantage in managing the work of bridging the hole but a closed network is the organizational suture that tightens the coordination across the hole. The gist of Burt's argument is that bridges are valuable for creating information variation, while bonds are valuable for eliminating variation and protecting connected people from information inconsistent with what they already know.

Ronald Burt: Active ingredients in brokerage
Make people on both sides of the hole aware of interests and difficulties in the other group
Transferring best practices
Analogy between groups ostensibly irrelevant to one another – you are not so different
Synthesis – combination
Shift in focus from the production of ideas to the value produced.
Contagious ideas where discussion is critical to contagion between adjacent groups
The sense of investing in people with whom you think good things could happen before you are sure what those things are captures the essence of brokerage and the critical role that trust plays in brokerage.

Managing boundaries in an interorganisational context

The fact that most innovations occur at the boundaries between specialised domains tells us that effectively managing knowledge across the various types of boundaries in an or between organization(s) is what drives competitive advantage. In the knowledge management and organisational learning literature three different but interrelated “tools” are used to analyse communication and coordination as regards collaboration. They are boundary spanners, boundary objects and boundary organisations. Helen Brown presents in her book *Knowledge and Innovation* how these tools can interact. “Special tools called boundary objects helped to connect experts horizontally and were particularly useful if there was no previous experience of working together. They act as bridges between different cultural practices.... creation of a boundary object helped individuals from different organisational cultures to share a common vision and a sense of identity...”. Examples of boundary objects are websites, databases, collaborative visualisation software and rapid prototyping equipment. She also found special people that can act as boundary mediators between levels. She found that such mediators played a crucial role as “technology translators”. She concludes with saying innovation

projects seemed to be most effective when they combined the work of boundary mediators with one or more boundary objects.

The lesson according to Kirby is that the effective leadership must clear about the strategic goals before these tools are used. The earlier the connections between a boundary object and a strategic goal are recognized the better in order to allow the collaborative processes to develop. The timeframe is also important. Boundary objects and boundary organizations are collaborative platforms for the various actors to socially construct outcomes that are acceptable to all parties, and that construction takes time to develop. Thus the effective leader must selectively use boundary spanning tools when they match the acceptable pace of change, which in these cases will be measured in months or years. Third the effectiveness of boundary-spanning tools are affected by stability of the environment in which they operate. In periods of relative stability and comfort, there is less motivation for the actors to engage in purposeful change which diminishes the effectiveness of these tools since they require active participation. Fourth, these tools are for systems approach. Fifth, there are certain attributes that a boundary object must possess for use in purposeful change. Sixth, all participants do not have to recognize an object as a boundary-spanning object, nor understand its properties for it to be useful but all must feel ownership and participate in its creation and use. Seventh, boundary organizations need some flexibility and autonomy. The actors working with the boundary organization must relinquish some individual control in order to arrive at some agreed upon function for the organization, derive a collective intentionality about what to do together and create constitutive rules that make the function of the organization possible. It is about giving up some control for flexibility and improved problem solving. Eighth, boundary organisations and boundary spanning objects only exist through sustained interaction and perceived usefulness by all parties, and thus it is difficult to maintain them over an extended period of time.

Boundary Object Property	Condition Met?
Satisfies information and coordination requirements of all parties	Yes
Integrity of interests of each stakeholder maintained	Yes
Object is useful in each party's social world	Yes
Purposeful with some assigned function	Yes
Constitutive rules exist to make possible function of object	Yes
Designed to support relationships and participation, not single user	Yes
Process is as important as the object produced	Yes
Participants can change the object or contents to keep it relevant	Yes

Different kinds of boundary objects serve different communication needs. This is the gist of Carlile's association of boundary objects with the classical communication distinctions of syntax, semantics and pragmatic boundaries. Carlile has developed a framework that describes three progressively complex boundaries- syntactic, semantic

and pragmatic based on Shannon and Weaver from the late 1940's. He combines this with three progressively complex processes – transfer, translation, and transformation. Linking these concepts to what has been said before means that transfer requires highly codified information like the algorithms Martin mentions to be effective and heuristics have the interpretive character of translation and possibly transformation.

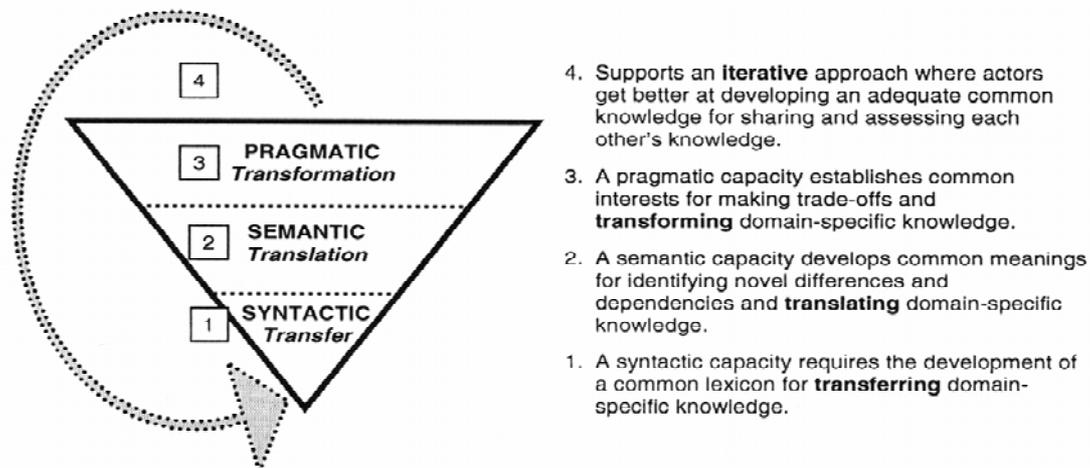
In figure 7 each type of boundary is categorized, showing the relative complexity of a boundary according to “knowledge properties”. The figure also shows three types of processes – transferring, translating, and transforming – associated with each type of boundary. At the bottom of the inverted triangle a syntactic boundary is faced, and when knowledge is transferred according to a common “lexicon”, domain specific knowledge can be efficiently managed across the boundary. As novelty arises, new differences and dependencies exist that need to be identified and their consequences understood. At a semantic boundary, a process of learning about and translating domain-specific knowledge establishes common meanings that become adequate for the actors involved to share and assess their knowledge. If a semantic response does not resolve the problem, then a pragmatic boundary is faced. What is now required is negotiating and transforming both the common knowledge and the domain-specific knowledge used in the past. Here common interests are developed that allow actors to address the consequences, differences and dependencies of each other's domain-specific knowledge. Although the line between each type of boundary is clearly demarcated in figure 7 the transition where one ends and another begins is not often easily identified by the actors involved. Further, the purpose of the hierarchical representation in figure 7 is to recognize that as we move up in complexity, the process or capacity at a more complex boundary still requires the capacities of those below it.

Since the issue at hand here – managing white fields – is about dealing with pragmatic boundaries it is interesting to note what Carlile mentions about them. Four characteristics describe the capability required at a pragmatic boundary. The first is the development of a common lexicon that actors use as they share and assess each other's knowledge. The second is that the actors involved need the ability to identify and learn about new difference and dependencies between them when novelty is present. The third is a transformation of actors' domain-specific knowledge so they can work effectively together. Being able to propose, negotiate, and transform knowledge lies at the heart of the trial- and error problem solving at a pragmatic boundary. The fourth and last characteristic of managing knowledge at a pragmatic boundary is that it requires multiple iterations.

“Objects, models, and maps” are the only category of boundary object that directly supports transforming knowledge. Not only are these types of boundary objects the most helpful in dealing with pragmatic boundaries, they are also the most complicated and expensive to establish. However, what should also be recognized is that all three categories of boundary objects have a portfolio effect; repositories and standardized forms support the use of objects, models, and maps as well as support processes to manage knowledge at a pragmatic knowledge boundary. Further, the knowledge

transformed and created through the use of objects, models, and maps can then be used to enhance the content of shared repositories and the use of standardized forms and methods.

Figure 7. 3-T Framework and the Four Characteristics of a "Pragmatic" Boundary Capability



This discussion is relevant for Skåne in at least two ways. The first is that the management of “white fields” probably requires both boundary mediators and boundary objects. The second is that Malmo university college has a research profile that enables and facilitates the creation of the more advanced types of boundary objects in collaboration processes. This also relates to the usefulness of Living Labs in relation to White fields because white fields involve transformation and therefore requires “high-powered” boundary objects. However, there is a limitation with boundary objects and that is that they are often short lived. For transformation to be implemented there is a need for brokers/boundary spanners as well as an organizational platform.

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4 Skåne's Clusters and Cluster Support Policies

Phil Cooke

4.1 Introduction

The idea of the regional innovation system as a self-organising, geographically-focused but open system by which knowledge is explored, examined and exploited by firms, in particular, is far from being achieved in most regions. However, a few, among which is region Skåne have ambitions, based on some accomplishments to achieve just that desirable state of affairs. Economists refer to such self-organisation as *autopoiesis*. Markets are often thought to display key features of autopoiesis, as writers like Hayek proposed; that is they show certain spontaneous interactions and evolutionary growth that are willed by no identifiable source of authority. Today, however, it is understood that self-governance of that kind scarcely exists in markets, except perhaps near the peak of the boom. Generally, markets rely on regulation and rules of the game to function properly, if at all. They are beset by pervasive problems, notably asymmetric information that can paralyse market activity. So the ideal of a well-functioning regional innovation system is to achieve a good fit between public regulation and business enterprise and innovation. Innovation is widely seen as the dominant factor in increasing factor productivity, which in turn determines rates of economic growth. The judicious regional innovation support services assist firms to anticipate shocks and proactively help firms gain synergies from innovative knowledge-sharing that does not infringe market rules in being largely pre-competitive in nature. This function involves engaging firms in regional consensus-building about policy, the envisioning of promising lines of collective economic opportunity, and the catalysing of regional assets of value to firms and the wider community.

Accordingly, in this chapter three main tasks will be attempted. First, accounts will be given of the nature and extent of clustering in the five most prominent clusters or clustering exercises in Skåne region. These five are: Life Sciences; Agro-food; ICT & Mobile Heights; Moving Media; and Cleantech. In describing these, attention is drawn, as appropriate, to lead-firms or agencies and their special characteristics, the scale and degree of integration of the cluster ecosystem, the role of supporting private and public actors, and the chief markets with which cluster firms are aligned. Second, the status of each of the five is assessed from the viewpoint of whether or not they are already or have potential to become functioning clusters. This involves assessment of the importance of geographical proximity to inter-firm interactions, the role and function of knowledge institutions in cluster activity, and challenges as well as assets of both the studied clusters and the policy support and private governance that are displayed. The

third section of this chapter will draw together the main features of the foregoing assessment as a prelude to the outlining of a policy model, with variations, that should assist region Skåne to become a catalyst for innovation in the regional economy, thereby making a significant future contribution to the economic accomplishment of the clusters and the broader regional innovation system.

Life Sciences

As will be seen there are many overlaps between life sciences and agro-food in Skåne region and the wider Öresund region, notably Medicon Valley. The core of life sciences activity is, though, healthcare rather than food. Thus at IDEON science park in Lund is located a major research facility of the UK/Swedish pharmaceuticals firm *AstraZeneca*. Over 1,200 people work at this state of the art R&D facility in Lund where efforts are focused on respiratory diseases such as asthma, rhinitis and chronic obstructive pulmonary disease, as well as inflammatory diseases such as rheumatoid arthritis and osteoarthritis. Sadly, it is planned to be closed by 2011.

Collaborations are common in the modern pharmaceuticals business but company data show these to be stronger elsewhere in Sweden or with UK firms that start as partners and end up being acquired (e.g. Cambridge Antibody Technologies) than with Lund IDEON firms. Recent Collaboration includes Albireo - February 2008 AstraZeneca and Nomura Phase 4 Ventures announced the signing of a deal to form Albireo, a company focused on developing new treatments for gastrointestinal (GI) disorders.

Albireo, based in Gothenburg, Sweden, has secured one clinical and a number of pre-clinical GI programmes from AstraZeneca as well as several researchers with extensive experience in AstraZeneca's GI Research Area. The spinout is a result of AstraZeneca's previously announced strategic decision to concentrate on Nexium® and internal GI research focused on Gastroesophageal Reflux Disease (GERD). *Albireo* raised \$40 million from a syndicate of growth capital firms, led by Nomura Phase4 Ventures, and joined by TVM Capital, Scottish Widows Investment Partnership and TPG Growth, all external specialist investors in the healthcare markets.

Under the terms of a further new partnership deal, Cancer Research UK's highly experienced Drug Development Office will conduct the clinical trials on new cancer therapeutic candidates at no cost to AstraZeneca. In addition, AstraZeneca retains the option to assume further development and marketing of the drug, with the charity receiving a share of any revenues. Potential downstream royalties have not been disclosed In 2007 the company acquired the leading US biotechnology specialist in biologics. AstraZeneca's acquisition of *MedImmune* together with the *Cambridge Antibody Technology* team and AstraZeneca's own biologics experts, accelerates the delivery of their biologics strategy, bringing critical new capabilities in discovery, development, regulatory, manufacturing and sales.

AstraZeneca in 2006 made the strategic acquisition of Britain's leading antibody therapeutics firm *Cambridge Antibody Technologies*. This is now a wholly owned

subsidiary of AstraZeneca, aiming to bring improvements to seriously ill patients' lives through its global leadership position in the discovery and development of human therapeutic antibodies. Working in tandem with the firm's existing small molecule organisation, it aims to provide candidate drugs to fuel a late stage development pipeline and, thereby, a strong flow of new medicines.

It is worth noting that the IDEON science park and Medeon incubator at Lund hosts numerous biotechnology start-up and spin-off firms. However, biotechnology is a vast platform, even if we just focus upon healthcare. Lund firms are active in areas the AstraZeneca is not such as regenerative medicine, especially regarding artificial bone stimulation and related technologies. Accordingly, there is, in effect, no localised supply chain. Moreover, since IDEON's biotechnology SMEs are in different strategic niches there is not a great deal of partnering or inter-connection to be found in operation there. Hence AstraZeneca's closure will release talent on to the biosciences labour market but not significantly hurt sales of biotechnology SMEs.

Notably, a number of IDEON's biotechnology firms specialise in functional food, which despite its health claims is rather far away from the medical therapeutics of other firms in the vicinity. Nevertheless, in line with the platform analysis the international team has been informed by, the co-existence of distinctive biotechnologies in the region means Medicon Valley offers good opportunities for training and attracting biotechnology talent in general.

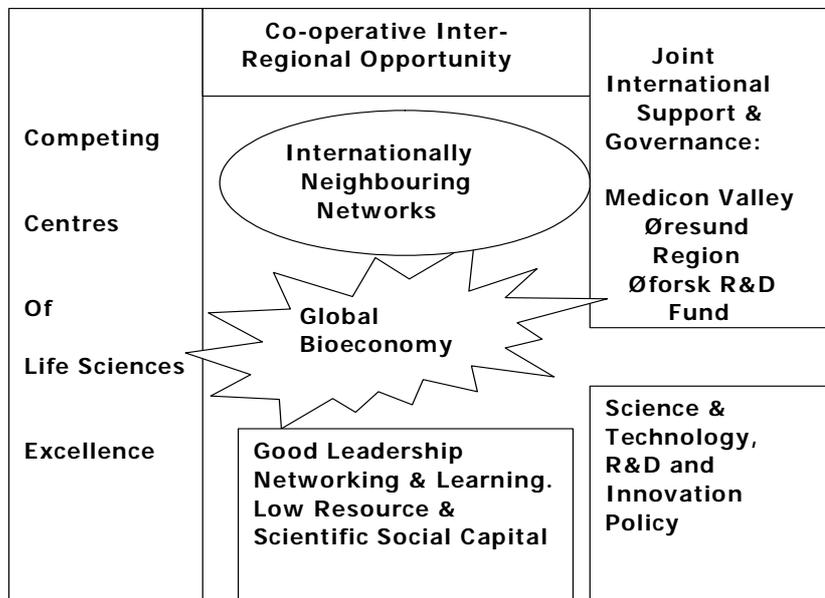
For Skåne region, Medicon Valley is an important factor which it shares as a cross-border innovation system focused on life sciences across the Öresund with Copenhagen. Numerous large and small biotechnology firms are found as members of the Medicon Valley Alliance that governs the cluster. Indeed one of the key features of Medicon Valley is its non-governmental governance structure.

This is summarised below because it is an important indicator of the prospects for private governance of Skåne clusters, which the international assessment panel believes can be a future strength and distinctive characteristic of the regional innovation system in Skåne. This recognises the crucial role of the public sector and public investment at the outset of the cluster-building process but suggests there is surprisingly widespread evidence across all clusters surveyed of the strength of private innovation and governance initiative in running Skåne's clusters.

This is a mainly healthcare biotechnology regional innovation system, but it exists across the international border between Sweden and Denmark. There is no Medicon Valley government but there is a slightly bewildering series of overlapping and interlocking governance mechanisms managed mostly by the bioscientific community or its agents. As Figure 8 shows The Medicon Valley Academy governs the system in question. This is drawn from the membership of the Medicon Valley Alliance. The membership of the Medicon Valley Alliance includes all the relevant and receptive university faculties from institutions on both sides of the Öresund region, university and

other important hospitals are among the membership, as are the counties responsible for services, including construction of urban infrastructure in Malmo-Lund on the Swedish side and Greater Copenhagen on the other.

Figure 8. Medicon Valley: successful private cluster governance



A third group of members of the Medicon Valley Alliance are the pharmaceuticals, medical technology and biotechnology companies that exist within the system. In terms of service providers, investors, clinical research organisations, science parks and business specialists can be members of the alliance while bioregions, companies and other relevant organizations can be external members of the network. The *Öresund Identity Network* manages the ‘branding’ activities required by the membership and *Øforsk* funds regional research of relevance to Medicon Valley. Envisioning and networking are two key strengths of note with learning and innovation as core objectives of the consortium.

Hence, it is clear that in complex and rapidly changing contexts a portfolio of governance styles for challenging contexts is available either as a predominant model of transition governance or of a more occasional approach to be taken as circumstances require. Hence in this section it is shown that effective governance of innovation can be managed through private governance models. However, good networking capabilities mean that governmental bodies are welcomed as members, supporters and ambassadors for the specific private model selected.

Agro-food

An established regional agro-food innovation network has been in existence since 1994. On the basis of this established experience, a bid was successfully submitted to VINNOVA’s *VinnVäxt* programme. The tendering protocols required that successful

bidders would need to display important technological knowledge and innovation capabilities. Accordingly 'Food Innovation at Interfaces' (now Skåne Food Innovation Network - SFIN) displays a strong research-technology led governance structure, with an emphasis on Functional Foods (biotechnologically-derived) and Food Processing (e.g. cook-chill technologies for institutional markets). However the successful bid found no space to embrace the regionally and internationally (Öresund) growing institutional and direct consumer markets for Organic Foods. The reason for this is that eco-farmers were perceived as sceptical of science and technology, overlooking the fact that organic food production frequently involves use of biotechnologies like molecular or DNA markers. This misunderstanding possibly warrants criticism of the 'scientism' explicit in both the VINNOVA call and the Skåne food cluster response. Nevertheless, the bid for €3 million over three years was clearly considered outstanding by VINNOVA and the cluster support programme began. Subsequently, equivalent funding for a further seven years was successfully sought.

The methodology adopted a clear focus on functional food, the integration of Engineering (food technology), Management Science and Nutrition Science. The partnership demonstrated exceptionally close links in functional food development and marketing between University of Lund food and management scientists alongside firms with track records in producing functional foods that were claimed to have beneficial health effects. The high focus on functional foods and the presumed future healthy food markets meant close relations between management and nutrition science regarding the marketing of products, product placement and shelf-display techniques in supermarkets.

With respect to Conventional Food innovation, large companies like Findus frozen foods are among the 33 members of the initial cluster partnership. These and other firms developing better flavour and nutrition solutions to the provision, particularly of institutional food, are therefore present but not dominant in the cluster and they can interact on research as needed. Thus in both main dimensions i.e. Functional and Conventional Food, there is a strong focus on potential growth markets in healthy foods. Accordingly, there is clear consciousness of future skills needs and the imperative to utilise technician training modules already worked out and available for implementation.

This is reflected in a growing PhD research programme in functional food technology. The academe-biotechnology push is very pronounced, addressing a perceived research-industry gap, rather inwardly focused on research alone. Nevertheless, the Triple Helix approach consciously adopted in light of *VinnVäxt* requirements could be said to be somewhat unbalanced with less than 40% of Skåne agro-food industry engaged. The exclusion of Organic Food interests, despite its fast market growth and noted interaction with aspect of Science & Technology e.g. breeding, genetic selection was rather dubious, but has since (by 2010) been corrected. Despite this and the desire to look outwards to at least the regional food network, better external Branding is needed and it could be said the cluster was slow in opening out internationally, although in due course the organisation in Skåne region International Food & Health Conference and presence

at other international food and cluster conferences elsewhere (e.g. Turkey) are commendable.

In terms of clustering, we find that links between the small number of Functional Food partners, mostly academic, to be well-integrated and connected to each other. We further find weak ties between the academics and some food processing firms to be present. However, despite the current image-slogan expressed in the Skåne region food cluster of full interaction 'From Farm to Fork', research commissioned by the region into utilisation of this familiar strapline showed otherwise. In terms of network centrality direct firm links to farms are virtually non-existent. Rather processing firms have as their most important partners, for the most part, those in food warehousing and distribution.

This strongly suggests SFIN has more the character of a set of distinct but somewhat anonymous supply chains rather than the horizontal, strong and weak ties model most typically found in a functioning cluster. Another way of expressing it more favourably is that among these relatively anonymous market relationships are found a few tighter sub-system arrangements such as that described for a relatively few firms but more academic researchers in the Functional Food sphere.

ICT Cluster and Mobile Heights

Concerning *overlapping sectors* new media and moving media are closely related to the ICT and media industries. In Skåne there is a relatively long tradition of both these sectors. Regarding ICT, Ericsson and later Sony Ericsson, Ericsson Mobile Platforms, Faculty of engineering at Lund University, and Ideon Science Park are important players. Sony Ericsson is for instance developing and producing knowledge of digital platforms. For media industries, regional newspapers, national television production studios and publishers of books and other printed media are important in the region. There is also at least one distributor of interactive entertainment products based in Skåne.

Mobile Heights is an initiative since 2007 proposed by Ericsson Mobile Platforms (EMP). Two problems for EMP stimulated this approach to the region. First, EMP had a downsizing problem, which can be an opportunity for entrepreneurship, especially in the telecoms industry where many spin-offs may form as staff are laid off, e.g. Richardson, Texas shows this characteristic repeatedly. The second problem was declining research budgets in mobile telephony. Both processes threatened the future of EMP in Skåne region. Mobile Heights was set up in 2008 and made an independent company in 2009.

Mobile Heights is a cluster initiative, not a cluster. Policy makers have the aspiration that the initiative should lead to a cluster being formed in the advanced mobile telephony industry. It embeds university research, firms and intermediaries like Skåne region. The strategy is to create 50 new firms and 2,000 new jobs linked to SEK 200 million R&D by 2013.

Five functions are envisaged in the strategy:

- Knowledge Development – university and private labs
- Skills Provision - joint actions on higher technical talent formation
- Cluster Expansion – start-up screening and establishment, relocations and an incubator ('excubator')
- Commercial co-operation – joint marketing and international branding
- Communication – creating an image for Mobile Heights at home and abroad

The management of the cluster initiative involves higher education institutions, branches of Ericsson, LTH, Telia Sonera and Skåne region. There are two specialised research centres involved in Mobile Heights: these are *System Design on Silicon* (SOS) and *Embedded Applications Software Engineering* (EASE) both based at Lund University Faculty of Engineering. A third centre focused on mobile services and applications is under way. As noted, small firms are expected to join the cluster. Research centres active in silicon design, integrated software and services research are also involved in the Mobile Heights set-up. Through Baltic Sea Region (BSR) Inno-Net it is networked to similar telephony communities in Denmark, Poland, Finland and Latvia. Open innovation is reported to be the underlying philosophy driving the cluster forward into the future.

The international evaluation team is of the opinion that more attention should be paid to external, especially marketing, relations through the adoption of a Strategic Niche Management approach for Mobile Heights to develop. Moreover, it is concluded that closer involvement of members in strategy formulation with facilitators of Mobile Heights would show in earnest the ecosystem-like network of interactions typical of the well-functioning cluster. At present neither of these assets is on adequate display (compare Moving Media below). However, cluster cross-pollination moves were made between Mobile Heights and GPS cluster Future Position X (FPX) from Gävle in early 2010.

Moving Media

New media is different from traditional media mainly in the three following ways; (1) the diversification of media forms, content and channels, (2) the personalisation of media content, and (3) a shift from consumption to production. It may be argued that it is misleading to call new media a sector since it is a diverse and complex set of activities that is linking up with other industrial sectors both in terms of technology and content. Furthermore, new media activities are constantly changing and developing. It may therefore be more accurate to see new media as a platform of activities requiring platform policy support. Despite the diversity, there are common characteristics of new media, e.g. that it integrates still and moving images, text, graphics, pictures, sound and data electronically and even animation and interactivity. The difficulties with identifying new media as a sector also become clear regarding defining it in terms of statistical classifications. The classification used in this study was made for the purpose

of the development of a strategic programme for *moving media* in Skåne and Blekinge (Table 4). Here, we focus on moving media rather than ‘new media’ since moving media is the terminology used for the strategic work in Skåne.

We define Moving Media as a ‘sub-sector’ and an attempt has been made to capture a rather specific group of firms and individuals focussing on ‘symbolic knowledge work’. Looking at employment figures it is a very limited sub-sector. It employs around 5 100 individuals in Skåne, or 1 % of the employment. However, despite its small size, the sub-sector is interesting because moving media companies and individuals interact with companies and institutions belonging to other sectors, e. g. ICT and tourism. This platform interaction, where moving media firms are involved contributes to innovation and value added in several sectors. Furthermore, new media is a growth sector in Skåne, particularly moving media. The growth builds on existing actors e.g. the regional film production centre *Film i Skåne* in Ystad, and a growing and thriving sector of companies in mobile user interface and computer games.

Here, in Moving Media, we focus on the production side, but with links into distribution and consumption particularly in relation to film tourism. On the production side, game development and film production are important but TV production is also important in Skåne. Actors in the production phase include firms as well as freelancers. Firms and freelancers in the ‘infrastructure’ phase of the production process provide various types of technical or specialised and strategic services. These can include sound specialists that are hired by a game development company or graphic designers hired by film tourism companies. In terms of the market channels in the model, these can include suppliers within TV who play an important role in film tourism.

Table 4. Components in the supply chain for moving media

Production process		Market channels	
Production	Infrastructure	Distribution	Consumption
TV-production	Production techniques	Distributors	Dealers
Film production	Graphic design and animation	Publishers	Online sales
Game development	Software development	Operators and suppliers within Internet, TV, mobile telephony	Interactive consumption
	Moving media-related advertising agencies	Events	Cinema
	Studios		Film and game rental
	Management		

Film tourism also takes its point of departure in the new media sector and the sub-sector moving media, more specifically in film production in Skåne. The basis for film tourism in Skåne lies in film production activities and hence moving media is the primary sector. Tourism is seen as a secondary but necessary and related.

Film production in Skåne has from a limited basis experienced a major increase in the last decade. There are deep roots of film making in Skåne dating back to the very first studio films being made in Sweden in 1909. The tourism sector is also has a long tradition in Skåne and it is a strong and important part of the economy. *Skånska Filmproducentföreningen* represents 16 film production companies based in the region. These companies span over the entire spectrum of film productions; short, documentaries, features, animated films. Some are also involved in producing adverts, and music videos.

Computer Gaming

Moving media and game development have a development path from within the south-western part of Skåne. The historical roots of game development can be found in information and communication technologies, later integrated with software providers of applications and creators of media content. Malmö has a tradition within 'old media' in the shape of the newspapers, publishers and also publishing of comics and games for children and youth. Lund, on the other hand, is both a university and industrial city where particularly the strong ICT sector including education, research and major firms such as Sony Ericsson and Ericsson Mobile Platforms contribute an important element of continuity with regards to the moving media and game development activities. Fourteen of the 91 firms in Sweden that state that their main activity is computer game development are located to Malmö or Lund.

Key actors in the area of moving media and game development are higher education institutions such as University of Malmö and Faculty of Engineering at Lund University (LTH), public actors such as the City of Malmö and Region Skåne and a number of companies. In the region there are both providers of software and hardware producers. Another important key actor within moving media is SVT, the national Swedish public service broadcaster. Their Malmö office is moving into the Västra Hamnen area where a new complex called *Moving Media City* is being developed. An important stimulant here is SVT's new production policy to buy a greater share of products from other producers. This opens up the market for content producers within moving media. The Department of Art, Culture and Communication (K3) Malmö University offers education in the field. Students at K3 have work placements for example at game development companies. Several members of staff at K3 are also entrepreneurs running their own firms. There is also a Game Academy in Malmö. It is an Advanced Vocational Education and Training of 2.5 years run by the education company *Hermods*. The MINC incubator helps commercialise ideas from the University of Malmö as well as from entrepreneurs with other backgrounds. New media firms are a priority for the incubator. A recently established game development firm here is, for instance *Ozma* game development run by two women. Furthermore, VINNOVA has co-funded Living Lab New Media in Malmö University, which is hoped will result in new competitive IT based game development services. Since 2004 Malmö University has also had a knowledge partnership with Massachusetts Institute of Technology (MIT). The project 'Agent 'O' is a game built upon a platform developed by MIT Teacher

Education Programme as a so called “Augmented Reality Outdoor GPS based Game”. The game is intended to be used for classes for sustainable development, chemistry and technology. *Awnic*, the firm that now owns Agent O is a spin-off from the university, and is a small company working with game development.

There is also education concerning game development in neighbouring regions. In for instance Blekinge there are several education institutes, for instance the Blekinge Institute of Technology and Hyper Island that offer education programmes of relevance for game development.

Media interaction in Skåne includes several game development companies and also national, regional, and local policy initiatives related to moving media. There are for instance related initiatives from the Regional Structural Funds Programme 2007-2013, in which moving media is one focus area. The cluster development platform Moving Media Southern Sweden (MMSS) initiated by Tillväxtverket, Skåne regional council and the neighbouring region Blekinge also aims at stimulating innovation and creating companies in the moving media sector in the two regions. The Media Mötesplats Malmö (MMM) funded by the national actor Knowledge Foundation, Region Skåne and the City of Malmö also provides an arena for developing media, by providing for instance competence and business development. Here it is important that actors from other parts of Sweden and from overseas are included in the projects.

The project Nordic Game Programme financed by the Nordic Council of Ministers is an important actor that among other things enables participation of game development companies at international conferences and fairs and also provides financial development support to game development companies. The project also organises the annual Nordic Game Conference, located in Malmö, an important meeting place for individuals and actors within game development from many countries.

The re-location of a number of companies or institutions of relevance for game development, such as Swedish television, the incubator MINC, Malmö university, the MMM, the Nordic Game Programme to the Western harbour area (Västra Hamnen) implies that the cluster distance between those actors is short.

Film Tourism

Film tourism in Skåne is an interesting growth area that is developing through the interaction between different actors and activities. There are a number of key agents, institutions, organisations and firms within the film sector in Skåne. In film production, the regional production centre *Film i Skåne* is important and is active within the production of feature films and TV drama series, short and documentaries in addition to media pedagogic film activities. Public funding from the national, regional and local level is supporting production activities in addition to private money. The public money is of importance for ensuring that film teams shoot in the region and employs staff. This may be seen as a way to anchoring of knowledge in the region. The international co-production of films that is increasingly the norm, and the pattern in the case of the major

film projects in Ystad, generate film production teams that are built up by people from many different places. Film teams consist of people from many different places and countries, and that in Skåne, the closeness to the capital region of Denmark is particularly noticeable in the film teams. The *Oresund Film Commission* promotes Skåne and greater Copenhagen as a location for shooting films. The non-profit organisation provides services free of charge for film teams that wish to shoot in the region. The Commission is part funded by ERDF through InterReg, and through public authorities on both sides of the border.

Skånska Filmproducentföreningen represents film production companies based in the region. These companies span the spectrum of film productions; including, shorts, documentaries, features, and animated films. Some are also involved in producing adverts, and music videos. There are also other film companies in the region that are not part of this association. Of these, *Yellow Bird* founded in 2002 and from 2007 owned by *Zodiac Television* is the production company that has had largest effect on the film sector in Skåne. The company was established in Ystad with a plan to focus on projects larger than one individual film to be able to collaborate and co-produce with international broadcasters. The success of *Yellow Bird* started with the project of producing 13 films based on Henning Mankell's books about Inspector Wallander of the Ystad police.

The three key actors for developing the marketing collaboration known as *Film Track* are Cineteket, Hasse & Tage Museum and The Regional Museum. Cineteket is located in Ystad. This public-private partnership runs a film related experience centre. The base for the activities was the fact that the Wallander films were shot in the studios next to the centre. The municipality of Ystad actively supported the shooting of the first Wallander films in 2003 and aims to develop Ystad into a film friendly place by offering training programmes. A film coordinator has been hired by the municipality. The municipality also started *Cineteket* as a project that has now developed to a public-private partnership.

The involvement of private actors, such as the local savings bank *Sparbanken Syd* shows film production is perceived as having economic and symbolic value for both local and regional development.

Regarding education and training, the 2 year film worker programme exists at Skurup Folkhögskola, and the two new Masters programmes based in Ystad are run by the University of Lund and Malmö Academy of Music. These programmes are in film production and in composition of film music.

The basis for film tourism in Skåne is the fact that films are shot in locations across the region and in Ystad studios. Within the framework of the national policy to support film productions in Sweden a regionalisation of film production has taken place. This process started in 1997 and has developed in various ways over the years. From a national point of view, regionalisation is driven by the cultural policy aim to facilitate

for story-telling from all over the country by many different actors to be told in film media.

Film Track is a leading film tourism production initiative, which represents collaboration between three different attractions; two publicly owned museums and one publicly owned visitor attraction that has developed in to a public-private partnership. The collaboration is related to marketing and exchange of ideas and has deepened into a product development collaboration. It is also an example of interpersonal and inter-organisational relations.

Moving Media has some embryonic cluster characteristics, especially in co-operation among multiple actors. However Computer Games and Film Tourism are separate, small sub-systems rather than a significantly overlapping set of skills. They are differently located and of distinct character, the former more in the market, the latter more publicly dependent. Both nevertheless are selling the region innovatively and with interesting external relationships such as MIT and Öresund with Copenhagen.

Cleantech Cluster

This is an aspirational not an existing cluster despite the region recognising the future potential and importance of Cleantech in setting up its *Sweden Cleantech Incubators* (SCTI) in 2007 after its *Sustainable Business Hub* (SBH) in 2002. There are some 80 member firms in the initiative. Inevitably these come from many distinctive industries. Yet because of their common interest in sustainability and contributing to the moderation of Climate Change they have transversal innovation potential as a major regional platform.

Member firms include the likes of; Airglass, Airec, Arc Aroma Pure, Beakon Technologies, Bio-innovation (Binab), Bioglobe, Bioprocess Control, Compower, EkoBalans Fenix, Magnetic Components, Noda Intelligent Systems, Ocean Harvesting Technologies, Split Vision and Zemission. SB Hub manages the operational development of growth and exports in existing regional Cleantech companies.

Clearly, there is substantial overlap into other cluster areas, notably Life Sciences, given the presence of numerous bio-businesses. Other cross-fertilization potentials lie in the direction of software, controls and systems design from the ICT platform. Main partners in SCTI are Teknopol, a technology park management agency owned by Sweden's Innovationsbron agency while SBH main partners are Skåne region and the City of Malmö. Both aim to induce new businesses and business in the Cleantech market regionally, nationally and internationally. Developing inter-firm and firm-agency connectivity is envisaged as a major support factor to building up the industry to become a well-functioning cluster.

Unlike some Skåne region cluster initiatives, the membership, each with one vote is fully engaged in the democratic process of representing firm and cluster needs while influencing the final form taken by the Cleantech strategy for the region. The

international assessment team was of the opinion that this cluster initiative has good potential and needs an operational cluster strategy to assist firms cross industry divides mentally and in terms of possible joint actions. SCTI has evolving contacts with other relevant initiatives in Switzerland, Norway, the US and Finland. Other international collaborators include Cleantech Group, WWF and The Natural Step.

SCTI has a large Cleantech contract with German power generator *E.On*.

4.2 Towards an Integrative Regional Innovation System in Skåne

We may summarise the challenges and assets of the prefigurative Skåne regional innovation system as follows:

Challenges

- Relatively low internal integration within clusters
- Small numbers of active firms, even in well-populated clusters
- Inadequate branding of clusters
- Fragmented and sub-optimal innovation support bodies
- Absence of clear regional innovation strategy

Assets

- An active and informed regional development agency
- Industries that show some innovative overlaps, and others with potential
- Existence of some important global firms
- Good international links, notably Medicon Valley
- Presence of numerous leading edge creative and high technology ‘clusters’

In circumstances such as these, which evolutionary economists describe as displaying ‘related variety’ of industry, an important policy challenge concerns whether stimulating synergies across clusters as well as within them has value. Where, as in Skåne, cluster candidates display related variety the policy support can usefully draw upon the ‘matrix’ methodology to help firms explore synergies.

Often realisation that a regional economy has potential for this comes when some overarching, integrative vision is expressed and achieves consensus among key economic actors. The most obvious instance of this is widespread and deeply-rooted concern about environmental matters like sustainability and climate change. A Green Vision can give rise to a Green Economy. Another such ‘Grand Challenge’ is Healthcare, involving recognition that populations are aging and markets exist for innovative solutions to dealing with issues arising from this. Yet another is recognition that the Creative Economy is an increasing element in economic activity in general and that what was once taken for granted as mainly a consumption activity can have value as a production activity. At least two, possibly three, if the Risk & Security industry (not studied here)

in Skåne is included of these potentials have been recognised and support actions taken in region Skåne. This is an exceptionally high score for any region, let alone one which is sometimes – wrongly – perceived (even self-perceived) as peripheral.

The Matrix Approach

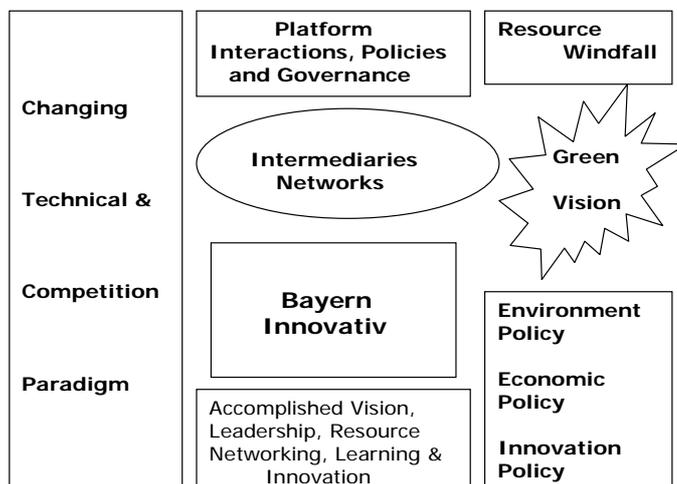
Fundamentally an appropriate model is one that is not only reactive to external shocks, as many are, but one that shows capabilities in the proactive dimension.

Bayern Innovativ

Such a model is found in Bayern (Bavaria) Germany as summarised below and focused upon the platform-building activities of *Bayern Innovativ* a governance agency for regional development (Fig. 9) based in Nürnberg. Here the agency identified key industries that were beneficiaries of cluster policy paid for by Bavaria’s resource windfall when it sold its share in the regional energy supplier. These were cross-tabulated against key technologies to find the inter-disciplinary and inter-industry innovation potentials of ‘related variety’ in the regional economy. Many innovations (on average 10%) have ensued from the over 1,000 per year ‘conversations’ facilitated between neighbouring sectors concerning technological co-operations, applications and resulting innovations. Part of the new platform thinking involved recognition of the importance of enhancing sustainable development, as part of a new green vision concerning renewable energy and clean technologies.

Figure 9. Proactive Platform Governance of Innovation

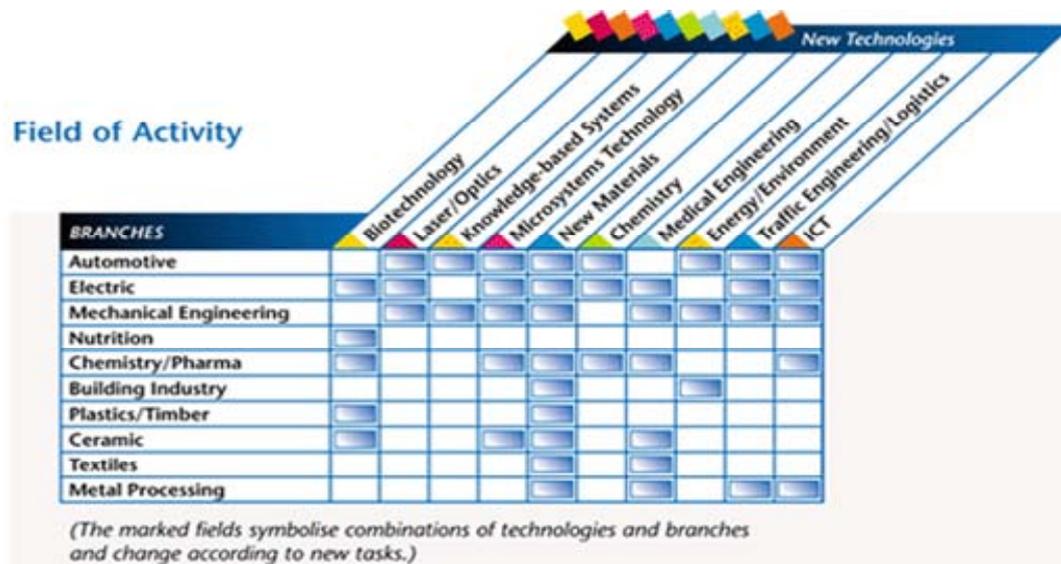
Proactive Platform Governance



How does *Bayern Innovativ*’s proactive regional innovation policy work? Fig. 10 gives an indication whereby matrix management of potential innovation opportunities at intersections between industries, some having been beneficiaries of earlier cluster programme investments, and technologies occur. These are points where conversations among distinct and by no means obviously neighbouring business sectors are facilitated.

Accordingly, where these facilitate personal discussion between experts and customers, sustainable cooperation networks are developed. More than 1,000 new co-operations are initiated annually. Examples of the roughly 10% of marketed innovations arising from these co-operations include:

Figure 10. Bayern Innovative Technology Platforms



Source: www.bayern-innovativ.de

- *Laser technology* adapted to beam nanoscale droplets onto microarrays for rapid bioanalysis
- *Mechatronic systems* for car engine management that have been transferred to bus steering systems
- *Portable fuel cells* that have been applied in automotive electronics
- *Plastic injection moulding* processes from button manufacturing which have been implemented in automotive plastic components
- *A logistics and transport* company that has secured a contract with one of the world's largest Internet suppliers
- *A technical textile producer* won a contract in medical engineering.

Hence, *Bayern Innovativ* initiates business-driven project co-operations across disciplines and branches, taking into account the latest results from the scientific community. Over the past decade the agency has forged new pathways and created a portfolio of cooperation platforms and networks that have generated an extended, sustainable network structure. Both the platforms and the networks are in demand at regional, national and international levels.

EcoPlus: Lower Austria

It is worth noting that this approach may have been pioneered in the late 1990s in Upper Austria where a *Technology Policy Matrix* cluster programme was first implemented. Unlike the BI approach that in Lower Austria is thematically formed into a matrix policy structure by infusing each member cluster with the common goal of enhancing 'sustainability'. There are nowadays five key clusters evolving and receiving support around the theme of eco-innovation. These are, respectively:

- Green Building – the economic hub of a network of appropriate firms in the region's green construction industry. The cluster team includes architects, energy experts, building and interior design professionals. The cluster is coalescing towards energy and environmental technology fields
- Automotives – companies are supported in; internationalisation, qualification and co-operation with research facilities.
- Food Cluster – supporting the regional food industry, from farm to fork. Food quality, safety, organic and regional products are supported and promoted.
- Logistics - this involves shippers, transporters, and logistics services to enhance transport bundling, reduction of empty journeys and more efficient transport and shipping.
- Plastics – an inter-regional cluster also involving the Salzburg region. Development of bioplastics and fibre composites (biofibres). Expansion into medical technology and recycling is planned.

Finally, two further variations on matrix or transverse innovation methodology are practised in north Jutland in connection with the interaction between energy suppliers, engineering industry, renewable energy producers and the agro-food industry, and Marche region, Italy, in connection with a new Nautical cluster, on the one hand, and an eco-community, on the other.

Flexenergi: North Jutland Clean Technologies Support

In this case we see a region of Denmark that has grasped the opportunities offered by the Green Economy over a period of some thirty years. This began with the first experimental wind turbines, production of which began in the early 1970's. Utilising technical knowledge from related and traditional regional industry such as manufacture of agricultural equipment and propeller-making for the shipbuilding industry, the Danes produced a superior, more innovative new technology solution to the problem of energy generation from wind turbines than the main competitor region, which was, at that time, California. The Californian model came from propeller-driven aircraft design while the Danes modelled theirs on the shapes of ploughs and ship's propellers. Learning to point three blade propellers downwind rather than two blades upwind – as typically occurred with Californian technology – proved the superior design. Now local business *Vestas* is the biggest in the world with a 40% global market share.

Figure 11. Flexenergi's Transversal Innovation Models and Projects

Flexenergie Knowledge-sharing Network, DK

- 40-50 Renewables Local Power Stations
- 5 Design projects – key one in Thisted
- Geothermal, wave, waste, biogas, biomass, engineering etc. firms
- Vatenfall, (ng), Aalborg U., Exergi, Velux-Arcon (heating & cooling systems)
 - Brøndeslev (Watenfall + biogas)
 - Jammerbugt (Geothermal + biogas)
 - Markets – Emirates, Spain, Russia, E. Europe

Source: Centre for Advanced Studies

The next steps were the evolution of specialised skills in related industries such as solar energy, biomass and biogas, wave and other marine energy, and geothermal energy. There were subsidies, often to consumers, to invest in renewable energies in these times. Subsequently, established firms like *Grundfos* and *Danfoss* both in engineering began experimenting with, then producing green engineering products. In *Grundfos'* case this also involved lobbying the EU to get tougher standards on the energy efficiency of products like industrial heating and cooling pumps. Other specialist firms like *Velux* (windows) and *Logstor* (pipework) began to pay attention to the renewable energy sector and by the 2000s a network of firms with many complementarities had evolved. This network is now called *Flexenergi* and specialises in the manufacturing of district heating and cooling systems. These are produced for the local market and export markets. They burn combinations of biomass or biogas in combination solar, with wind, sea or geothermal power. Such flexibility is required because perhaps solar or wind energy is inadequate at particular periods and the customised package can compensate for this by bringing other energy forms online as required. Markets have expanded to the Middle East, India and China as well as southern and Eastern Europe. Recently a regional consortium won a Euro 4 million contract with the regionally-managed Danish *VaxtFonden* (User Driven Innovation Fund) initiative to conduct five advanced projects into renewable energy combinations (Fig. 11).

Figure 12. Thisted, Denmark’s second fully-sustainable municipality

Production

- Bach – supplier to Vestas
- Cimbria SKET-oilseed presses
- TVT – biogas plant builder
- Ideal Combi – energy-efficient windows



Consumption

- 150 MW land-based wind power by 2011
- 400 MW sea-based wind power by 2012
- Increased remuneration for wind energy and bio gas
- Subsidies for solar and wave energy
- Reduction in energy consumption in newer buildings
- Tax free hydrogen and electric cars

The Municipality of Thisted

46.000 inhabitants
Approx. 1700 businesses
245 m2 of national park

Source: Centre for Advanced Studies

It is important to understand that this exemplar emphasises more the successful identification of the Green Economy by firms than the leading role of governance and policy in achieving the described outcome. Nevertheless, the role of government has to be recognised in three important ways. First, early renewable energy experimentation and production were subsidised by consumer grants that enabled firms to be able to produce and sell new products like wind turbines to individual consumers, notably farmers. Second, more recently the new regional governance system in Denmark, with devolved control over regional budgets of the national User Driven Innovation Fund is a stimulant to this innovative network in local district heating and cooling systems, for which there is a rapidly growing global market. Finally, as is shown below, efforts by localities of up to 50,000 people to become entirely dependent only upon renewable energy have borne fruit (Fig. 12). Thisted is North Jutland’s second community after the island of Samsø, to become wholly independent of fossil fuels in its energy use. It also has firms producing for renewable energy supply chains, so it is sustainable in production and consumption. As noted above farmers in some cases have diversified into energy production from biogas, the surplus energy from which they sell to the national electricity grid. Most of this initiative in Samsø and Thisted has is at the initiative of the local Communal government.

The New Nautical Cluster in Marche, Italy

This leads conveniently into the penultimate discussion of transversal innovation opportunities, which refers to the prospective for further horizontal interaction among existing and imagined Marche clusters. The desirability of further transversal knowledge transfer for innovation and facilitation of policy, especially given the current

global economic crisis, was identified by the trades unions, and co-operative movement representatives amongst others. This is a clear field in which the regional administration in general and SVIM (the regional development agency) in particular took a leadership role armed with the vision of Marche not as a series of disconnected industrial districts or clusters but as a platform of integrated and innovative industry. To take on this function would imply three key things. First, the region, especially SVIM became catalytic to regional innovation as the sole agent with the necessary legitimacy to invoke meaningful conversations about transversal innovation prospects at both general and detailed levels. The Technology Centres, which are dedicated to the four main regional clusters of Agro-food, Domestic Appliances (and Domotics, i.e. Domestic Robotics); Furniture; and Footwear & Leather were a key resource in the further examination of transverse innovation prospects with individual groups of firms or value chains. Second, SVIM developed a methodology suited to the character of Marche industry and economy culture so that unnecessary interest advancement through knowledge appropriation occurred. Important here was introducing 'rules of the game' to help often highly individualistic family business owners allay fears of confidentiality of intellectual property being infringed. Third the region and its agents were able to secure the support of the financial actors for this new Nautical Cluster venture. As noted, everything is seen as working vertically in Marche. This presumably includes the banks, without which regional renewal would be stillborn. As an earnest of this intention, Marche region assisted three of the four clusters – Domotics; Furniture and Leather to come together, reach agreement on their willingness to collaborate, and implement the Nautical Cluster focused on luxury yacht manufacturing at Ancona.

LEAF Eco-community in Marche, Italy

Finally, the model presented by *Loccioni* of the LEAF initiative shows that related variety can be integrated within one firm. The challenge for SVIM, the region and the new, integrated Technology Centre will be to show it can be achieved for the region. This would allow for possibly new clusters, following the model of the Nautical Cluster, or reinvigoration of established clusters by knowledge transfer and product and process cross-fertilization. This initiative deserves attention because it can perform a 'lighthouse' function for large parts of Marche industry, notably the electro-mechanical, agro-food and furniture industries. *Loccioni* is a medium-sized firm employing 295 and with an annual turnover of \$50 million. Of this 4% goes on R&D, 7% on training and the firm holds 11 patents. The firm is mainly involved in aspects of ICT-based quality control and testing, with interests also in automation, integrated ICT solutions and energy management. The LEAF (Life Energy and Future) initiative is based on the concept that a secure future world is built upon the concept of a sustainable world inter-connecting economy and environment. To this end *Loccioni* is developing Italy's first eco-sustainable community. A primary school powered by photovoltaics has been constructed. The community is fuelled by local hydro-electricity and buildings are equipped with condensing boilers, home automation and integrated lighting. The signature architects Herzog & De Meuron have designed the new research and

innovation laboratory on-site. An experimental carbon-neutral domestic building 'LEAF House' has also been constructed for demonstration purposes. It embodies solar panels, efficient lighting, building automation and hydrogen fuel cells surplus energy storage. CO2 avoided by LEAF house alone and the related eco-developments is some 85 tons per year.

Figure 13. LEAF - Italy's First Eco- community

LEAF House Demonstration Project



The Leaf House is the hearth of the Leaf Community



The Leaf House expresses the concept of living like a Leaf: in the carbon neutral house energy is entirely produced by renewable sources without CO₂ emissions



Leaf House is a laboratory for new clean energy technologies and a place awakening and educating to the future



This is an initiative of great future importance to the Marche region economy since it offers substantial new markets for very many local firms in adaptation of existing buildings and development of new investments utilising the highest Cleantech standards. It is widely anticipated that world markets for such designs will grow fast following the end of the global financial and economic crises. The role of modern regional governments is clear, namely to evolve a strategy to optimise the lead for a cleaner regional future for the region and beyond.

5 A Learning Based Approach Towards The Regional Development of Skåne¹

Marjolein C.J. Caniëls

5.1 Introduction

The aim of this paper is to adopt a learning based approach towards regional development and apply it to the Skåne region. The research methodology adopted for the analysis is grounded in evolutionary innovation theory, and integrates the main insights from Strategic Niche Management (SNM) with insights from project management at the niche level. We will use archival data generated by the Region Skåne, reports available in the public domain (via websites etcetera), as well as input from the discussions on 15 September 2009 with the Mobile Heights (ICT) cluster and the Moving Media cluster. During the discussions with the cluster participants, interviewees were allowed to talk at length on their own expert subjects, in order to build up a real-world view of the cluster initiative.

The organization of the paper is as follows. First, we briefly outline the theoretical background of Strategic Niche Management as well as project management studies on radical innovation. Second, we analyze the success of the Skåne cluster initiatives by showing how they (instinctively) adopted several of the best practice principles as suggested by SNM and radical innovation studies. In the final part of this paper, we make some suggestions for how additional insights from the two approaches may be used to further strengthen the clusters as part of a regional development policy. The concluding section will give a short summary of suggested actions that promote further cluster growth.

5.2 Theoretical background

Strategic Niche Management (SNM) is a recently developed approach that helps to induce a broad socio-technical transition towards more sustainable development. It is designed to facilitate the introduction and diffusion of new technologies through setting up protected experimental settings (niches) in which actors learn about the design, user needs, cultural and political acceptability, and other aspects. SNM has been applied in fields such as wind energy, biomass energy, public transport, electric vehicle transport, and eco-friendly food production. SNM is not specifically designed as a technique for designing regional development policies, however, it offers suggestions for policy

¹ This paper draws on Caniëls and Romijn (2008)

guidelines that are likely to work for the development and implementation of radical new technologies.

Central to the concept of SNM is the view that technology policy must contribute to the creation and development of niches (protected spaces) for promising new technologies through experimentation with new solutions within the dominant technological regime. It is needed to initially shield new technologies from market conditions, in order to help them overcome the innovation inertia that emanate from the existence of an incumbent dominant regime. The regime comprises "... the whole complex of scientific knowledge, engineering practices, production process technologies, product characteristics, skills and procedures, established user needs, regulatory requirements, institutions and infrastructures" (Hoogma et al. 2002, p. 19). In turn, the regime is embedded in a wider contextual 'landscape', which consists of societal factors that can change only slowly over time, such as demographics, political culture, lifestyles and the economic system (Raven, 2005). Innovations with radically new features do not rub well with socio-technical regime characteristics. Their successful development, market introduction and diffusion require simultaneous adaptations in all major parameters of the regime.

The whole process of SNM can be viewed as a laboratory experiment, where the niche is developed under special settings and step-by-step diffusion can take place into real-world conditions. If successful, the transition is made from technological niche to market niche. Experiments and niches are born through networks of organizations and people interested in the development of a specific application. Within the experiments there is room for interaction and learning about the innovation, and about stakeholders' preferences and attitudes in relation to the innovation. In addition to experimentation and learning, SNM authors have pointed up the importance of network formation and convergence, and alignment of actors' expectations. Together, these three processes are seen to interrelate closely, and be mutually reinforcing (Raven, 2005, p. 43). In this way, all parties (including producers, users and policy-makers) are involved and can contribute to the diffusion process. See the box for an explanation of the niche development process.

How does one create technological niches and manage them? Governments could contribute to the processes of niche formation by setting up a set of successive experiments with a number of new technologies. Such a policy consists of five steps (elements): (1) choice of a promising candidate technology; (2) choice of an appropriate setting for the learning experiment, i.e., an area where the advantages of the technology count highly, and its disadvantages count less; (3) set-up of the experiment, which includes the need to find a good balance between protection and performance pressure; (4) scaling up the experiment by means of public support measures; (5) dismantling of protection, in order to avoid permanent support-dependence and promote increasing competitiveness. For each element in strategic niche formation process several concrete policy guidelines can be given that haven proven to be successful in other cases, we will come back on these in section 4 of this study.

Box: Niche formation process

The various SNM authors have a shared view on the nature of the niche formation process. It is seen to consist of three sub-processes that are interrelated and mutually reinforcing (Raven, 2005, p. 43). Firstly, niche formation revolves around experimentation-based learning on the possibilities and constraints of the innovation, specific application domains, its acceptability, suitable policies to regulate or promote it, and so on. At the same time, social actors themselves change their views and align their expectations about the new technology over time. People's expectations become more specific and consistent (Hoogma, 2000). To sum up, Kemp et al. (1998) say that "experiments are a way to stimulate articulation processes that are necessary for the new technology to become socially embedded" (p. 190).

Secondly, niche creation is widely seen to require the development of a co-operating actor network. According to Hoogma, it will be conducive to success when actors' motivation to participate are not centred on short-term financial gains (2000, p. 84). Furthermore, the composition of the network is important, and this may need to change or expand over time in order to facilitate niche growth. The role and activities of incumbent partners may also change over time (Kemp et al., 1998, p. 191).

Finally, niche formation is meant to match the promises held out by the innovation and the stakeholders' expectations about it, with the needs in society that the innovation is meant to satisfy (Kemp, 1998, p. 190). The participating actors in the network should share a common core view about where they are going with each other and with the technology. Actors' strategies, expectations, beliefs, practices, visions, and so on, must go in the same direction (Hoogma, 2000, p.85).

The literature about radical innovation yields several additional perspectives on the three above-mentioned central processes identified by SNM, i.e. learning, alignment of expectations and network formation. Radical innovations are in essence very similar to the new niche technologies that SNM is concerned with: They are technologically radically new, as well as completely new to the market. The only difference between the two literatures is the perspective from which the innovation process is examined. SNM takes a 'meso' view, focusing on the level of the actor network, whereas writers about radical innovations study the strategic dynamics of innovation from a 'micro' (firm) perspective. However, there are obvious points of overlap, since modern innovation processes are commonly carried out in networks that extend well beyond a firm's organisational boundaries, involving customers, suppliers, partners, and even governmental bodies (Dicken, 2003). Studying a firm's radical innovation behaviour therefore inevitably entails an analysis of actor network dynamics. Hence, we can draw lessons from studies on the development and commercialisation of radical innovations in large companies. And in this way we are able to identify several common organizational and institutional factors associated with innovation success and cluster development.

5.3 Mobile heights and Moving media

Region Skåne has chosen to support seven cluster initiatives, whose purpose is to generate greater competitiveness and sustainable growth in the region. Among these cluster initiatives are *Mobile Heights (ICT)*, which focuses on mobile communication and *Moving Media Southern Sweden*, which promotes development in the field of moving media, i.e. film, television, computer games, internet and mobile platforms, in Skåne and Blekinge. Other cluster initiatives are Skånes Livsmedelsakademi (The Skåne Food Innovation Network); Medicon Valley Alliance; Sweden Cleantech

Incubators; North European Societal Security Training; and Innovator Skåne. On 15 September 2009 the international review panel had discussions with two of these clusters, namely the Mobile Heights cluster and the Moving media cluster. Hence, the report will focus on these two cluster initiatives.

Mobile Heights

The choice for a cluster initiative in ICT and in particular the choice for Mobile Heights was more or less coincidental. Two people from Ericsson Mobile platforms (EMP) were worried about the competences of students in the field of electronics and ICT.

Furthermore, they acknowledged a tendency that consortia of business teams were not able to gain national support and funding of research. In particular, it was very hard to find funding for undertaking proper research in ICT related areas, such as electronics. In addition, it had become impossible for Ericsson to attract international researchers, who are vital for keeping the research on an advanced level. It was recognized that these trends posed a serious risk and danger to the electronics industry as a whole.

The people that induced the cluster initiative proposed the set up of the Mobile heights cluster in 2007. They initiated a dialogue between the Region Skåne, the universities in the area and the industry about how to make programs on microelectronics more attractive for students. The idea was to take joint action on training issues in order to stimulate greater labour supply from the local universities, as well as to enhance the amount of R&D performed on the ICT sector. The training opportunities that are offered to students are intended to lead to jobs in the future and in this way the region will be further developed. The new programs for students were funded by the industry or the research center for 80% and the remaining 20% was financed by Region Skåne. This initiative proved to be a great success. Mobile Heights was set up in 2008 and became an independent company in 2009. The main partners in the Mobile Heights initiative are ST Ericsson, Sony Ericsson, Telia Sonera, the Faculty of Engineering at Lund University, Malmö University, and Region Skåne.

The success of the Mobile Heights cluster initiative has to do with the people that took the first initiative – the change entrepreneurs – that were involved. People like these are usually characterized by being outwardly oriented, open, adventurous, tolerant of uncertainty, flexible, and able to facilitate others rather than to control them, in order to create an environment conducive to trial and error. They are able to reflect on, and evaluate their own contribution in a constructive manner in order to be able to adapt in response to changes along the way. Roep et al. (2003) see change agents as visionaries, who "... are needed to make the connection between societal developments at landscape level, putting pressure on the dominant regime, and the room for manoeuvre at the local level. Their capacity is to envision windows of opportunity, express expectations and enrol alliances" (p. 212). The two people that first induced the cluster initiative played this important visionary role in Skåne. Later on, as the cluster grew, this role was taken over by a handful of individuals that put a lot of time in the initiative. They cared and anchored projects into their organization.

From radical innovation studies we know that it seems to work well when a hands-on project champion is combined with a promoter at a high level in the firm's hierarchy (Day, 1994). The project champion hails from the lower levels of the firm, from where the innovation emerges. He or she is close to the necessary sources of technological and market information, and has informal organizational power and influence that help him/her to build effective support coalitions. If necessary, such a person can let the project keep a low profile, so that its activities remain invisible to top management until the innovation can demonstrate success. In this way it avoids interference from the top and conflicts from powerful opponents that could frustrate the incubation process. Likewise this strategy avoids having to cope with pressures for quick results and obligations to absorb overabundant resources at too early a stage. The radical innovation literature also makes suggestions about the tasks that these hands-on champions have to perform in order to promote learning in the actor network. Daily practice of community is important, through sharing expertise, talk, sociability, argument, disagreement, negotiation and so on. All these interaction processes serve to mobilise the network's creative potential. Regular games, competitive events etc., should also be conducted, in order to encourage the emergence of divergent views and ideas that can rub against each other (Wenger, 1998). In this respect the 'do tanks' which were introduced in the Mobile Heights cluster initiative are a very valuable technique that help to catalyze project participants into new ways of thinking and motivate them into getting things done. A 'do tank' is the action-oriented version of a 'think tank'. In do tanks people discuss how some creative ideas that were brought up earlier can be realized in practice.

Furthermore, for an initiative to become successful, it is important that the first ambitions are small size and technologically simple to introduce, thereby adhering to the principle of Keep It Simple, Stupid (KISS). The KISS principle refers to the importance of learning in small increments. It is easy to underestimate the complexity of niche processes. It is therefore wise to start simple and add complexity at later stages, when the basic features of the new technology and the associated organizational aspects have been mastered. This was the case in Skåne. Brainstorming about how to make programs on microelectronics more attractive for students was a first goal that was achievable within a reasonable time frame. One of the activities of the cluster was that Mobile Heights runs campaigns before the university application season, and holds an event for high school students in the autumn to inspire them to work in ICT. Hence, the aim of the first initiative was ambitious enough to challenge the stakeholders, and at the same time it was achievable. This is conform with the SNM guideline that it is important to aim high, but not too high. If aims are too ambitious, there is a risk of the experiment petering out (Weber et al. 1999, p. 35).

Related to this point is the fact that the new technology and ideas of the Mobile Heights cluster offered a plausible promise to the stakeholders. This is only possible after it has been shaped into a reasonably concrete idea: "The concept identified as promising should be sufficiently specific to inspire other stakeholders that innovation should be attractive enough and the objective should be reachable within a reasonable time frame,

and sufficiently open to be modified during the further experimental process" (Weber et al. 1999, p. 33). In the Mobile Heights cluster it was very clear what the exact needs of the industry were. The industry wanted and needed a solution to the problematic trends that occurred. One example is the objective of Region Skåne to create a profile for Mobile Heights and the region as a world-leading centre for mobile telecommunication, with the aim of attracting talent, companies and investment. In concrete terms this was organized by raising awareness through newsletters, a website, taking part in conferences and meeting decision-makers. The ability of the cluster to choose concrete activities that are achievable and provide a plausible promise to various stakeholders is one of the reasons behind the success of the Mobile Heights cluster initiative.

In choosing concrete experiments for a cluster initiative it is important to initiate user-producer communication, especially through the involvement of potential lead users. Critical input from users who are able to communicate their requirements push suppliers to constantly improve the innovation. The Mobile Heights cluster extensively investigated the needs of the industry as well as the needs from customers, and interesting new areas of research and applications were determined such as business intelligence. Again change agents were present.

After some time the step was taken to continue and expand the collaboration within the Mobile Heights cluster initiative. The idea that started out as a simple project was gradually being upgraded to a more complex system with more and more stakeholders and participants. As the cluster grew the needs of the industry as well as those of the region were further investigated. Alignment of expectations took place, which involved an exchange of views between the industry, the universities and region Skåne on what could be the focus of the 3rd excellence center.

Moving Media Southern Sweden (MMSS)

The Moving Media cluster was created in 2007-2008 and was formally launched on 17 December 2008. Its main objective is to become one of the world's foremost environments for innovation and ground-breaking entrepreneurialism in the field of moving images for digital media. In the cluster the public authorities (among others Region Skåne and Region Blekinge), the industry (among others Scandvision Communication AB, Netport Karlshamn AB and Film i Skåne) and higher education institutions (among others Malmö University) joined forces.

One of the concrete drivers of the cluster initiative was the question as to how all media sectors that are present in the region can collaborate. The media sectors include older, traditional companies such as broadcasting firms and publishers as well as new firms for example start-up firms on gaming. The goal of the Moving Media cluster initiative is to let the firms work together and create growth for the sector as a whole. One of the ways to do this is to introduce new ways of working together and making the stakeholders in the sector interact, by connecting them to each other, defining joint projects and creating networks. Furthermore, there was a feeling that too few research findings reached the business world. In order to bring institutions of higher education and firms together,

there is a need for “brokers” who have focus, insight and understanding of both worlds. An example of an activity in which Malmö University worked together with media firms is the Living Lab New Media (2007-2009). The Living Lab New Media is a place where new media services and products were cocreated by using audience participation and user-generated content. Visitors at the cultural center INKONST in Malmö, were engaged in developing, experimenting with and evaluating new media formats, services and products, together with researchers, students, artists and professional new media producers.² Projects were ranging from short student assignments to longer activities which involved several professional and non-professional partners.

One of the reasons behind the success of the cluster initiative is that it built on what was already there. SNM studies propose that one must seek out and utilise existing strengths in terms of actors' knowledge, skills, experiences, network relations, assets, and so on (Weber et al., 1999, p. 71). Then, the overall management strategy should be one of "going with the flow", utilising the ongoing dynamics of socio-technical change while exerting pressures to nudge the learning process in desired directions (Kemp et al., 1998, p. 185; Kemp et al., 2001, p. 280). This constitutes a cyclical process. Due to limited foresight, one can only proceed in small steps, followed by evaluation and adjustment of goals and strategies, if needed (Elzen et al., 2004, p. 288). Truffer et al. (2002) call this reflexive experimentation. In the course of this process, strategies and actor expectations are adjusted to each other. This continues even after the experimental phase is over (Wiskerke, 2003, p. 446). Moving Media is building on a number of prior projects, including activities carried out by the City of Malmö, the Knowledge Foundation and Region Skåne as part of the Media Mötesplats Malmö (MMM) initiative. Media Mötesplats Malmö (MMM) is one of the eight Meeting Places for the experience sector in Sweden. The MMM meeting place acted as a driving force and neutral player by connecting several different industries which have the moving image in common, but which did not otherwise interact. Another goal of MMM was to achieve better cooperation between researchers, students, freelancers and companies. MMM has been existence since 2005 and its experience, network and activities have been fully integrated in the activities of the Moving Media cluster initiative since 1 April 2009.

Studies on SNM suggest that consultations with, and active involvement of project partners is essential for creating a broad support constituency behind the project. The local stakeholders need to achieve a sense of "ownership" over their project, so that they identify with it and feel responsible for its wellbeing. The Moving Media cluster has as a specific objective to enhance cooperation and joint activities between businesses, universities and the public sector. There are several strategy and working groups (Task) that are engaged in setting up these joint activities. Currently, the cluster initiative has created a strong sense of commitment among key people at management level in business and the public sector and it has the support of the region's media companies.

² See http://www.malmoliveinglab.se/MNMLL_english.htm

SNM also advocates that a special effort should also be made to create opportunities for interaction with the external actors who potentially will be affected. They can bring fresh views to bear on the problem (Truffer et al., 2002, p. 115; Weber et al., 1999, p. 44), while interactions among actors around a shared goal or problem also enhances broad support for the project (Brown et al., 2004, pp 199-200). The Moving Media cluster fulfils these suggestions by increasing strategic relations with the other cluster initiatives by setting up seminars and conferences across sector boundaries.

Another positive driver behind the success of the Moving Media cluster is that currently a need is expressed to target the initiative's orientation and focus more specifically on moving images for digital media. Of particular interest are the intersection between the new and traditional moving image media and the conjunction of various new digital production, distribution and consumption technologies. This development shows that in the beginning several technological trajectories and promising options were explored in parallel (Raven, 2005, p.253; Roep et al., 2003, p. 211; Truffer et al., 2002, p. 114), which results in a higher chance of success of the niche development process.

Concurrent experimentation also enables faster learning because different actor groups can learn from each other. And multiple options entail more chances of success (Raven, 2005, p. 253). The earlier mentioned strategy and working groups helped along these processes by long-term scenario-building exercises that encouraged actors to "think out of the box". Methods can include visioning, system thinking, and mental model building, among others (Brown et al., 2004, p. 200; Truffer et al., 2002, p. 122). A larger market size may result when a new technology is tried out in different geographical markets or application domains simultaneously, and this is one of the ideas that is still to be explored by the Moving Media cluster.

5.4 Suggestions for further actions

How to make sure that a cluster experiment will continue to grow and that it over time become independent from subsidy from the region. Directions for further actions can be given on several levels. First we will pay attention to several managerial principles whose application in the conduct of an experiment is associated with effective ongoing learning by the network actors. Hence these suggestions are particularly relevant in the period that government protection for the cluster still exists and the cluster's main objective is to grow and become independent. Subsequently, we will provide suggestions for the commercialization of a successful technological niche technology and the break down of protectionist measures.

Cluster growth inducing actions

In addition to the aforementioned principles that are already adopted in the clusters, several rules of thumb can aid successful learning with is an important driver of cluster growth.

An attitude of openness and flexibility on the part of all actors in the experiment is essential. There should be a willingness to change course in midstream when it has

become obvious that a dead end has been reached (Brown *et al.*, 2004, p. 196). That means that stakeholders – and in particular the innovation champion – should avoid developing too much attachment to 'their baby'.

Actors must also strike "... a [continuous] balance ... between protection and selection pressure" (Weber *et al.*, 1999, p. 40, pp. 56-57, italics added). On the one hand, they must ensure sufficient protection, so as to avoid the experiment coming to a premature end due to competition from incumbent technologies. This protection could consist of government policy measures such as subsidies or tax relief, but also of ensuring R&D funding commitments by private actors participating in the experiment. At the same time, coddling should be avoided. It creates unrealistic expectations, induces inertia, and allows unproductive experiments to keep running (p. 77). Also, unexpected events like failures, surprises, public media attention and various adverse incidents (or threats of such events) are to be utilised as inputs for learning. One can *learn from failed experiments as well as from successful ones* (Weber *et al.*, 1999, p. 40; Brown *et al.*, 2004, pp 199-200). Actors must be encouraged to come forward to discuss the problems they experience. Project failures should not be swept under the rug. Moreover, experiments should be used to *challenge every assumption about the new technology*, including technology options, technology diffusion strategies, and effects upon patterns of use (Weber *et al.*, 1999, p. 73). It is helpful to *seek out independent external evaluators* to assess the progress in the experiment (Weber *et al.*, 1999, p. 76). They can cast the situation and the problems faced in a new light, thereby helping the actors to draw lessons from their work (Truffer *et al.*, 2002, p. 115).

Users have a special role to play among the stakeholders. Accordingly, users must be actively involved in the experiment on a regular basis. User involvement does not come about spontaneously. Opportunities for voicing their concerns and ideas must be built into the design of the experiment from the start (Weber *et al.*, 1999, pp. 42-3).

The management of the actor network assumes great importance in the SNM literature. First, it is necessary to ensure an *effective constellation of stakeholders* who connect effectively with one another. A triangular set up has been found to be particularly effective, composed of (i) innovating firms along with (ii) supporting actors such as researchers, technical advisers, consultants or extension officers, and unions, whose interactions are driven by (iii) endogenous development potential of the new technology as needed by the local constellation. This basic triangle is crucial because "... It makes local practices and resources into a starting point for further processes of unfolding (Roep *et al.*, 2003, pp. 211-12). *Monitoring potential barriers to effective co-operation* between the actors is crucial, especially when competing interests and potential free riding behaviour are at stake (Weber *et al.*, 1999, p. 78). It is therefore important to ensure a sufficient degree of reciprocity between the actors in terms of the distribution of the costs and benefits of the experiment (Roep *et al.*, 2003, p. 212). In particular, "... Care should be taken ... that the development of the technology is not dominated by industry, but that the users and 'third parties' can also contribute their ideas" (Kemp *et al.*, 1998 p. 191).

The *actor network must be managed dynamically*. As the experiment proceeds, the optimal network composition, required tasks and needed interactions will evolve (Weber *et al.*, 1999, p. 52). After the initial start up phase, niche expansion will often require the involvement of specific new actors. The existing actors in the network need to adjust their work and interactions accordingly (Kemp *et al.*, 1998, p. 191). These adjustment processes are not necessarily smooth if no explicit attention is paid to network stability. Maintaining individual responsibility for, and commitment to the collective goals, approach, and products, remains an important activity (Wiskerke, 2003, p. 446; Roep *et al.*, 2003, p. 212). Another important principle of good dynamic network management is that project partners should be free to join and leave. Partners who have lost their motivation along the way should not be persuaded to stay on, in order to prevent the atmosphere in the experiment from falling. As Weber *et al.* (1999) put it, "A clearly defined network of highly committed partners may be very effective in implementing an experiment, but it may be too inflexible and closed once changing boundary conditions of an experiment require the modification or the restructuring of the network" (1999, p. 38). It is thus better to be flexible, and not to have overly high expectations of one's project partners.

The *network for an experiment should be driven and guided by a network manager* (Weber *et al.*, 1999, p. 39), whose role is to co-ordinate the process, essentially ensuring that the network partners adhere to the principles already outlined above. It is mentioned that any actor, be it a public policy maker, a regulatory agency, a local authority, a private individual, a company, an NGO, an industry association, a citizen group, or a special interest group can play this role, depending on who is best suited for the particular task at hand (Kemp *et al.*, 1998).

The SNM literature tends to elaborate on the role of public policy makers as a party who shape the context of experiments conducted by others. *Policy makers should assume the role of enabling actor and catalyst*, rather than regulator or technology sponsor (Kemp *et al.*, 1998, p. 191). Weber *et al.* urge policy makers to "Consider which kind of complementary policies could be conducive, needed or detrimental to the experiment" (1999, p. 53. and p. 75). An interesting observation is that financial contributions may not always be the most effective means of governmental support. The motivation to provide free inputs among stakeholders, and their willingness to improvise on a shoestring budget may be negatively affected when more plentiful resources become available. Weber *et al.* caution that 'funding to death' should be avoided (1999, p. 67). A more effective form of government intervention seems to be the creation of forward linkages, or 'demand pull'.

A final recommendation for successful niche formation is to *keep the momentum* going. Raven, who compared different experiments in the field of biomass utilisation, noticed that the more successful ones were characterised by a continuous development pattern, whereas a discontinuous trajectory was visible in the case where no new market niche emerged. He concludes that it is important to ensure continuity in the learning process, in order to avoid losing important lessons for future use (2005, p. 253-254).

The radical innovation literature provides clear guidelines for top management. The role of top managers should be one of indirect management of these processes. They should put in place the right organisational structures, incentives and a good research climate, leaving sufficient flexibility for the project implementers to get on with their tasks ('orchestration'), endorse the innovative results that come up from within the organization ('retrospective legitimising'), and act as mediators and decision makers in conflicts between project champions and critics ('judging and arbitration') (Day, 1994, p. 151). Even if top management is reasonably closely involved in nurturing a radical innovation project, it will not typically assume detailed championing functions such as the actual definition of the product or carrying out frequent mentoring and monitoring (Day, 1994, p. 153). Their role is that of an organizational sponsor or 'patron', providing encouragement from high up in the firm's hierarchy, and ensuring financial backing that prevents premature closure of niche processes (McDermott and O'Connor, 2002). Others characterize this role as catalyst, encouraging, sharing and integrating (Bonner et al., 2002). Top management must create a shared context and a sense of common purpose that informs an overall strategic direction in which the experiments must fit (Wenger, 1998). Projects that are subjected to too much direct control from top management have been found to suffer from delays, cost overruns, lower product performance, and lower team performance (Bonner et al., 2002).

Attention should be paid to the composition of the actor network responsible for niche development. The SNM studies mention the need for a diverse range of social actors such as firms, NGOs, unions, producer associations, suppliers, and so on. The radical innovation literature goes beyond this, by emphasizing the importance of diversity on the individual level within the actor network as well. Members should vary across race, gender, nationality, age, personality profile and experience. The greater the diversity, the greater the range of viewpoints and knowledge that will be brought to bear on the project (Lester, 1998). The more unfamiliar the market, the more important it will be to involve commercially-oriented R&D staff and senior management from participating firms, leading members of the technological community, experts from related markets, and potential users (Rice et al., 1998).

Furthermore, people who join the niche network from the side of the participating firm(s) should form cross-functional teams (Bonner et al., 2002; O'Connor and McDermott, 2004). A study tracking radical innovation teams spanning twelve projects in ten large US-based firms found that teams consisted of five to six core members, each of which had an in-depth specialisation such as marketing, process engineering, or industrial engineering, as well as considerable amount of all-round knowledge (O'Connor and McDermott, 2004). The professional breadth of the core individuals is apparently crucial. They should have a wide knowledge of their company through having served in several different business units on rotation. This wide exposure is necessary for building a wide informal network, both inside and outside their firm, which they can access at any time. This network enables them to get early signals about emerging business opportunities. It also saves considerable time and money by

facilitating co-operation from colleagues and friends when it comes to performing tests, trial runs, or making information available. People with broad personal networks easily form 'communities of practice' across organisational divisions and the company's boundaries (McDermott and O'Connor, 2002). For obvious reasons such people have also been called 'boundary-spanning individuals' (Probst et al., 1998) and innovation brokers (Nooteboom, 1999).

The core team members (at least those who join the niche network from the side of the firm(s)) should be dedicated to the innovation development project for at least fifty per cent of their time. If this requirement is not met, they are likely to suffer from task fragmentation and fall behind schedule, while those who can devote sufficient time to the project become disgruntled and frustrated due to lack of progress by the other team members. In addition to the core members, there is a role for resource persons who are less closely involved in the decision making process and need not be completely informed of all activities in detail. Typically, such people spend less than half of their time on the project (Lester, 1998).

The radical innovation literature also yields some important suggestions for the cluster manager, whose management role remained rather unspecified in the SNM studies. The manager must ensure that the participating team members are to be actively involved at an early stage at the determination of the project's operational controls such as goals, budgets and schedules (Bonner et al., 2002). The manager should also organise regular professional conferences and meetings at which data are presented for the technological community's reaction, and to gain potential customer interest through early market probes.

How to commercialize a successful technological niche technology?

After the creation of a viable technological niche there is a the subsequent process of *market* niche formation. With the help of radical innovation studies, two important dimensions of that process can be highlighted. The first concerns the question how firms manage the transition of a new technology from the R&D phase to the start of production operations. Underestimation of the requirements of successful transition can create several problems that can easily lead promising projects to fail. Many managers wrongly assume that radically new products can be commercialised by using the same tried and tested techniques and methods for market research as are applied to more incremental innovations (Rice *et al.*, 2002).

Rice *et al.* (2002) argue that the transition should be a well-managed process in order to avoid projects from falling in between two stools. They recommend that the R&D unit (the sending unit) and the operations unit (the receiving unit) should assess transition readiness by sharing information. A separate transition team should be established, composed of members from the R&D and the operations sides, as well as transition experts. This team should draw up a transition plan that lays out the tasks, timetable, roles and responsibilities of team members, and guide the efforts of the team and provide a benchmark against which progress can be assessed. The transition team

should organise continuous learning by undertaking regular market probes and analysing feedback. In addition, a transition oversight board should be created, composed of senior managers with organisation clout and knowledge of the transition process. Transition funding from corporate resources should be committed. The transition team should do the groundwork for a big market launch, while senior corporate managers should continue to assume championing roles at this commercialisation stage.

Other radical innovation authors provide insight into the nature of the marketing techniques that should be utilised during this phase. They emphasise that conventional marketing techniques such as market surveys, focus groups and concept tests are quite useless and may even be misleading and counterproductive (Lynn *et al.*, 1996; Rice *et al.*, 1998; Leonard, 1998). Lead user analysis is useful only when the new product can be somehow linked to existing products that users are familiar with. In the case of radical innovations, customers lack this frame of reference (Leonard, 1998, p. 190). It makes little sense to be customer driven when it is not yet clear who the customers are going to be (Lynn *et al.*, 1996).

What is required are techniques that will help create a new market. Market probes are conducted by means of organising demonstrations of early prototypes in the organisations that form the firm's network, and organising potential customers' evaluations of early working versions. A Darwinian selection strategy entails experimentation with multiple models simultaneously, to find out which ones the market appears to value. Also well known is the conduct of a series of sequential market try-outs, 'probes', with early prototypes in different market segments. Each probe serves as a vehicle for learning about the new technology in its real life context, followed by adjustment in technology design and marketing approach. At the same time the exposure to early prototypes influences the expectations, needs and behaviour of potential customers. This experimentation and learning (also called 'product morphing') is an iterative process. Each probing and learning cycle strives to be "... a step closer towards a winning combination of product and market" (Lynn *et al.*, 1996, p. 19).

Relevant for SNM is the fact that probing and learning not only occurs within the boundaries of individual firms, but that it also involves competitors. Some firms practice vicarious learning, waiting for a pioneer competitor to take the lead with market tests and learn from its mistakes. A similar idea underlies the SNM approach, which advocates the simultaneous establishment of several parallel experiments and niches focused on the development of alternative solutions for the same problem.

Marketing and distribution costs can be substantial, especially in the early stages when a dedicated network for the new technology does not yet exist. It may not always be feasible to build an extensive new distribution network right from the beginning of the marketing effort, when the probing process is still going on. A potentially interesting way to get around this problem is to try to team up with manufacturers of established products that are in some way complementary or related to the new product, initially

utilising their distribution and marketing channels (Heierli, 2000, p. 70). This kind of piggy-back arrangement can produce win-win situations. Translated into SNM language, this strategy amounts to utilising features of the incumbent regime as a starting point for the transition process. Another useful marketing strategy is to offer a variety of models of the new technology in order to attract a larger clientele in the initial stages, when demand for any specific model is still well below the threshold profitability level. Thirdly, adoption in small instalments could be advisable in the case of new products that are divisible, such as small-sized packages. In the case of non-divisible products, financial constructions such as hire purchase can have a similar effect of bringing the new technology within the financial reach of a larger customer group. All these methods can help to bring about critical mass which is needed in order to reach financial sustainability (Heierli, 2000).

When the process of *market* niche formation is completed, the cluster initiative is strong enough to become independent from government support. Hence, the protective measures can be broken down. Kemp et al. (1998, p. 188) and Weber et al. (1999, pp 55-58) observe that the protected space should be dismantled gradually, in order to avoid disruption of the ongoing processes. There are two clear circumstances in which protection must be withdrawn. Firstly, continued protection will be wasteful when it has become evident that the prospects for the new technology are not good enough so that it is unlikely to become financially viable. A better option in those circumstances is to try to utilise the network that was formed for more promising fresh experiments. Protection should also be withdrawn in the opposite case, when a newly developed technology with good market prospects is ready to be exposed to market discipline. In the latter case, continued protection is likely to thwart or stall successful commercialisation (Weber et al., 1999, p. 58). However, in reality the main difficulty is likely to lie in assessing the scenario correctly. Often the case is not clear cut. When should an experiment be dubbed a success or a failure, in view of the fact that it can take decades for good workable prototypes of new technologies to emerge? Aside from this, political considerations (vested interests) are likely to play a major role in the decision process as well, making this stage a tricky one.

5.5 Conclusion

Tables 5 and 6 summarize all actions that can enhance cluster growth. We distinguish actions from cluster participants as well as actions of public bodies. In addition an overview is given of possible actions for cluster participants to become independent from government support and several suggestions are given for actions of government bodies to break down protection.

Table 5. Suggested actions for cluster participants as well as regional government bodies part 1

	Suggested actions for cluster participants	Suggested actions for Skåne regional government
Goal: Promoting cluster growth	<p>Adhere to Keep It Simple Stupid</p> <p>Change agent / innovation champion should be present</p> <p>Use a combination of a hands-on project champion combined with a promoter at a high level in the cluster's hierarchy</p> <p>Technology should offer a plausible promise</p> <p>Aim high but not too high</p> <p>Initiate user-producer interaction</p> <p>Build on what is already there</p> <p>Overall management should go with the flow (reflexive experimentation)</p> <p>Explore several technological trajectories or promising options in parallel</p> <p>Undertake long term scenario building in order to think out of the box</p> <p>Have an attitude of openness and flexibility</p> <p>Consultations with and active involvement of project partners is essential for creating a broad support for the project</p> <p>Create opportunities for interaction with external actors who potentially will be affected</p> <p>Ensure an effective constellation of stakeholders who connect effectively with each other</p> <p>Monitoring potential barriers to effective cooperation</p> <p>The actor network must be managed dynamically (be flexible and do not have overly high expectations of one's project partners)</p> <p>The network of an experiment should be driven and guided by a network manager, whose role is to coordinate the process</p> <p>Hands-on project champions should daily practice community building and enhance interactive processes, through sharing expertise, talk, social events, negotiations, discussions etc.</p> <p>Hands-on project champions should mobilize the network's creative potential through games, competitive events, encourage the emergence of divergent views and ideas that can rub against each other ect.</p> <p>Diversity on the individual level in the actor network is important – members should vary across race, gender, nationality, age personality profile and experience</p> <p>Core team members should be dedicated to the innovation development for at least 50% of their time in order not to suffer from task fragmentation</p> <p>The cluster manager must ensure that the participating team members are to be actively involved at an early stage at the determination of the project's operational controls such as goals, budgets and schedules</p> <p>The cluster manager should organise regular professional conferences and meetings at which data are presented for the technological community's reaction, and to gain potential customer interest through early market probes</p>	<p>Strike a continuous balance between protection and selection pressures</p> <p>- Avoid coddling</p> <p>- Incentive structure must consist of a judicious combination of carrots and sticks</p> <p>Learn from failed experiments as well as from successful ones</p> <p>Challenge every assumption about the new technology</p> <p>Seek out independent external evaluators to assess the progress in the experiment</p> <p>Policy makers should assume the role of enabling actor and catalyst, rather than regulator or technology sponsor</p> <p>Keep the momentum going – avoid losing important lessons for future use</p> <p>Top managers should ensure financial backing, be a catalyst, create sense of common purpose (indirect management)</p> <p>Top managers should put in place the right organisational structures, incentives and focus on orchestration</p> <p>Top managers should endorse the innovative results that come up from within the organization ('retrospective legitimising')</p> <p>Top managers should act as mediators and decision makers in conflicts between project champions and critics ('judging and arbitration')</p>

Table 6. Suggested actions for cluster participants as well as regional government bodies, part 2

	Suggested actions for cluster participants	Suggested actions for Skåne regional government
Goal: Decrease dependence on government support	<p>The R&D unit (the sending unit) and the operations unit (the receiving unit) should assess transition readiness by sharing information</p> <p>A transition team should draw up a transition plan that lays out the tasks, timetable, roles and responsibilities of team members, and guide the efforts of the team and provide a benchmark against which progress can be assessed</p> <p>The transition team should organise continuous learning by undertaking regular market probes and analysing feedback</p> <p>A transition oversight board should be created, composed of senior managers with organisation clout and knowledge of the transition process</p> <p>Transition funding from corporate resources should be committed.</p> <p>The transition team should do the groundwork for a big market launch, while senior corporate managers should continue to assume championing roles at this commercialisation stage.</p> <p>Conventional marketing techniques are quite useless and may even be misleading and counterproductive. Instead techniques are needed that will help create a new market, such as market probes by</p> <ul style="list-style-type: none"> • organising demonstrations of early prototypes in the organisations that form the firm's network, and organising potential customers' evaluations of early working versions. • conducting sequential market try-outs, 'probes', with early prototypes in different market segments ('product morphing') <p>Try to team up with manufacturers of established products that are in some way complementary or related to the new product, initially utilising their distribution and marketing channels</p> <p>Offer a variety of models of the new technology in order to attract a larger clientele in the initial stages, when demand for any specific model is still well below the threshold profitability level</p> <p>Adoption in small instalments could be advisable in the case of new products that are divisible, such as small-sized packages. In the case of non-divisible products, financial constructions such as hire purchase can have a similar effect of bringing the new technology within the financial reach of a larger customer group</p>	<p>The protected space should be dismantled gradually, in order to avoid disruption of the ongoing processes</p> <p>Continued protection will be wasteful when it has become evident that the prospects for the new technology are not good enough so that it is unlikely to become financially viable - try to utilise the network that was formed for more promising fresh experiments</p> <p>Protection should also be withdrawn when a newly developed technology with good market prospects is ready to be exposed to market discipline</p>

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6 Mobile Heights – Alternative Innovation Strategies

Johan Wallin

6.1 Introduction

This paper will present two alternative approaches for innovation policy in the case of Mobile Heights. The first alternative is based on the framework of strategic niche management (SNM). The other alternative takes the perspective of ecosystem orchestration.

The paper consists of four parts. This first part presents the general background about Mobile Heights. The second part introduces the main concepts behind Strategic Niche Management, and makes some suggestions for how this approach may be used to strengthen Mobile Heights. The third part uses the notion of business orchestration, and makes some proposals for how this perspective may be used to promote the development of Mobile Heights. The fourth and concluding part compares the two approaches.

To start with background about Mobile Heights.

Mobile Heights is a mobile communications cluster initiative in Southern Sweden. It brings together world-class organizations from the industry and academia as well as institutions from the public sector.

With Mobile Heights as the foundation, member organizations act in unison to establish Southern Sweden as an internationally leading region in research, innovation and entrepreneurship in mobile communications and its entire value chain: hardware, software and services.

By joining Mobile Heights, organizations and their people will have access to a dynamic and inspiring environment where members seek to cross-fertilize perspectives and ideas in order to generate world-class innovation and growth. Concerted efforts are also undertaken to attract to the region more talent and human resources as well as investment capital, critical components for growth. (<http://www.mobileheights.org/>)

The leading partners of Mobile Heights are Ericsson, Sony Ericsson, TeliaSonera, Lund University, Malmö University and Region Skåne.

Mobile Heights is a platform for research:

The Faculty of Engineering at Lund University, Malmö University and Blekinge Institute of Technology (BTH) make up the region's knowledge infrastructure. They

have developed their expertise while cooperating with mobile communications companies, thereby creating numerous links between academia and the industry. Research groups are focused on areas such as software systems, software technology, real-time systems, embedded systems, electrical construction, radio systems, signaling, theoretical electronics, digital libraries, computer graphics and picture analysis. Two new industrial research centers have been started within Mobile Heights: System Design on Silicon (SOS) and Embedded Applications Software Engineering (EASE). They are based at the Faculty of Engineering at Lund University (LTH). Work is underway to start a third center, focused on mobile services and applications. (<http://www.mobileheights.org/>)

6.2 Strategic Management and Mobile Heights

The notion of strategic niche management (SNM) is an analytical approach that is designed specifically to facilitate the introduction and diffusion of radically new sustainable technologies through societal experiments. Its ultimate aim is to contribute to a broad shift to more sustainable development, through an integral combination of technological progress and system-wide social-institutional transformation. (Caniëls, Romijn, 2008b, p. 613)

SNM is rooted in evolutionary innovation economics. It posits that successful radical innovations emanate from socio-technical experiments in which various stakeholders collaborate and exchange information, knowledge and experience. This induces a learning process that will facilitate the incubation of a new technology. Experiments occur in protected spaces called ‘niches’, specific application domains for the new technology. Experiments create ‘proto-markets’, in which connections with market parties are made even when the technology is still in a laboratory phase. When incubation goes well, an actual market niche will develop in due course, in which the innovation can sustain itself commercially. (Caniëls, Romijn, 2008b, p. 614)

SNM takes its starting point from the observation that technologies are part of a broad and complex system, a ‘socio-technological regime’. This is ‘. . . the whole complex of scientific knowledge, engineering practices, production process technologies, product characteristics, skills and procedures, established user needs, regulatory requirements, institutions and infrastructures’ (Hoogma et al. 2002, 19). In turn, the regime is embedded in a wider contextual landscape, which consists of material and immaterial societal factors that can change only slowly over time, such as demographics, political culture, lifestyles and the economic system (Raven 2005, 31–2).

A key tenet of SNM is the ability to create a niche. Firstly this requires the matching of the promises held out by the innovation and the stakeholders’ expectations about it, with the needs in society that the innovation is meant to satisfy Secondly this requires experimentation-based learning on the possibilities and constraints of the innovation. These experiments are a way to stimulate articulations processes that are necessary for the new technology to become socially embedded. (Kemp, Schot and Hoogma, 1998).

Thirdly, niche creation requires a co-operating actor network. Hoogma (2000) states that it is conducive to success when actors' motivations to participate are not centered on short-term financial goals.

SNM also seems to be particularly suitable for such technologies that can be developed through continuous evaluation and incremental improvement by means of broad stakeholder interaction processes (Elzen, Geels, Green, 2004). The new technology should also be open to development in different directions. Studies on SNM have also noted that a crucial factor is the presence of a change agent who champions the innovation. Personal characteristics the champion should possess are: outwardly oriented, open, adventurous, tolerant of uncertainty, flexible, and able to facilitate others rather than to control them, in order to create an environment conducive to trial and error. (Brown et al., 2004)

Another observation related to SNM is that it seems to work best with experiments that adhere to the possibility for learning in small increments. At the same time, stakeholder management, including the network manager's role, is a key aspect to successful SNM practice, alongside adequate protection. Two other characteristics are highlighted by researchers from the SNM field:

- 1 The experiment has to be very open in its nature; *there should be a willingness to change course midstream when it has become obvious that a dead end has been reached – the innovation champion should avoid developing too much attachment to the “baby”*. (Brown, et al. 2004). In the same fashion it is stated that *care should be taken...that the development of the technology is not dominated by industry, but that the users and “third parties” can also contribute their ideas*. (Kemp, Schot and Hoogma, 1998)
- 2 The network and its management should be quite loose; *another important principle of good dynamic network management is that the project partners should be free to join and leave* (Weber et al. 1999). *Any actor, be it a public policy-maker, a regulatory agency, a local authority, a private individual, a company, a non-governmental officer, an industry association, a citizen group, or a special interest group can play the role of network manager, depending on who is best suited for the task at hand* (Kemp, Schot and Hoogma, 1998).

Relating to the second point above it has however been noted that there is not much information available about what specific management style the network manager could best adopt in order to be effective. Instead, the SNM literature tends to elaborate on the role of public policy-makers as a party who shape the context of experiments conducted by others (Caniëls, Romijn, 2008a, p. 256)

From the perspective of Mobile Heights the SNM approach would be suitable for open source type of development activities, where the initial idea has been developed by an individual entrepreneur, or by researchers in one of the participating universities. The type of application that would fit the criteria of being adaptable, and where the network could be flexibly adjusted based on how the development evolves means that this

approach is less suited for initiatives that are strongly driven by one of the leading corporations, such as Ericsson, Sony Ericsson or TeliaSonera. As stated above, the SNM approach is emphasizing that one should take care that the initiative is not dominated by industry.

6.3 Ecosystem orchestration and Mobile Heights

If SNM has not elaborated much on the role on the network manager, this has been the focus of the concept development related to ecosystem orchestration. Ecosystem orchestration is closely related to the concept of dynamic capabilities (Teece et al. 1997; Winter, 2003; Teece 2007; Teece 2008). When taking an ecosystem perspective on innovation, one has to expand the discussion on capabilities to not just relate to firm-specific capabilities, but also to how firms together are interacting, wherein the complementary capabilities of the firms enable co-specialization, based on which the collaborating firms are stronger compared to a scenario in which each would just pursue its own individual strategy. (Laamanen, Wallin, 2009)

When taking the ecosystem perspective on capabilities one needs to consider how a firm's entire *constellation* of co-specialized capabilities is morphed over time (Rindova and Kotha, 2001). This viewpoint is different from the focus on individual capabilities or shifts of attention allocation emphases between different operational capabilities since it puts the attention to the capability system as a whole, partners' capabilities included (Afuah, 2000).

Considering capability constellations adds new perspectives when designing national innovation policies. The notion of co-specialized capabilities is not meaningful if one takes the cluster approach. Co-specialization is a way for some selected companies within the cluster to form an orchestrated ecosystem, wherein competitiveness enhancing co-specialization should take place over time. For a MNE, with its headquarters and a disproportionately big part of its workforce still in its home country, the question of how to design a co-specialized, orchestrated network is not primarily about how to organize around exiting domestic technologies. Instead the key question is how to orchestrate global resources and capabilities to better serve customers in the most important markets (Wallin, 2006). For a small country the domestic market is unfortunately not more a very important market as such. Subsequently the attention of these companies is shifting from a domestic perspective towards a global one. Another important shift in innovation priorities for large corporations is from not just emphasizing technology, but increasingly services and total solutions.

The innovation thinking of corporations is therefore more and more about a broader perspective on how to sustain competitiveness. Three perspectives on innovation can be identified: cost innovation, offering innovation, and ecosystem innovation. Cost innovation aims at providing similar value but at lower prices. Offering innovation again intends to provide new positive experiences for the customer. Finally ecosystem innovation is a way to institutionalize a setup where the orchestrating firm and the

members of the ecosystem collaborate so that customers will repeatedly get new and thrilling products and/or services that are perceived as providing better value than any other competing alternative.

Orchestrating in business thus means that one company clearly takes the leading role in the network, and provides the function of the business orchestrator. This has been suggested to ask for three characteristics: awareness, engagement and persistence. The orchestrator has to be able to provide the direction for the other participants in the ecosystem, this is awareness. Then the orchestrator has to be able to inspire the network members to contribute with their complementary capabilities, so that the joint offering truly will be competitive (i.e. engagement). Finally the orchestrator has to have patience and persistence to allow for the time needed for the process to crystallize, and establish a truly competitive position for the whole network, the ecosystem. (Wallin, 2006)

Compared to the SNM perspective two main differences are thus noteworthy: (i) orchestration starts from how to provide value to a set of customers, and is therefore quite focused right from the beginning, (ii) an orchestrated network has a clearly identifiable nodal company (or companies) that acts as the orchestrator. (The individual(s) in charge of the orchestration work have then to have certain qualifications in order to be successful.)

For Mobile Heights the notion of ecosystem orchestration could be one way of developing more far reaching comprehensive solutions that ask for significant contributions from several players, and aims for global impact for example in the areas of mobile solutions for environmental control, traffic control, health care or elderly care. In such cases also the public sector could be a significant customer for the ecosystem to be formed, and in this role provide a natural role for the public sector to strengthen the ecosystem. However, this means that the participating anchor company or companies would ask for some form of exclusivity relating to the technologies and solutions they would develop, especially if they would aim for solutions that have a global potential. In this perspective the approach would be one where the local conditions possibly could have the characteristics of local lead markets.

6.4 Building innovation capacity for Mobile Heights

The recommendations from the international peer review 14.-15. September 2009 supports the division of innovation challenges into two types: the ones relating to the stimulation of entrepreneurs, and the ones relating to solutions and services that will ask for a broader perspective and complementary policies. Some key arguments are here presented:

Stimulating entrepreneurs

The focus of the intermediaries needs to be on the growth phase of High Potential Start-up Companies (HPSC). To drive this development, a realignment of and simplification of the intermediary system should aim to provide clarity and easy access for companies to support and mentoring facilities. (p. 15)

The area of marketing and sales is underserved, while the discussions with the entrepreneurs revealed that there was a strong need for support in this area, especially directed to international marketing and sales. (p. 19)

Innovation in the Skåne region has to date been largely technology driven. The innovation policy and practice should clearly show that technology driven innovation is necessary but not sufficient. (p. 14)

The need for a broader perspective

There is a too narrow focus of the innovation support system on the early phases of development, including emerging technologies and start up firms. (p. 20)

To translate innovation into economic wealth and socio-economic benefits, the Skåne region needs to respond to market and user needs, the pull rather than push phenomenon. Such transformation often requires a significant shift in mindsets, traditions and modi operandi, often challenging the core of collective determination and commitment. (p. 13)

Increasingly, the users of innovation are outside Europe and North America, in countries such as in China, India and Brazil. These countries are increasingly demanding innovative products and services, for example in the field of environmental technologies. (p. 20)

There is a need to define the skills, management competence and internationalization needed for service innovations: In defining various forms of innovation, drivers such as knowledge base, skills, entrepreneurship, management competencies, internationalisation and intermediary support, may need to be examined. (p. 14)

The public sector is a further important source of innovation. Public procurement is a powerful example of driving innovation that can promote both technological and services innovation. (p. 16)

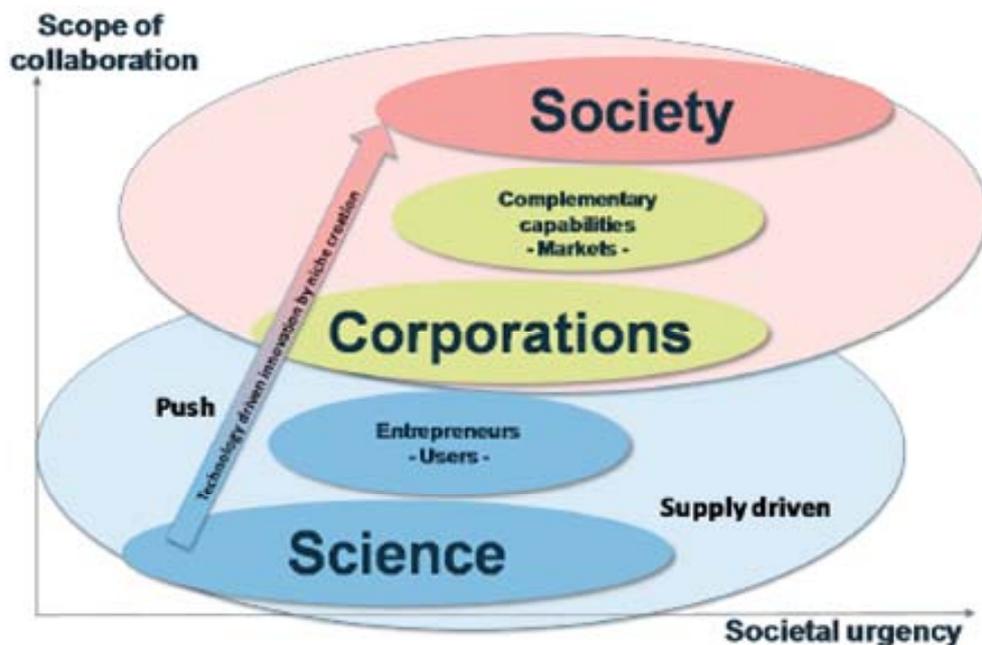
Regional Healthcare provides a thematic innovation platform for companies, knowledge providers and the public sector to engage in all forms of innovation including technologically driven innovation, innovation in services and the servicisation of technology. (p. 16)

The conclusion from the peer review seems to be that there are still improvements that are necessary to better support entrepreneurs, but the major challenge is how to mobilize efforts to be able to provide more comprehensive demand-driven solutions for the global markets.

The peer review report emphasizes the use of resources already existing in the region by more effective forms of dissemination and sharing of information. – However, at the same time the SWOT analysis also highlights that *Industry and business leaders are not involved in strategy and action plans for innovation* (p. 8). This suggests that the perspective of ecosystem orchestration could be one way to make representatives from

large corporations more interested in the participation around Mobile Heights. Here intermediaries will need to engage leading individuals in companies like Ericsson, Sony Ericsson and TeliaSonera to take the orchestrator role in some key initiatives. - The present way of stimulating entrepreneurship is however in many ways adhering to the ideas behind technology focused innovation, which is the main perspective of SNM. Figure 14 illustrates this thinking.

Figure 14. Technology based innovation



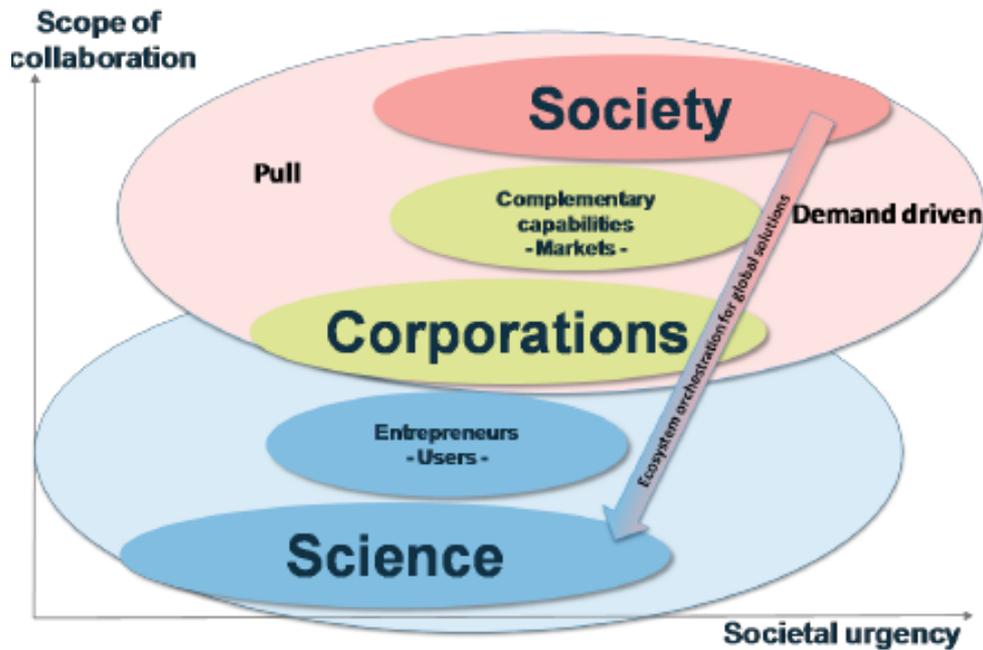
As Figure 14 indicates, the starting point for technology based innovation is normally some new innovative technology, which in the case of Mobile Heights often is related to some scientific discovery. To establish the right environment for such a technology to evolve into market solutions, the main task is to support entrepreneurs in their efforts to find early users, which have the patience and interest to get involved in the collaborative development process. – Often these innovations are not necessarily driven by global market needs, but instead of areas of personal interest for the entrepreneur. Therefore the innovations are often in such areas as entertainments, social media etc, where the entrepreneur him- or herself has a strong personal vision of what could form a competitive offering.

The other alternative is to start from the demand side. The examples from the peer review relating to for example solutions for health care, and the use of public procurement are examples of such demands. This would then ask for a different type of innovation approach, illustrated in Figure 15.

As Figure 15 indicates the starting point here is the identification of the demand, a clear societal need, which is universally recognized. This perspective has also recently been

advocated by Professors Pisano and Shih (Harvard Business Review, July-August 2009).

Figure 15. Orchestrated solutions



The conclusion for Mobile Heights is that different approaches are needed for different forms of innovation initiatives. However, in light of both international comparisons and the recommendations by the peer review group it seems that relatively it is more important to consider how competitive ecosystems can be formed with the innovation support from Region Skåne.

International benchmarks showing large undertakings in this area can for example be found from the United States and China in the area of development of new more environmentally friendly cars. In the United States the Department of Energy has launched a \$25 billion Advanced Technologies Manufacturing Loan Program (ATVMLP), to help promote the development of energy-efficient, advanced-technology vehicles.

The notion of ecosystems puts the focus of governance of innovation policies into a different perspective. Small countries will have to identify, which are those playing fields where they can provide truly competitive global solutions. Here the question is about seeing what complementary capabilities the country possesses, and with whom these capabilities could form a solution, which would also strengthen the competitiveness of the selected partners. Most of these activities will be carried out by companies, but regional innovation policies and governmental actions can also be used to support networking, and fund different types of research activities that are needed to

identify and build those technologies and capabilities that best would fit the new emergent needs.

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7 The Leadership Challenge

Markku Sotarauta

7.1 Introduction

Silicon Valley, Cambridge, Boston and Singapore have been celebrated as stars of a knowledge era. However, in midst of an ever heating global innovation race, there are more and more voices warning policy-makers about the dangers of ‘imitate the best practice’ and ‘replicate Silicon Valley’ strategies fairly commonly adopted by many regional policy-makers. It is believed here that regional advantage cannot be constructed on one ‘best practice’ model but with more fine-tuned development policies reflecting the different conditions and problems of respective regions and regional innovation systems (Tödling & Tripl 2005).

And indeed, policy-makers across the world aim to forge new partnerships, build networks, create regional innovation systems, foster creativity, boost learning and push clustering forward. All this reflects, in one way or another, the basic assumptions of the contemporary research agenda that in the knowledge economy the creation of a local high-level knowledge pool with strong internal links and pipelines to global knowledge sources is the way to construct regional advantage. (e.g. Bathelt et al. 2004; de la Mothe & Mallory 2004; Asheim et al. 2006; Cooke et al. 2007).

The aim of many regions to consciously free themselves from the past path and to branch out by renewing and reinventing themselves for future success seems fairly difficult to implement in practice. The nastiest question in these kinds of efforts often is not *what* should be done but *how* to do it all - how a fragmented bunch of actors, resources, competences, powers, ideas and visions can be pulled together, how people can be mobilized, how a new perception about the region and its futures can be created for needed changes – who and/or what individuals/organizations are capable and respected enough to do it.

Our case studies in the Nordic countries, mainly in Finland, show that the most successful city-regions in their development activities are the ones that have been able to utilize and combine a variety of resources; i.e. local and regional as well as the European and national institutions and resources in the implementation of their own collective strategies. (see e.g. Bruun 2002a and 2002b; Linnamaa 2002; Sotarauta & Kosonen 2004; Kostianen & Sotarauta 2003.) This suggests that at all levels we need people who are capable of leading people, and not only formulating new policies, across many boundaries and managing flux rather than stability defining the order of things.

The responsive capacity of regions requires competent leaders alongside effective innovation systems and policies

The basic premise in this paper is that the knowledge economy is so complex, blurred, dynamic and penetrating that regions, or people engaged in regional development, are forced to learn new skills and become more skilled not only in administrating resources, creating and recreating regulations and formulating development programmes, but also in leading transition and interactive processes. The argument here is that genuine leadership is required and more attention should be directed to skill needed in promoting regional development and to leading development processes in particular.

In regional innovation system studies and in related studies, as well as in the world of regional policy-making more in general, the significance of leadership is not fully understood, or at least appreciated although the significance of leadership is in a central position in the creation of new strategies and in implementation of new models. The main aim of this paper is to open some horizons on policy-networks and leadership for regional development, and more specifically for regional innovation systems. Actual questions revolving around regional innovation systems or the specific case of Scanian innovation system are not discussed here because the other contributions focus more explicitly on those issues.

This paper is an honest compilation of previously published articles (Sotarauta & Bruun 2002; Sotarauta 2005; 2009; forth.)

7.2 Policy-network and its bottlenecks

The 1990s saw increased emphasis placed on competition, partnerships, networks, learning, interaction, communication, etc. Consequently, contemporary policy processes are more ambiguous than before, sometimes it is difficult to say what the goal is, or can any clear goals be perceived at all? Rather we can perceive a series of goals of individual players all the time evolving. At the same time networks are changing, new coalitions emerge and old ones wither away. There indeed is a fairly commonly held consensus for the view that promotion of regional economic development is an interactive process between firms, various public or semi-public development agencies and research institutions. Consequently, there has been a move away from understanding policy-making as a relatively linear decision-making and planning process proceeding from policy design to decision-making, and finally to implementation, towards comprehending policy as a multiagent, multiobjective, multivision and pluralistic process, in which the actual policy is shaped continuously. In this kind of process, such questions as what is to be done, and how, are constantly negotiated and communicated in various forums. All this has led to a vivid discussion on new modes of governance.

‘Governance’ is concerned with co-operation transcending various borders; it takes many goals into consideration and consists of constantly evolving combinations of teams according to different situations. Governance also recognizes and acknowledges that many activities have shifted from formal organizing to more informal networking, and therefore network negotiation and co-ordination can be confounded by the political

context in which they are embedded. Governance can thus be defined as self-organizing, inter-organizational networks that are characterized by interdependence between organizations. Interactions in these networks are game-like, rooted in trust and regulated by the rules of the game negotiated and agreed by network participants (Rhodes 2000, 61).

As Pierre and Guy Peters (2000, 1) state, part of the appeal of governance as a concept is that it links the political system with its environment. Governance can be defined, drawing on Stoker (1998, 18), as “set of institutions and actors drawn from but also beyond government, where boundaries and responsibilities for tackling social and economic issues are blurred, the several institutions are power-dependent, and the resulting networks are autonomous and self-governing”. In this kind of complex and fragmented urban world the paradigmatic form of power is that which enables certain interests to blend their capacities to achieve common purposes (Stone 1993; in Stoker 2000, 91-92). And all this calls for effective policy-networks and well-developed leadership.

The concept of policy network is aimed to help us in taking a better grasp over the new contexts in which policy processes take place. Municipalities, key enterprises, business lobbies, educational and research institutions, financial institutions, state’s regional administration, citizens’ organisations etc. may be members of such a network.

Development agencies should not expect to gain free lunches through networks. Successful network policies require considerable investments in the process, both in terms of financial and spiritual resources. The credibility of the policy initiator is extremely important and attention should be paid to gaining such credibility.

A network can simply be defined as a series of established social relationships, of various degrees, between interdependent actors. A basic assumption is that one party is dependent on resources and/competencies controlled by another, and that there are gains if the resources and competencies can be pooled. Moreover, in networks individual units exist not by themselves, but always in relation to other units. One important advantage of the network concept is that it helps us to understand not only formal institutional arrangements, but also highly complex informal relationships (Kenis & Schneider 1991, 27). On their part, Kickert et al. (1997, 6) define policy networks as “more or less stable patterns of social relations between interdependent actors, which take shape around policy problems and/or policy programmes”. This kind of interaction does not only reflect complexity, but also is in itself complex, dynamic and pluralistic. In practice policy-networks often exist for a simultaneous search for new policy contents, and of new ways and combinations to achieve these aspirations.

In communicative and interactive regional development networks the conscious construction of collective strategic awareness is one of the key elements both in ensuring strategic focus, and the density and integration of development networks.

All in all, policy networks are inherently political (not only party political), involving bargaining and compromise, winners and losers, ambiguity and uncertainty (Lynn et al. 2000, 4), and hence a challenge to mobilize, co-ordinate and direct these kinds of networks for regional development is formidable. For a network-like co-operation relation to come into being it is essential that

- *mutual dependency should be realised* - it could be stated in simplification that no single organisation listed is capable of such effective development work alone as what can be achieved in co-operation with other development organisations.
- *shared power and leadership should be accepted* - no single development organisation may take precedence over others in issues of urban development (this may be possible in individual issues). Thus power is the ability to promote shared and/or separate objectives in interaction. Management of networks is stressed. (See Kickert et al. 1997; Sotarauta & Linnamaa 1999; Bryston & Crosby 1992,13.)
- *the nature of network-like co-operation should be understood, i.e.* the importance of reciprocity, trust, solidarity and confidence must be accepted and internalised.

A regional development network often is a loosely organised strategic network. It is rendered strategic by the effort to influence the development of the urban region in the long term. Here it must be pointed out that only part of the actors of the development network has been assigned the task of promoting regional development. Some of the actors of the network participate in its activities via their own interests, simultaneously having an indirect effect on the development of the urban region. The network is rendered loose by the fact that it does not necessarily have an established organisational form or permanent forums created for its purposes (even though it often has). Moreover, the regional development network is generally organised in different combinations around different projects.

Even though being loosely coupled a development network ought to be able to join internal and external resources and competences together in the creation and implementation of their own collective development strategy.

For a development network to become a force in fostering regional competitiveness, it must be possible to bypass many of the bottlenecks in the networks. The series of studies, carried out in the University of Tampere focusing on networks in regional and urban development policies suggests, that the many bottlenecks in the networks can be summarised as follows:

Artificiality - the development network exhibits a tendency to be artificial, if cooperation is defined by the administrative sectors and institutional structures. Thus cooperation may become an end in itself.

Incompatibility - organisations and their key personnel do not get on together.

Isolationism - organisations concentrate on internal matters and do not actively orientate externally seeking new partnerships and joint projects.

Withholding of information - organisations do not actively share information with one another.

Lack of trust – network-like relations are based on trust. If trust is lost, time and energy are needed to restore it.

Lack of discipline - some of the actors do not respect the ‘rules of play’ and primacy of partnership, thereby jeopardizing relationships of trust.

Lack of understanding - key actors do not understand each other’s points of departure, objectives and strategies. They may also use their own professional jargon, thus people may end up talking at cross purposes.

Lack of commitment - actors are assumed to commit to the common good without seeking commitment from the perspective of actor’s own points of departure and without accepting different ways of making a commitment.

Lack of resources - operating within network-like relations each party ought to contribute some value added to the network, lack of time is generally regarded as one of the most valued resources now lacking.

Failure to learn - actors belonging to the network cannot learn from their own and other actors’ experiences nor incorporate anything new into their activities.

Shortage or inactivity of forums - successful cooperation presupposes a sufficient number of forums to enable cooperation to be broken down into details and to support the actors’ opportunity for dialogue.

Unclear division of labour - the debate simply goes round and round getting nowhere if tasks cannot be divided up and responsibility for actions cannot be apportioned.

(Sotarauta & Linnamaa 1997; Sotarauta & Linnamaa 1998; Sotarauta 1999; Sotarauta et al. 1999; Cooke 1996)

The many institutional and other obstacles blocking development processes and networks should be systematically analyzed and removed in order to make the changeover to a new development path possible. Such obstacles may be prevailing thought and action patterns, organizational structures, administration, fear of losing acquired advantages, conflicts between organizations, etc.

The proposition here is that a truly effective regional development policy and a regional innovation policy require regional leadership that reaches beyond the boundaries of

those organisations that authorizes various key development actors and is simultaneously effective and open.

7.3 Leadership

The kind of policy setting briefly described above is challenging. Leaders of the complex policy networks are not some external third parties, actors aiming to influence from above and outside, but the effect of different actors on each other and on themselves (Kickert 1993, 195). The classical, mostly intra-organizational inspired leadership and management perspectives so dominant for more than a century in public administration and in corporate world are according to Agranoff and McGuire (1999) simply inapplicable for multiorganizational, multigovernmental, multisectoral and hence multivision, multistrategy and multivalue forms of governing and promotion of regional development. The point of departure is that it is always easier to find out the elements of success and/or failure in retrospect than to find new development paths for the future and new modes of action in the middle of uncertain and open-ended situations.

The skills and thought patterns of development officers should evolve so that a mechanical planning and development culture could be left behind and regional development policies could enable and empower the activities of small groups and individuals as well as intensive collaboration between key organisations.

Leadership in policy networks is more or less an interdependent process. It consists of individuals, coalitions and their capabilities exercised in interaction to achieve joint and/or separate aims (Sotarauta 2005). An effective promotion of, let us say digital media in a city, requires in-depth understanding and knowledge of the substance of digital media; it also requires a good view on how general policy processes and specific policy processes of that field come together, what their dynamics is, who the key-people are and how issues can be pulled through the multiple chain of decision-making. In addition, somebody should know how people think in this field, what the driving forces of firms, researchers, and other key players in the field are, and what the right measures in building networks are in this specific field and how they can be linked to wider development efforts to gain more power. Therefore, leadership needs to be shared. No one can master all the pressures and all of these spheres of knowledge alone. Individuals with different knowledge from different walks of life are needed, and they ought to be able to pool their knowledge to show shared leadership.

Key actors in the regional development effort should be regionally well-known and respected individuals. The combination of enthusiasm and authority that they embody is likely to transmit a positive and regionally anchored view of the project to the network and more widely to the general public. However, they ought not to expect that their institutional position translates automatically into authority and influence in the network. Respect needs to be earned.

Leadership always raises conflicting views; it is quite easy to underrate its significance by arguing that regional development cannot be led, that it is a result of many forces, or that it is impossible to identify leaders who really make a difference. This is, of course, the nature of regional development, but it does not imply that leadership would not play any role. It is also quite easy to overemphasize the role of leadership by giving some leader(s) all the credit, thus mystifying leadership and reconstructing the old-fashioned notion of a leader as a “talented and visionary (and often white) male” who controls and provides his followers with a visionary direction. This is naturally an overly simplified dichotomy but discussions on the role of leadership in regional development easily drift along these lines, even though reality is much more diverse. At all events many case studies have shown that the capacity for bold and fast decisions in opening opportunities for new paths has been of utmost importance, which emphasizes the role of leaders. As Kostianen and Sotarauta (2003) point out, brave, visionary individuals and innovative coalitions formed by them are often needed in creating conditions for a new development path. Core coalitions formed by innovative and determined individuals often plant the first seeds of something new in the midst of the different spirit of the times and its institutions and culture; they act against the tide.

Visionary leadership and concentration of representative authority in the regional development network should be balanced with openness, transparency and goal consistency to guarantee the credibility and educational self-renewal of the network.

To be able to influence regional development events, leaders have to act in the riptide of several different interests and aims and find a totally new range of different means to be applied in different events. On the other hand, a good leader has always known how to act in a complicated field of activity, mastering several different operational environments, interests, people and issues simultaneously. Leaders have also earlier been able to sense what different people need in different situations; therefore they have been able to act as required by the situation. They have also earlier known how to build networks, to involve new actors in networks, to negotiate funding, and to capitalize on state funding, for example, through skilful tacking. The knowledge economy as an environment, however, requires that more and more people have a more developed strategic in-built sense of the regional development game than earlier.

According to the Webster’s dictionary *to lead* is...

- to go before or to show the way
- to influence or to induce
- to go head of or in advance of
- to have the advantage over
- to act as leader
- to go through or pass
- to act as guide

But what is to lead a complex, ambiguous and muddled process of regional development? How to go before or to induce or to act as guide if one does not have formal power to do it? How to go ahead of, if one has formal position but is not respected?

The key actors in the regional development network should include visionary individuals capable of fostering consensus around a common vision for the development process. Managers in the regional development network should have the skills to observe, understand and act on opportunities promptly as they open up in the development process, such as adopting new modes of development work and funding.

If asked what is important in the role of a leader engaged in regional development, leaders themselves may provide a wide range of different answers. Some might stress the implementation of statutory services, some draw attention to the significance of the creation of shared visions and strategies that steer the network or development organisations, some stress the creation and use of networks, or emphasise success indicators and their follow-up. And most likely, all of them would be right. Leadership tasks are manifold and intricate: along with the changing world, the challenges leaders are facing are continuously changing. It should also be noted that in regional development leadership is not a straightforward question of leaders and followers, leaders lead some issues but often they are followers in some other, and some of the followers may in some other occasion be leaders.

In this kind of context leadership may be seen as the effect of actors on one another and it may be that in promotion of regional development there are several leaders having different qualities, and at all events leadership in regional development is more or less collaborative process, no one can lead the entire region alone since it is not possible to control the activities of the other actors. In this paper I argue that leadership in regional development may be based on many things and basically the question is about seizing it, and about how it can be seized.

Next I raise some messages for regional development that aim to tentatively answer the previous questions and that for their part stress the importance of leadership in regional development as well. These messages are based particularly on a case study carried out in a Finnish region of South Ostrobothnia (see Sotarauta & Kosonen 2004) but also on earlier case studies of three Finnish city-regions of Turku, Tampere and Jyväskylä, and of North Denmark. (see Bruun 2002a and 2002b; Kostiainen & Sotarauta 2003; Linnamaa 2002.)

The spirit of the times is often the soil in which the seeds of a new development path are rooted. In Finland, for example, in the 1990s the rapidly evolved interpretation of “Finland as an innovation country” in a way forced regions to seek and create their own understanding of information society, the knowledge economy and related issues. When the knowledge economy and related issues were discussed everywhere, in the media, conferences, literature, to mention a few, and when the national bodies began to channel

resources into it, also the local “inspirers”, the champions of development efforts, were thus able to utilize general societal discourse in their own argumentation and in collective creation of new interpretation. This kind of process usually calls for leaders who do not give orders but who facilitate and co-ordinate the sense-making processes across the institutional and organizational boundaries. (Sotarauta & Kosonen 2004.)

If there is an uncritical outlook on the spirit of the time, the promotion of regional development may end up being hollow development rhetoric with some fashionable catchwords. Consequently, many actors may lose their faith in the development process and momentum may be lost.

Our case-studies also show that *intensive collaboration* among firms, the public sector and educational institutes made it possible to launch new flagship processes. It should be kept in mind, however, that in Finland in the 1990s a common strategy for all public efforts to promote regional development was to build networks for policy-making and implementation. The cases studied show that the authorities who themselves invest financial and/or temporal resources in the development processes and those whose key individuals are respected and trusted have more success as network builders than those who do not. In contrast, authorities that enter network-building without such investments and/or such individuals face considerable scepticism and will probably have small chances to make the most of the network strategy. Therefore *individuals* and *coalitions* formed by them often play a decisive role in development efforts. The combination of enthusiasm and authority that the key actors embody transmits a positive and regionally anchored view of new prospects to other development actors, firms and the general public.

The capabilities and skills of the key actors should be continuously developed to be able to see different things as “stakes” in the promotion of regional development and to utilize them in cooperation with other actors.

In mobilizing people and resources these key individuals often use an *ambitious but believable story* as a unifying force. In one of its dimensions regional development is about competing ideas and interpretations; by a believable story it is possible to link fragmented pieces of information together in a world that is full of information, development programmes, projects and other development efforts. In South Ostrobothnia, for example, an *inductive and inducing strategy* was applied wrapped with a constantly emerging story line (see Sotarauta & Kosonen 2004). The development process was based on a collective sense-making of the knowledge economy and its reflections in South Ostrobothnia; thus collective interpretation and conceptualization formed a core in the strategy process. The story about a less favoured region in the global knowledge economy with its own identity and stubborn resistance to giving up in front of “big changes and big players” and to adapt strategically formed the plot of the development story. It is worth noting here that it was not about a ready-

made plot about but a constantly emerging and ongoing discussion that bounced back and forth between vision and practical issues and among many organizations.

The capacity to bring forth a vision of a different future for the region is an important element in the emerging story line. However, the mechanical formulation of a vision and strategies is not sufficient. The skills and abilities of key actors to use visions and strategies as tools in creating the story and its implications are more important than a strategic plan with well-formulated and documented visions. To be truly functional in the development work, a vision should be communicable, challenging and appealing. A vision is not an outcome of a planning process but a long process in itself.

The regional development network should solidify in a functioning organization the capacity to bring forth a vision of a different future for the region. The mechanical formulation of vision and strategies is not sufficient but key actors should develop their skills and abilities to make better use of use visions and strategies as tools in leading processes.

In an inductive and inducing strategy process it is important to create a *sense of urgency*, because often the formulation of a vision or development programme and, for example, receiving EU-funding, provide a development network with a false sense of security. (Sotarauta & Lakso 2000.) Development efforts need the sense of drama that in South Ostrobothnia was found in a combination of a crisis, a believable story, credible individuals and a desire to show the rest of the Finland that “our region is not out of the game yet”. In creating a sense of urgency the role of the media as a forum of critical discussion is important in making the discussion public and people aware of the challenges and opportunities. *Institutions* usually provide inducing and inductive processes with a general framework and they have a major directing effect on processes. Institutions frame the stories and actions of individuals and prevent them from getting out of hand. At their best institutions open up new opportunities for individuals and small active groups of people but do not trap them amidst endless bureaucracy and thus lock the whole region in the past.

Such issues as shared vision and common strategy are not in the context of regional development as straightforward as they seem at first sight. Even the question “what is development?” may prove hard to answer. Moreover, such questions as “what are we aiming at?”, “how are we acting together?”, “how are resources to be channelled?” may be very difficult to answer as all the various organizations and their leaders contemplate development from their own perspective. Afterwards leaders willingly tell us how rationally they led the process and found answers to the above questions, but in practice the process may have been muddled, full of inertia and confusion. In the middle of this kind of process it is not an easy task to find answers and to mobilize people in an interactive and interdependent process. Thus from the leadership point of view, it is relevant to ask how the answers were actually found, or how the processes were led.

These are challenging questions, because in the promotion of regional development there is generally no single strategic management to set goals single-handedly and formulate the strategies. Even though city governments, various regional development agencies and national agencies play an important role in regional development, they are in no position to direct or control the strategies of enterprises, organizations, families, for example. The management of the regions cannot be described as “top-down” or “direct and control” models, nor is strategic management able to easily define and implement “objectives to serve the common good”. Strategy preferences must be formed and reformed by balancing different interests and seeking third solutions. Often they emerge from dynamic processes and are thus also dependent on the logic of the situation and political judgment as to what is feasible and what is not. (see Healey et al 1995.)

Therefore also the assumption of one vision guiding many organizations may not be as easily achieved as often suggested in literature. The basic idea of having a grand vision guiding the activities of many organizations is very tempting. It would make the transformation process more manageable. It is only natural, however, that different organizations would nevertheless first seek to realize their own strategies. Thus I suggest that if leaders forge partnership within a shared vision, they do it the hard way. If we accept that organizations and individuals are selfish and always approach regional transformation from their own points of view, we could make an assumption that leaders operate between visions. Perhaps in retrospect it appears as if there had been a shared vision from the day one. Vision is therein not directly guiding different actors but is in itself an arena for discussions, battles and quarrels; hence, it is not seen as an outcome of a superb thinking of a leader or a creative planning process but as a process. In spite of literature claiming otherwise, it is not necessary for a leader to have vision to lead. A leader may lead by engaging followers to an open-ended visioning process and hence empower them to search for the futures; a leader may also identify the vision implicitly existing in the community, interpret it, and then communicate it convincingly in the community and so mobilize people.

7.4 Leadership challenge summarized

In development networks, a sense of mutual empowerment is important and conscious efforts need to be made to create and actualize this. In this endeavour, it has been essential to understand that mutual dependency should be realized. It could simply be said that no single organization or individual is capable of achieving such effective development work alone as it can achieve in cooperation with other development organizations. Also, the nature of network-like cooperation should be understood; namely, the importance of reciprocity, trust, solidarity and confidence ought to be accepted and internalized in order to have a truly functional network. In networks, shared power and leadership should be accepted. No single development organization may easily take precedence over others in issues of regional development (although it

may be possible in individual issues). Thus, power is the ability to promote shared and/or separate objectives in interaction.

The true value of regional development network is based on the moral values, that is, is it open or closed and whose interests it is striving for and how. Ensuring the longevity of regional development and maintaining its entrepreneurial performance requires an adequate degree of density and connectedness of the regional development network. Therefore, the key role for network leaders, whatever organizational form the network may have in regional development, is to maintain and deepen the sense of mutual benefit that exists within the network by enhancing network connectivity, integration (mutual adaptation) and transparency. Network leaders should also be able to maintain sufficient network informality, connectivity, and integration to promote education, research and entrepreneurship within the network, while at the same time guaranteeing network transparency and goal consistency to attract external actors, broaden participation and stimulate critical discourse.

The leadership challenge can be summarized as follows: the resilience, persistence and consistency of regional development work should be secured. The aim ought to be a) to deepen the pool of commonly held knowledge (explicit and tacit) both in substantial and policy matters; b) to secure institutional flexibility (the ability of the systems and key organizations to change); c) to develop innovation capacity in all walks of life (also within the policy community itself) and; d) to increase the capacity to develop relations of trust and reciprocity and to create a sense of a widely-held common project.

8 Systems, what systems? A reflection on the innovation strategy of region Skåne

Elvira Uyarra

8.1 Systems, what systems?

Region Skåne aims to strengthen the innovative capacity of its territory, with the vision to become the most innovative region in Europe by 2020. Previously centred mainly on supporting clusters in key sectors, the policy interest now focuses on strengthening the governance of its system of innovation and on addressing new challenges such as social issues, environmental problems, challenges of the ageing population etc.

The innovation action of the Skåne region plan states that: “knowledge of innovation systems and innovation processes, and above all the capacities for developing such systems and processes, have as a result become increasingly important for the competitive capacity of companies and regions”. Therefore a key objective for Skåne is to ‘strengthen the system perspective’ and to ‘develop systemic governance’

One first consideration in relation to the aim of ‘strengthening the system perspective’ in Skåne therefore concerns the definition of system, and its articulation in policy. While the idea of systems has been highly influential in innovation analysis and practice, different interpretations of the concepts of the term coexist. This is not unproblematic, as different interpretations will suggest different (implicit or explicit) implications for policy design.

‘Systems’ as metaphor

Early uses of systems of innovation used the term as a ‘metaphor’ to help understand the role of (national) institutions that were perceived to influence the rate and direction of innovations. A metaphor is, according to the Oxford dictionary, a figure of speech in which a word or phrase is applied to something to which it is not literally applicable. The use of the term ‘systems’ is therefore a representation or a map of something more complex.

The starting point of systems approaches was the recognition that technological capabilities were very uneven across countries and regions, variation that could be explained by “institutional differences in the mode of importing, improving, developing and diffusing new technologies, products and processes” (Freeman, 1995:20). The interest was to examine to what extent the presence (or indeed absence) of those institutions mattered for innovation. In this vein, Patel and Pavit (2004; 79) define a system as “the national institutions, their incentive structures and their competencies, that determine the rate and direction of technological learning”. However, the interest

of such analyses was not so much to delineate or to provide an exhaustive account of those institutions, but to provide a comparative-historical narrative that could help explain the influence on innovation of various kinds of interactions and interdependencies between organisations and institutions. Indeed, such an examination can only be done retrospectively. A degree of caution was exerted when translating those into policy design. No presumption was made of a 'right' or 'efficient' configuration of systems. The motivation was rather to compare diverse settings (and therefore learn from diversity and differences, Nelson and Rosenberg, 1993) rather than to provide any form of general explanation.

Such a view of systems constitutes a loose framework rather than a clearly articulated term. As such it remains under-theorised. Edquist (1997; 27) notes that it is not able to provide a "sharp guide to what exactly should be included in a (national) system of innovations". The criteria for inclusion of the relevant institutions and organisations vary between a narrow one ('organisations and institutions involved in searching and exploring') and a broad one (all parts and aspects of the economic structure and the institutional set up affecting learning as well as searching and exploring) (Lundvall, 1992, p.12). In relation to the system boundaries, a national perspective has been predominantly adopted on the basis that many institutions influencing innovation have a national character. However Lundvall (1992:24) conceded that "national systems of innovation are open and heterogeneous systems" and that there can be other levels (local, sectoral) at which to study the innovation system. Further, the approach remains ambiguous with respect to whether the existence of a system can be presupposed or whether we can only speak of a system when certain conditions are met, for instance in terms of certain infrastructures or a minimum level of socio-economic development (Sharif, 2006).

Systems as networks

Yet other approaches see systems primarily as flows, networks and linkages. Systems are the 'elements and relationships which interact in the production, diffusion and use of new, and economically useful, knowledge' (Lundvall, 1992). This is linked to Lundvall's (1992) examination of user-producer interactions within national systems of innovation. These micro-foundations place interactive learning and knowledge at the centre of analysis and are the starting point of discussions on the bottom-up dynamics of systems, particularly regional systems of innovation (Cooke et al, 1997; Howells, 1999), but also sectoral systems. Such bottom-up dynamics try to understand "how firms respond to, and interact with, the innovation system" (Archibugi et al, 1999; 8).

Such analyses are not so much concerned with seeking to identify the key (static) elements of an innovation system but instead try to identify the dynamic processes that influence such localised learning and knowledge sharing at the micro level (Howells, 1999). Such an interpretation is closely connected with the notion of regional clusters. According to Cooke et al (1997), regional innovation systems result from industrial clusters that present the quality of 'associativeness'. If we add to this the governance

structure of firm support organisations, then “we may speak of a regional innovation system” (Cooke et al, 1997: 484). Clearly, a region can host various, competing clusters, and many clusters may be mostly extra-regional.

Some critiques would argue that interactive learning need not necessarily mean the presence of a ‘system’. As Archibugi (1999;8) notes, it is unclear “how much the presence (or indeed absence) of a national or sectoral system of innovation may affect the innovation behaviour, actions and outcomes of firms”. In this case networks (or clusters) may be a more purposeful unit of analysis. Miettinen (2002) argues that interactive learning can be analysed by studying interactions in networks without resorting to any systems concept.

Regardless, such accounts of interactive learning processes seem to be lacking in most descriptions of systems of innovation, which tend to privilege institutional analyses vis-à-vis the dynamics of actors’ links and interactions. Andersen et al (2000) argue that more effort needs to be done in connecting the internal relationships, the cohesive dynamics linking the system and feedback elements at the micro level, namely a better alignment of top-down and bottom-up perspectives of systems (Howells, 1999, Uyarra, 2010, Iamarino, 2005).

Systems as artefacts

More recent system approaches are characterised by more comprehensive attempts to understand the determinants of innovation—namely the factors (actors, functions, relationships) that have an impact on innovation—than has previously been the case. The system is here not a (narrow) set of actors influencing innovation, or a shorthand for knowledge sharing networks or interactions. Instead it is defined as “including all important determinants of innovation” (Edquist, 1997). Hekkert et al (2006; p.414) similarly see the concept of innovation systems as a “heuristic attempt, developed to analyse all societal subsystems, actors and institutions contributing in one way or the other, directly or indirectly, intentionally or not, to the emergence or production of innovation”.

If we can understand the determinants of innovation, system approaches automatically become a useful “conceptual framework for government policy making” (Edquist, 1997; 16). According to Hekkert et al (2006), if we are able to understand the activities that foster or hamper innovation, or “how innovation systems ‘function’”, we would then “be able to intentionally shape innovation processes.” Thus the performance of the ‘system’ becomes a causal explanation of national innovative activity and the identification of its determinants makes its management and improvement feasible (Miettinen, 2002; 46). This interpretation of systems is therefore that of the system as instrument or artefact, a machine performing certain ‘functions’ whose performance can be improved or fine-tuned through the right policy levers.

Such an approach would presuppose the existence of a ‘system’, even if it is weak or under-performing. The performance of the system can be evaluated in terms of “how

well the functions are served within the system” (Hekkert et al, 2006). According to Johnson, inherent in ‘systems views’ is the assumption that system components contribute to the ‘goal’ of the system (“or they would not be considered part of that system”), and this contribution to the ‘goal’ of the system is referred to as a ‘function’. The question that concern scholars is therefore the identification of the set of functions³ that are (or should be) fulfilled by the different actors or components.

Such functionalist approaches tend to imply that actors fulfil a single explicit function within the system and see actors as targets of public policy to be transformed by policy-induced learning into exhibiting behavioural changes⁴. They also tend to treat actor types (e.g. universities, SMEs) as relatively homogeneous and run the risk of conflating actors with the roles that they play⁵. The use of functions to discuss innovation intermediaries and intermediation is a typical illustration of these difficulties (Howells, 2006). Intermediaries are not a class of actors, nor is intermediation a function: intermediation is a role which can be played (or claimed to be played) by a variety of actor types. Furthermore, such actors can choose to play that role in combination with other roles, rather than passively adopting an ‘intermediating’ function.

There is also a risk of focusing more on those ‘components’ that are more amenable to policy influence (at regional or national level), even if their relevance for the innovative performance of firms is not demonstrated. Indeed, whereas early system approaches discussed the influence of institutions as ‘rules of the game’, more recent accounts centre more on the role of formal organisations, particularly those performing ‘intermediating’ functions. A serious analysis of institutions seems to be missing (Parto et al. 2005).

Despite claims to the contrary these approaches can be reductionist and static, treating the ‘system’ as the sum of its parts and abstracting a context-specific, historically determined and ever-evolving cast of actors and institutions into a snapshot-like depiction. When operationalised, such approaches concentrate on inventories or checklists of components (some of which may be relevant and explanatory, some just ‘noise’ - see Radosevic, 2002) and on the quantity of system interactions, rather than exploring the quality of interactions, institutions, processes and actors, understanding how they and the roles they play in the system evolve over time.

This all-embracing approach is at odds with the idea of innovation is a complex, uncertain, contingent, heterogeneous phenomena, view that renders it impossible to

³ Broad functions are knowledge producing, knowledge using, intermediating or policy-making functions, although the literature is unclear on whether functions reside in actors and institutions or whether functions are a property of the system itself (see e.g. Chaminade and Edquist 2006 versus Van Lente et al 2003).

⁴ It therefore denies agency in relation to innovation policy to all but ‘policy-makers’ and ascribes passive systemic ‘functions’ to other actor types.

⁵ Galli and Teubal (1997) however distinguish between organizations and functions, as organisations have multiple roles.

identify all the factors influencing technological change. All-inclusive approaches run the risk of confusing the map with the territory (Nelson, 1977). Jorge Luis Borges' tale 'Of Exactitude in Science' provides a salutary literary warning of such perils:

... In that Empire, the Art of Cartography attained such Perfection that the map of a single Province occupied the entirety of a City, and the map of the Empire, the entirety of a Province. In time, those Unconscionable Maps no longer satisfied, and the Cartographers Guilds struck a Map of the Empire whose size was that of the Empire, and which coincided point for point with it. The following Generations, who were not so fond of the Study of Cartography as their Forebears had been, saw that that vast Map was Useless, and not without some Piteousness was it, that they delivered it up to the Inclemencies of Sun and Winters.⁶

Systems as an 'emergent property'

Finally, 'systemness' can be seen as an emergent property resulting from complex mutual interactions. A number of authors (e.g. Katz, 2006; Metcalfe and Ramlogan, 2008) see systems of innovation as complex systems. This is also what appears to be implication when systems are referred to as 'ecosystems'. The characteristics of complex systems include a dynamic structure with interdependent constituents that interact in complex and non-linear ways. Complex systems are open, with boundaries that are difficult to identify, and structures that span many scales. They also exhibit emergent properties or behaviour. Emergent properties cannot be predicted by the fundamental properties of the system's constituents or the system itself. Finally, complex systems are able to self-organize, i.e., its emergent properties may change its structure or create new structures (Katz, 2006).

This has implications in terms of trying to predict innovation outcomes in conditions of uncertainty and complexity. Change is non-linear, discontinuous and probabilistic rather than deterministic. This interpretation also implies that the identification of cause-and-effect relations (or determinants) and their manipulation must always be a profound challenge. Cause and effect in complex systems are "distributed, intermingled (e.g., an organism and its environment) and not directly controllable, so policymakers need to become more comfortable with strategies that aim to influence rather than control" (OECD, 2009: p.13). Measurement with traditional tools is also problematical. As Katz (2006; 907) notes, "our perceptions about innovation systems are only informed by indicators based on linear assumptions even though our observations tell us that they behave differently".

These systemic characteristics would preclude any attempt to manipulate, let alone create, systems. As Metcalfe and Ramlogan (2008) note: "innovation systems do not occur naturally, they self-organise to bring together new knowledge and the resources to exploit that knowledge; and the template they self-organise around is, we suggest, the

⁶ Jorge Luis Borges, *Collected Fictions*, Penguin 1999 .

problem sequence that defines a particular innovation opportunity. Hence, innovation systems are emergent phenomena, created for a purpose, they will change in content and pattern of connection as the problem sequence evolves, and they are constructed at micro- and meso-scales. Within these networks, firms, the unique organisations that combine the multiple kinds of knowledge to innovative effect, play the key role in the self-organisation process. Science and technology systems, networks and communities of practice, are necessary parts of the innovation networks but they are not sufficient.”

An implication of this view is that there is no clearly identifiable ‘system’, and that systems are linked to a problem or purpose, and are therefore not stable but transient. Rather than a holistic explanatory framework for understanding all determinants of innovation, the implication is that innovation systems are more useful to understand specific (or “local”) innovation problems (Metcalf and Ramlogan, 2008).

Implications for Skåne:

While the idea of systems has been highly influential in innovation analysis and practice, different interpretations of the concepts of the term coexist. This is not unproblematic, as different views of systems (may be shared by different actors) suggest different (implicit or explicit) implications for policy design. They would have different implications in relation to: whether systems can be assumed to exist in every potential setting; their extent and boundaries; their composition; and their malleability and control. A reflection on the implicit model adopted is a relevant exercise in order to understand the values and assumptions adopted and to manage the expectations of the different actors involved in the process.

8.2 Does theory matter in policy making?

The previous section argues that there is a mix of possible interpretations of systems as well as policy uses. The differences are not trivial, as they would have different responses to questions such as: Can we understand systems? Can we measure them? Can we assess their performance? What are the system components? What are the boundaries? What is the most important directionality of cause and effect relationships for innovation? Can we influence systems, and if so how? Can we govern systems?

However, does it matter which theoretical model of systems of innovation is adopted? Do policy makers necessarily follow or apply a particular theory in policy design? Can they use a mix of those approaches to fit the chosen development goals?

Policy ‘rationales’ are more or less formalised models implicitly or explicitly drawing upon academic theories or concepts that could inform policy design, implementation and evaluation (Laranja et al, 2008). Rationales contain assumptions about the nature of the system within which an intervention is to be made.

It is clear that academic theories are just one amongst many factors shaping public policy. Majone (1989) suggests that policy makers use theory in a selective way to justify policy action. Scholarly theories are seldom adapted “wholesale in a one-to one transfer of ideas to policy” (Laranja et al, 1998; 825) but instead attractive elements of scholarly ideas tend to be ‘cherry-picked’ by policy makers. Policy makers may use theories justify policies but more often policies may be rationalised retrospectively.

Laranja et al (1998) distinguish between meta-rationales (high-level philosophies about the proper modes and limits of government action) which influence in turn the way in which specific ideas are taken up and interpreted in the policy process; and specific policy rationales, the adoption of which is guided by the meta-rationales in operation at the higher level⁷.

The appeal of the NIS and RIS concepts are that they constitute a broad discourse that policy makers can use selectively (De Bruin and Lagendijk (2005). Miettinen (2002) suggests that the system of innovation concept constitutes a ‘boundary object’ linking yet at the same time preserving the integrity of academic and policy discourses. Different meanings are attached to boundary objects by different people and in different contexts. Sotarauta (2009) notes how systems of innovation have played a key role in Finnish policy making by allowing the different stakeholders to better understand the interconnectedness of economy and therefore help break administrative silos in order to change policies.

A one to one translation or mapping between theoretical contributions and specific policies and instruments is therefore not a straightforward exercise. This notwithstanding, understanding the rationales (theoretical or otherwise) for action in policy making is relevant. Uncovering the rationale behind policy action or inaction is essential if any meaningful evaluation is to occur (Salmenkaita and Salo, 2002). Indeed a common pitfall in evaluations of regional policies such as regional innovation strategies and clusters is a lack of clear vision or rationale of the intervention.

8.3 ‘Broadening’ of innovation policy

The demand for new ideas and models to understand innovation to support policy intervention is partly driven by heightened expectations on the part of policy makers in relation to innovation policy (and these heightened expectations are created in part by the promise held out by ‘systemic’ ideas).

Countries (and indeed regions) are trying to move towards a ‘broad-based’ innovation policy, one that stresses demand and users (demand-side policies) alongside a supply side innovation policy based on science and technology. The move is partly justified by: a realisation of the increased complexity of innovation and the perceived need to provide a broader mix of external support to firms, the need to tackle pressing economic and societal problems (grand challenges) and the relative failure of traditional research and innovation policies to transform the innovation performance of member states.

⁷ The idea of meta-rationales is akin to the term ‘policy paradigm’ proposed by Hay (2002, inspired by Thomas Kuhn (1962)), namely packages of related ideas that act as a filter of responses to problems. Meta-rationales can prevent certain sorts of conclusions being drawn from otherwise influential theories and concepts. This can lead to an over-emphasis on one lesson from a body of theory at the expense of other, possibly equally significant, lessons.

This increasing broadening of innovation policy, namely the recognition of the multiple manifestations of innovation and therefore that innovation-driven economic success depends on more than traditionally-conceived S&T policies is typified recently by new typologies of innovation policies which recognise the role of indirect as well as traditional 'direct' measures and 'demand-side' as well as 'supply-side' measures or instruments. In a related vein, Borrás (2008) describes a process both of widening and deepening of innovation policy, with the introduction of new and more sophisticated policy instruments (widening) and an expansion of the realm of action for innovation policy (deepening). Legrand and Associates et al (2003) define this rethinking of the scope of innovation policy as a transition to a 'third generation innovation policy' which should "place innovation at the heart of each policy area". The latest drive (perhaps a 'fourth generation innovation policy'?) in relation to European research policy appears to be the need to increasing the value of the contribution of public and private sector research to Europe's economic, social and environmental goals⁸.

The expansion of the realm of action and new expectations for innovation policy implies that instruments intended to achieve other policy goals (such as procurement, regulation, education, tax measures, etc) have been or could be 'co-opted' in the service of innovation policy. As Nauwelaers and Wintjes (2008) put it, innovation has "invaded" the agendas of many traditional policy fields (p.286).

This broadening of innovation policy involves an implicit value judgement in relation to the boundaries of innovation policy (what is and what isn't innovation policy), and in relation to whether innovation constitutes a means to achieving other policy goals or whether it is a policy goal in its own right.

Lundvall (1999; p.20) notes that traditionally "industrial and technology policies have been thought of as having a single aim to accelerate innovation and economic growth." He argues that this is not sufficient, given the potential social and distributional impact of industrial and technology policies, and thus should be "integrated, or at least coordinated, with policies relating to infrastructures, social justice and not least education and training." It is unclear whether this refers to the (potentially adverse) effects of innovation policies and the need to minimise those, whether innovation goals should be subordinated to the pursuit of objectives of other policies or whether policy goals should be better aligned and coordinated.

Regardless of the rationales behind the 'broadening' of innovation policy, the implication is that the potential for tensions and trade-offs in policy increases. Such tensions may happen not only within the same policy domain or arena but also across different policy areas, across levels of governance, across implementation spaces or places (not necessarily the same as levels of governance) and across time. Table 7

⁸ ERA Expert Group "Rationales for the European Research Area", chaired by Luke Georghiou (University of Manchester)

provides a characterisation of the main dimensions and types of interaction and potential sources of tension.

Table 7. Conceptualising policy mix interactions: dimensions, forms of interaction and potential sources of tension

Dimensions of interaction	Forms of interaction
Policy 'space'	Between different instruments targeting the same actor or group (within or across dimensions)
Governance	
Geography	Between different instruments targeting different actors/groups involved in the same process (within or across dimensions)
Time	
	Between different instruments targeting different processes in a broader 'system' (within or across dimensions)
	Between nominally 'the same' instruments (across the different dimensions)
Possible sources of tension between instruments in the policy mix	
Conflicting rationales	
Conflicting goals	
Conflicting implementation approaches	

Source: Flanagan et al (2010)

This expansion of the accepted (or aspirational) realm of action for innovation policy and the high expectations on innovation policy to tackle new and pressing problems paradoxically coincides with changes in governance that can imply a lower capacity of regions to influence policies. The involvement of a variety of actors in policy also increases the challenges for systems governance (see below).

Decisions in research and innovation policies are now increasingly being negotiated in multi-actor arenas, across multiple levels of governance. A variety of actors and agencies, both private and public, at multiple layers of governance, are involved in the formulation and implementation of policies (Kuhlmann, 2001). Policy is the outcome of interactions and compromise of a variety of actors, state and non-state, individual, networked and corporate, rather than of the action of a single, overseeing, policy making. This implies that public policy is part of the system and that actors in the system have 'agency' not only in innovation but also in the policy making processes (Flanagan et al, 2010).

This increasing dispersion of power away from national governments and their agencies both to supra- and to sub-national state actors and to non-state actors, results in a reduced ability both to use traditional direct policy levers and influence the 'framework conditions' for innovation. Policy design and implementation are subject to constraints such as policy complexities and interdependencies, multi-level governance, path dependencies, resource and capacity limitations (not to mention *politics*).

Implications for Skåne:

The Skåne region aims to be the most innovative region in the world by 2020, and also tackle grand challenges such as climate change, social problems and problems derived from an ageing population. There is a risk that the region may be over-ambitious in its objectives, given the multiple policy goals it has set and also considering policy complexity and political constraints. Greater prioritisation of objectives (health?) and a consideration of the potential policy conflicts would be advisable.

8.4 Policy boundaries of the system

The regional innovation systems view may create the wrong impression that regional-level actions can in principle not only enhance the ‘systemness’ of the regional innovation system but that in practice sufficient levers are likely to be available at the regional level. In an analysis of the policy mix of the North West of England it was noted how the three key sectors in terms of R&D expenditure in the region (nuclear, pharma, aerospace) were mostly influenced by non-innovation policy and by national policies rather than regional intervention. The effects of ‘non-innovation policy’ on these three major R&D intensive sectors constitute a major challenge for the Northwest and is a key concern driving regional innovation policy (Uyarra and Flanagan, 2010).

An analysis of the regional policy landscape needs to go beyond the potential impacts of regional policy and acknowledging the spatial impacts of policies at other levels. Regions as ‘spaces’ are clearly subject to the effects of policies made and implemented at multiple levels; they are not closed ‘systems’ governed solely by their own regional innovation policies. Regions are policy and implementation spaces, but are also affected by multi-level, multi-domain policy mix that acts upon them. ‘The region’ as comprising multiple and overlapping ‘spaces’ in which policies are shaped and implemented but also *spaces in which the effects of policies* at other levels are being felt. The spatial effects of such policies may be more significant than those of policies made with spatial effects in mind. This is true not only for science or innovation policy but also for other policy domains. Indeed in the innovation policies of regions are often partly motivated by the desire to deal with (or insure the region against) negative impacts stemming from changes in policy direction in other domains and at higher levels of governance (Uyarra and Flanagan, 2010).

Thus we must ask whether regional or sub-regional authorities – even in regions with a strong social, economic and cultural identity and a great deal of political and administrative devolution - really have either the policy levers or the policy making (and learning) capacity to influence innovation in their regions. Regions can no more be considered closed policy systems than they can be considered closed innovation or economic systems. Policy design should therefore not focus too tightly on (often artificial) regional boundaries

Implications for Skåne:

The Skåne region aims to be the most innovative region and tackle grand challenges, but it is unlikely that this can be achieved by region action alone.

Both the action plan for innovation and the recommendations of the international peer review refer to the economic integration of the Öresund region. The peer review group notes that “the potential of the region geographic location is clearly underexploited”. Probably not enough efforts are directed towards strengthening such integration and there is a risk that regional innovation system view may not be sufficiently inclusive of the assets available through integration in the Öresund region.

8.5 The limits to systemic governance

Generally, descriptions of the increasing complexity of policy mixes for innovation are accompanied with recommendations for more and better coherence and more effective coordination. Such attempts are however assumed to be unproblematic.

There are at least two problems with such pleas for increasing coordination. The first one arises from the earlier discussion of policy complexity. Achieving a more active governance of the broader policy mix for innovation, where interactions potentially cross traditional policy systems and at multiple levels of governance, is a profoundly difficult challenge.

Secondly, it seems to imply that coordination can be unproblematically done by a single, objective, rational and neutral overseeing actor, as if it were somehow ‘outside’ of the system. As Flanagan et al (2010) note “it is hard enough to see how any policy actor operating within a system of policy systems can at the same time step outside the system and take a rational and objective overview. It is even harder to imagine how the resulting impetus to coordination would be legitimated and accepted within that system. Co-ordination then can at best mean mutual adjustment between actors and systems within this larger system of systems.” Indeed co-ordination problems can never be completely solved by new co-ordination mechanisms as those new mechanisms inevitably contribute further to the complexity they seek to manage, a problem exacerbated by the fact that it is rather easier to create new mechanisms than it is to remove existing ones. The absurd but logical outcome of seeking to manage complexity with co-ordination bodies is that additional coordinating mechanisms will periodically have to be created to coordinate the older ones, and so on and so forth in an infinite regress which is, again, predicted by the ‘map and the territory’ metaphor⁹.

When co-ordination is spoken of in the context of ‘the governance of innovation systems’ what is usually sought is *steering*. If we reject the mechanical-functionalist view of innovation systems as artefact and adopt a more complex systems approach, then co-ordination must be seen as an emergent property of the system itself. ‘Systems’ must, by definition, be self-coordinating. With a large number of explicit and implicit, and potentially mutually conflicting policy goals at play in the messy real world, Lindblom famously argued that rational planning is impossible. He suggested ‘agencies’

⁹ Any map of a territory would, to be truly accurate, have to contain a representation of itself representing the territory, including a map representing the territory, and so on, in infinite regress.

must of necessity proliferate in tandem with the number of policy goals and that the only co-ordination possible between the agencies advancing distinct goals would be adaptive mutual co-ordination. Those calling for co-ordination from the perspective of ‘innovation’ as a policy goal tend to see that co-ordination as a solution to the ‘fragmentation’ problem of agent and goal diversity. In reality agent complexity is the unavoidable resultant of goal diversity, and a system characterised by ongoing mutual adaptation between agents is not a symptom of fragmentation but the only possible route to ‘co-ordination’ between diverse goals.

Implications for Skåne:

One of the objectives of the region is to develop a system governance function. The international peer review group suggested the creation of the Skåne innovation council, representative of the diverse stakeholders of the region. If we consider systems of innovation as complex systems, the risks of governing complexity need to be accounted for.

The analysis of the international peer review group see efforts in improved coordination as the solution of the perceived gaps of the innovation support system. They suggest the creation of a new body for leadership and governance – the Skåne Innovation Council- performing a number of functions (convener, broker and collective voice). Such suggestion fails to question whether any of those functions are or could be performed by existing organisations such as Region Skåne. It falls into the trap of suggesting a new organisation to perform new activities, and underestimates the difficulties association with the ‘coordination’ or ‘fit’ of that new body with existing structures.

8.6 Actors and functions

Equally, there is a danger that the regional innovation system analysis focuses solely on the actors and mechanisms that are amenable to be influenced by the policies of the region (often reduced to the creation of more ‘intermediaries’, and the better ‘coordination’ of this increasing network of ‘intermediaries’) as opposed to those most relevant for innovation *in* the region.

The functionalist view of ascribing specific functions to actors in the system presents the risk of creating new organisations (more intermediaries) to fulfil new roles (or roles that are perceived to lacking in the system) and of neglecting existing organisations and the roles that they could and do play.

Policy makers generally find it easier to deal with new actors created to perform new functions than to transform old actors. However, as already noted, the new landscape becomes more complex as old and new actors and roles coexist and potentially conflict, competing with each other in relation to the same policy targets (as Sotarauta, 2009, notes for the case of Finland). Efforts subsequently centre on structuring and restructuring the support infrastructure so that firms can take better advantage of it, but that effectively becomes a ‘supply’ side intervention with less consideration to the specific characteristics of the ‘demand’ side. In an analysis of the role of technology centres in Castilla y Leon, it was noted how funding initiatives for collaborative projects between technology centres and regional firms tended to support research that was closer to the activities of the centres and the supply infrastructure than to the innovation needs of firms (Uyarra, 2004).

An ever-present danger is the adoption of a static approach focused on stocks of actors and institutions and on the quantity of system interactions, rather than exploring the quality of interactions, institutions and actors, understanding how they and the parts they play in the system evolve over time. The sheer impossibility of understanding all actors and organisations that can influence innovation creates the opposite danger, of coming to rely on inventories or checklists of actors or broad actor types. Political visibility and ‘number counting’ may prevent any real efforts to understand interactions.

Implications for Skåne:

Skåne region now has 51 intermediaries. However, the international peer review noted that while Skåne was a very diverse region, the intermediary support is not representative of that diversity. They suggest that support structures should be more diverse in order to maximise the potential of the region, but do not suggest how the region should address this shortcoming. It is not clear whether the functions exist, but do not work, or whether there are gaps, and whether the number of intermediaries is too high, or too low, or whether they are uncoordinated or underperforming.

The peer review seems to suggest that new functions are needed, to be performed by the same or perhaps new intermediaries. This should be considered with some caution.

8.7 Policy evolution

This leads us to our next point, namely that of the path dependency of public policies. The impact of a policy depends on when it is implemented and on the path previously followed, not only by a changing economic landscape (the objective of innovation policy is always a moving target) or processes of co-evolution or mutual learning between the policies and the socio-economic system (Flanagan et al, 2010). Public policies, just like innovations, display irreversibility and path-dependency effects: they are adopted not on a tabula rasa but in a context of pre-existing policy mixes and institutional frameworks which have been shaped through successive policy changes (Uyarra, 2010). Past policy decisions clearly constrain the range of options available for current decision makers (Kay, 2006; Bardach, 2006). Successful policies (or actors, such as certain intermediaries, or science parks) become institutionalised and thereafter form part of the foundation for the beliefs of actors. They are ‘legacies’ that gradually institutionalise, and as institutions they restrict or enable options for future policy makers (Kay, 2006).

Implications for Skåne:

When formulating policies, the region needs to not only take the knowledge and institutional base of the region as starting point, but also consider existing policy mixes and past policy history (including actors and initiatives that may have hardened or become ‘institutionalised’), for they will enable or constrain new policy goals.

Instrumental analysis of the policy mix

The concept of ‘policy mix’ is too often used as a shorthand for a (ever-expanding) bundle or portfolio of policies and frameworks. The tendency is to adopt an instrumental and static approach, at least implicitly assuming that policy instruments are interchangeable and can be chosen from a ‘tool box’ of policy measures. Less attention

is placed on the potential interactions between these different components of the mix as they impact upon the intended goals or outcomes of innovation policy (table 8).

However, policy instruments have a high degree of ‘interpretive flexibility’ and nominally similar instruments may differ markedly in their use and impacts across time and space. An instrument may over time be associated with different rationales for intervention. Nominally identical instruments may in practice constitute very different forms of intervention. This renders instruments that have been used to promote innovation in regions over a number of years, such as Science Parks, and even clusters, very difficult to compare. They cannot be considered as discrete, tangible, unproblematic, tools.

Table 8. Evolution of Science Parks, research infrastructure and cluster policies as regional development tools

	Science and technology parks	Research infrastructure	Cluster policies
Phase 1 (pre 1985) Silicon landscapes	Early foundations of science parks, rapid growth in lead countries. Main focus on university based parks and incubators with strong academic connections	Isolated investments in research and few examples of focused national strategies for research decentralisation. Major focus on new universities in peripheral regions, but targeted at teaching. Few examples of science cities but basic research focused.	No cluster policies as such but some regions pursued sectoral initiatives and sought to build up infra-structures and skills and attract firms in selected sectors, including developing supply chains
Phase 2 (1985-1995) Technology transfer and enterprise	Saturation and slight disillusion in core countries as university spin offs fail to materialise, but expanding in numbers in mid range economies. Focus on incubators in less favoured regions.	Growing interest in regional centres of technology expertise. Isolated cases of relocation of public labs. Some Asian wave 2 science cities appear as mega science parks	Greater focus on supply chain initiatives and early clustering policies including support for cooperation
Phase 3 (1990s) Regional innovation networks	Some science parks take a lead role in newly emerging networks but policy focus shifts to soft infrastructures in regional systems. Science parks become but one tool among many.	Strong focus on centres of expertise to support local business and clusters. Rapid growth of Asian wave 2 science cities but not yet imitated by Europe and North America.	Mainstream cluster policies at national and sub-national levels. Wide range of approaches often underpinned by comprehensive cluster studies to identify gaps and policy needs
Phase 4 (2000s) Regional science policy	Revival of campus based parks linked with investments in science infrastructure and science cities, often with greater intermingling of university and firms.	Renewed interest in basic science facilities. New wave 3 science cities emerge, embedded in civic society and broadened agenda.	Cluster policies being targeted at science based sectors. Some disenchantment with cluster policies as not producing quick results.

Source: Charles and Uyarra, 2010

Instruments are not only modified by rationales for intervention over time. They are also modified by the way they are implemented. Decisions during implementation may lead to significant variations in ‘the same’ instrument quite independently of differences in strategies or rationales. Flanagan et al (2010) examine the case of ‘innovation vouchers’. Even with that relatively new type of intervention and new rationale (“demand-side”), they demonstrate the variety in the goals/rationales and modes of implementation of innovation voucher schemes in selected EU member States, based on the limited information available in the Trendchart database.

Implications for Skåne:

The international peer review suggested the use of instruments such as the Innovation Voucher scheme (as it has been used in the Netherlands or Ireland) to stimulate collaboration between enterprise and knowledge providers, but also so encourage innovation capacity building. Suggestions in relation to the use of a particular instrument should be interpreted in relation not only with the perceived rationale of the instrument but also considering the way in which they are (or may be) implemented and articulated in practice. Adopting a policy instrument that has been used elsewhere does not just involve considerations about goals and rationales of a ‘generic’ instrument.

Country/ region	Stated rationales/goals					Targets of policy action		Implementation		
	Stimulate/raise level of demand for R&D in firms	Support R&D performing institutions	Promote collaboration	Make public R&D more responsive to demand signals	Match supply of and demand for know-ledge in the same region	Eligibility	Eligible R&D/knowledge partners	Face value of voucher	Allocation and other conditions	Co-funding by company
Austria Innovation Voucher Austria	✓	✓				Austrian SMEs not in any contract with the selected partner during the past 5 years and which have received less than a certain amount of public funding.	Universities or non-university public research institutes from Austria, any EU member state or from any external country.	< €5,000	Max. one voucher per year per company. Allocation on a first come, first served (FCFS) basis.	No info
Belgium Wallonia Technology vouchers	✓	✓		✓	✓	Wallonian SMEs. The supported services cannot already be subject to public funding.	One of the 22 accredited Wallonian research centres or one of the 13 research centres associated to the French-speaking Hautes-écoles of Belgium.	€500	Maximum 40 technology vouchers per company per year.	SME must co-fund 25% of the value of the voucher
Cyprus Innovation Vouchers	✓		✓			Cypriot SMEs	All public or private organisations in Cyprus doing research and/or technology transfer activities	€5000	One voucher per company. Applications on FCFS basis	No info
Denmark Knowledge Voucher (small innovation projects)	✓		✓			Danish SMEs that have never collaborated with the selected partner.	A public research organisation or a member of The Advanced Technology Group (GTS institution)	€6670-13330	No info	SME must meet at least 50% of the cost of the project
Denmark Research voucher for SMEs			✓	✓		Danish SMEs not in receipt of other public funding. Project must meet Frascati manual definition of R&D.	Danish universities, R&D intensive Danish hospitals, GTS-institutes or other research institution, incl. equivalent overseas research institutions.	< €0.2m	Partnership of at least one SME and at least one research organisation.	SME must meet 50% of the total co-funding and the research institution at least 25%.

Country/ region	Stated rationales/goals					Targets of policy action		Implementation		
	Stimulate/ raise level of demand for R&D in firms	Support R&D performing institutions	Promote collaboration	Make public R&D more responsive to demand signals	Match supply of and demand for knowledge in the same region	Eligibility	Eligible R&D/knowledge partners	Face value of voucher	Allocation and other conditions	Co-funding by company
Greece Innovation Vouchers for SMEs	✓		✓			One or more Greek SMEs of the manufacturing sector, software industry and research and development firms	Greek universities, technological colleges, research centres and institutes and "sectoral" suppliers of knowledge-intensive services "of high added value".	€7000 (but two SMEs may combine their vouchers)	One voucher per company allocated on a FCFS basis while funds remain available.	No info
Hungary INNOCSEKK (Innovation voucher)	✓				✓	Hungarian SMEs registered or having a branch office in the respective region. Eligible activities: project concept appraisal; product development; process innovation; and other innovation development services.	No information	A range from €12,000 (project appraisal) - €120,000 (product development)	Applications must be submitted in one region only for one of the listed activities.	Not required - voucher can meet up to 100% of project costs.
Netherlands Innovation vouchers	✓		✓			For small vouchers, Dutch SMEs not previously in receipt of a small voucher. For large vouchers, Dutch SMEs.	(Semi-)public knowledge institutes; large companies with R&D expenditures that exceed €60 million p.a.; other EU public knowledge institutes.	€2500 (small) or €7500 (large)	3,500 of each type per year. One small voucher per SME. One large voucher per SME per year. Allocation on a FCFS basis. SMEs can combine large vouchers for collective projects.	For large vouchers, SME must meet at least one-third of the face value.
Portugal SME Skills Support System - Innovation Voucher	✓	✓	✓			Portuguese SMEs. Three-year limit of €200,000 per company.	No information	<€25,000	Priority given to smallest firms. After size, allocation on FCFS basis.	No information

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