

Establishment of Nordic Innovation Centres in Asia?





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Contents

Executive Summary 5

Chapter 1: Introduction 9

Chapter 2: Key Trends in Innovation..... 13

Chapter 3: The Case for Asia..... 23

Chapter 4: Three models for global innovation support policies 31

Chapter 5: Financing scheme for Nordic innovation projects in Asia..... 35

Annex I: Mapping Nordic Innovation 39

Annex II: National Nordic Innovation Centres in Asia 47

Annex III: Global Hotspots 53

Annex IV: Terminology 55

The Nordic Prime Ministers from: Sweden, Denmark, Norway, Finland and Iceland commissioned the review at their summer meeting in 2007.

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Blue = Participants in both the working and reference group
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Executive Summary

The challenge of globalisation includes a change towards more open, networked and international ways of organising innovation processes. Cutting edge knowledge companies and knowledge producers need input from innovation processes external to themselves. These inputs are to be found in supply chains, at the sites of lead user clients and customers and in the heads of experts located in hotspots around the world.

Nordic companies and knowledge producers need to access such hotspots. Joint Nordic innovation representations and joint innovation initiatives can provide such access.

A working group and a reference group representing the Nordic national actors owning innovation representations in Asia have been asked to review the potentials and possibilities of establishing joint Nordic innovation representations in Asia.

Three models for joint Nordic innovation activities have been discussed by the group. (1) A model along the lines of existing Nordic innovation representations in Asia and elsewhere; (2) A model based on principles of open innovation, creating centres that would provide Nordic companies and other actors access to global knowledge hotspots accessing solutions, technologies, market knowledge etc. The open innovation centre model is based on experience in innovation practices among multinational companies. Finally (3) a project financing scheme to accelerate joint Nordic innovation initiatives in Asia.

Model 1 was discussed as probably being able to provide a Nordic benefit as an alternative to almost identical national representations being set up or existing in countries around Asia. On the other hand this option would be quite expensive and far beyond the budget estimated in the mandate of the working group. It would require a lot of administration and could be in competition to already established representations. Thus for the moment it would not be the best solution.

Model 2, the open-innovation model was seen as an interesting new model, but has never been tried out in practice. A network of Nordic open innovation centres was discussed as a prospective future scenario in the process. A Nordic Open Innovation

Centre in Asia should accelerate the adoption of models of open innovation among Nordic companies and institutions. It would also be a response to a problem experienced by many Nordic companies - difficulty in recruiting appropriately skilled people in sciences and engineering, thus helping companies to source knowledge. The model would still need further development and testing, but could be an interesting model both to inspire national initiatives as well as joint Nordic initiatives. The group thus decided to recommend to test the model by financing pilot projects on functions of a possible future Nordic open innovation centre in Asia.

Model 3, a project financing scheme for cooperation on innovation initiatives among Nordic representations in Asia could accelerate joint Nordic innovation initiatives and pave the way for more intensified modes of cooperation. The joint Nordic project “Nordic Green” was used as an example, where Nordic institutions –Nordic Energy Research and Nordic Innovation Centre – were involved. Clear mandates from capitals to engage in Nordic cooperation as well as awareness raising of the possibilities and examples would however be necessary. The group recommends to establishing a joint Nordic financing scheme for this purpose, prioritising innovation in certain areas.

Recommendations

The working group recommends that the Nordic Council of Ministers support Nordic companies and other Nordic institutions globally by:

Establishing a joint Nordic financing scheme for Nordic co-operation on innovation initiatives and projects among Nordic representations in Asia.¹ Priority should be given to innovation initiatives in areas that address the targets of the Nordic globalisation initiative. This would include areas as identified in the Nordic Excellence Research Programme as well as the themes competitiveness, creativity, branding and design. The scheme will be a further incentive for Nordic countries’ representations in Asia to identify common topics and initiatives such as high-level visits and workshops, communication strategies, fairs, studies and other relevant project based interventions.

A specific part of this financing scheme should be dedicated to implementing pilot projects testing and developing the concept of a Nordic open innovation centre in

¹ Island has few representations abroad and will therefore be able to participate in projects with partners based in Island.

Asia. The pilot projects should be evaluated and provide knowledge to develop a more consolidated concept to be decided upon after two years.

Financing

The financing of a Nordic Innovation Network would come from three sources: Private companies and institutions participating in projects on developing the concept of an open innovation centre or participating in other projects of the scheme, National contributions and a contribution from the Nordic Council of Ministers.

Projects under the financing scheme should be financed through a 50-50 % Model, where 50% is financed from the Nordic Council of Minister's budget (up to 3.7 million DKK) and 50% through participants in the project (public institutions and companies).

Implementation and Administration

Awareness raising measures should be channelled through the national systems (innovation representations, other representations, innovation agencies etc.) and through relevant Nordic institutions. An existing Nordic institution should administer the projects, whereas the service provider should be defined and delivered through the projects.

Chapter 1: Introduction

Generally the Nordic countries have benefited from the last 5-10 years of globalisation and experienced strong economic growth and almost historically low levels of unemployment. The success has, however, not removed the questions on how the Nordic countries should modernize their institutions, policies and innovation systems in view of the ongoing challenges from globalisation. At their June 2007 meeting in Punkaharju, Finland, the Nordic Prime Ministers agreed to launch common Nordic globalisation initiatives to further prepare the region for the opportunities and challenges of globalisation. The initiative of common Nordic innovation representations in Asia is one of the outcomes from the meeting in Punkaharju and an effort to complement similar initiatives that the Nordic countries have pursued on a national level for some time.

In order to make sense of globalisation and the initiative of Nordic innovation representations in Asia it might be useful to dwell on what is actually meant by globalisation from an economic and innovative point of view. Trade liberalisation is one important component of globalisation. The demise of state monopolies in countries like Brazil, Russia, India and China (BRIC countries) and the consequently new companies entrance into the global market economy through the World Trade Organisation and in other ways have increased the number companies and suppliers in virtually all industries. On top of the BRIC countries several other nations like Singapore, South Korea, South Africa, Mexico, Thailand, Taiwan and all the Eastern European countries have entered the global economic scene and added to the global competition. This vast increase in possible suppliers at every level of the value chain in different industries has also opened up the possibility for greater specialization and division of labour for all those involved in economic development. The first wave of globalisation was about the richer OECD countries outsourcing their manufacturing activities to especially China and later on lower-end services to India. However, the BRICs and other emerging economies have aggressively been investing in R&D, education and innovation and thereby moving up the value chain of production on their own.

In line with this a development has taken place where the biggest added-value of a new product, service or concept comes from the knowledge components put into the

production process. Hence, the notion a global knowledge based economy. In this economy knowledge is the most valuable resource. Moreover, with this global race for a privileged position in the global value chain of production investments in knowledge has increased tremendously and former manufacturing places like China and India have today developed their own elite universities, innovation centres and R&D centres which are on par with the best in the USA and Western Europe. Russia also has centres of world-class knowledge centres producing some of the world's best mathematicians and hard scientists.

In other words, globalisation in this context is about: How can the Nordic countries as a region increase their stake in the global knowledge economy? First and foremost to benefit from globalisation is about understanding how to slice-up-the global value chain of production and tap into those knowledge and production centres where it makes most economic sense in view of global competition. Companies react by transferring knowledge production to new locations where it can be profitable applied and developed. In some cases it serves the growing of new markets more efficiently. In others, it is combined with the local pool of people with high formal training in engineering and sciences available at competitive wage levels to pursue innovation and R&D activities for other markets (World Bank, 2008). In some cases this increases companies' innovative capacity, when open networks of innovation substitute former in-house R&D activities.

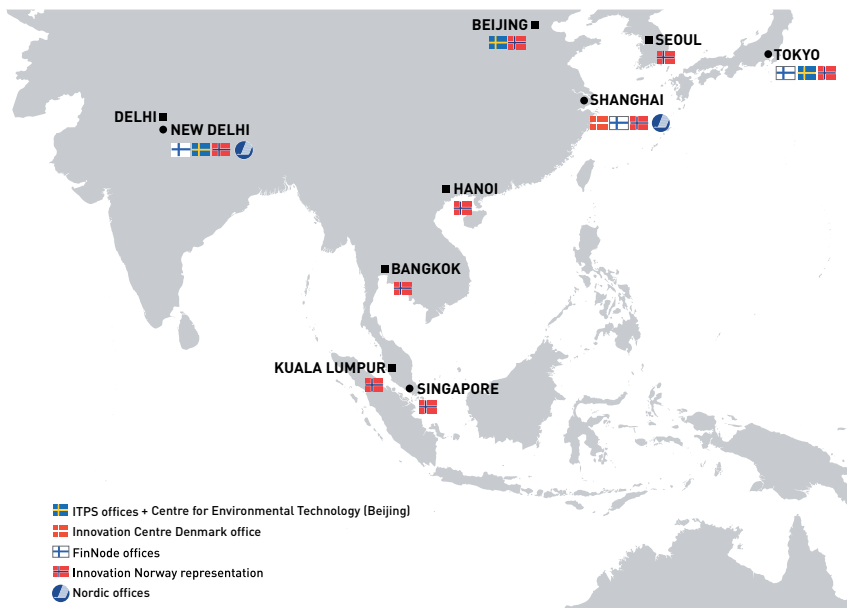
The Nordic countries and economies are relatively small compared to many of the nations they compete with for global markets, overseas students and a position in the global knowledge economy. In a global perspective it might be increasingly difficult for each of the Nordic countries to individually uphold and finance the business framework support institutions necessary to sustain a competitive edge in a global knowledge economy.²

In continuation of the goals of Nordic cooperation within business and competition policies, the Nordic Prime Ministers' agreed at their meeting 19 June 2007 in Punkaharju, Finland, that the Nordic governments will review the possibilities for establishing common Nordic innovation centres in Asia's fast growing economies. The review report will be presented to the Ministers of Economy, Energy and Regional affairs at their meeting in September 2008.

2 Source: Nordisk Ministerråd: Nordisk næringspolitisk samarbejdsprogram 2006-2010 side 17

It was further decided that the review would have to explore the rationale for establishing common Nordic innovation centres in Asia. The exploration should take into consideration already existing national Nordic initiatives with innovation representations around the world. In order to reach the conclusions and recommendations for the review the terms of reference for the project has been to examine and answer:

- *Which Nordic activities do already exist or are planned?* -of existing Nordic innovation centre like activities in Asia the map shown below is instructive. It should be noted that Finland's FinNodes and Denmark's Innovation Centre Denmark share many of the same characteristics in terms of services and focus on innovation, Sweden's ITPS offices mainly focus on science and research policies and the organisation Innovation Norway is essentially an amalgamation of trade promotion, tourism, investment promotion and innovation. Iceland has no physical innovation representations as such.



- *Which services should a common Nordic innovation centre provide?* The review shows that all the Nordic countries are faced with a shortage of supply of scientists, engineers and mathematician, and the demographics are going to make this even more pronounced in the future. Moreover, the Nordic countries are below the EU average in attracting overseas students. In view of this, it was decided that Global Nordic innovation projects should focus on strengthening

Nordic co-operation within the existing export promotion and innovation infrastructures in Asia, and in identifying and assisting Nordic companies and institutions with their sourcing of knowledge.

- *Which format for co-operation would be the most relevant and prudent?*

The suggested model for cooperation is a financing mechanism to fund co-operation between Nordic national representations in order to set up joint Nordic projects and a number of open-innovation case initiatives. All existing Nordic representations may apply for funding. Projects will have to demonstrate a Nordic value and longer-term perspective for co-operation and be potential self-sustainable activities.

- *Which organisational structure for the co-operation would be preferred?*

The working group recommends an organisational attachment to existing Nordic representations in Asia. This means that projects will be inserted into the existing infrastructure of Nordic representations in Asia and projects will as minimum have to have 3 different countries' support in order to full-fill the requirements for added-value at a Nordic level.

- *Which governance structure would have general backing?* The management and evaluation of initiatives under the project model will rest with one of the Nordic institutions and in co-operation with the Nordic actors responsible for Nordic innovation and export promotion representations in Asia.

- *Which Nordic added value can be expected from implementing the project?*

The added value of the project based model lies in that it supports existing Nordic representations all over Asia and the model allows them to experiment with building new common Nordic activities and services, a facility not available today.

- *What kind of financing model would be preferred?*

The project model will primarily be financed by the Nordic Council of Ministers with a 50% co-financing from the Nordic representations and external partners in each project applied for.

Chapter 2: Key Trends in Innovation

The OECD defines innovation as 'new products, business processes and organic changes that create wealth or social welfare'. Richard Lyons - Chief Learning Officer at Goldman Sachs offers a more condensed version. He says that innovation is 'fresh thinking that creates value'. Both serve as definitions for innovation in this report.

Although innovation often refers to new technologies this is not always the case. The self-service concept of fast food popularised by McDonald's is an innovation that involves running a restaurant in a different way. This was an innovation in the business model for running a restaurant and in the processes that lie behind the business model. Leading companies stress the need to move innovation out of the laboratory, indeed out of the company and into the 'real world' where it is integrated with the 'real work' of a company that of growing revenues, beating competitors and winning in new markets.

A number of important trends have emerged in response to pressures on companies arising not only from the rising cost and complexity of R&D but from the slow and insular nature of traditional innovation processes. According to a global cross-industry study by Booz Allen Hamilton³, higher research spending doesn't ensure better performance in terms of growth, profitability or shareholder returns.

Lab-centric bureaucratically controlled approaches to innovation are giving way to more democratic and open models of innovation. Companies recognise that clever ideas are everywhere, most often and most usefully in the minds of their clients and customers. They see that too often they have failed to exploit these very valuable resources. This has led to the emergence of a new model or a new way for organizing innovation called Open Innovation.

In this review we use the term 'Open Innovation' to refer to a range of innovation related behaviours of companies that are very much inter-related, that have received a lot of attention in the literature recently, and all of which imply a need to open-up

³ 'The Customer Connection: The Global Innovation 1000' by Bary Jaruzelski and Kevin Dehoff in Strategy and Business Issue 49, 2007

a two way traffic of knowledge, know-how and insight into the innovative company. These main concepts are:

- *Hidden Innovation*^{4,5,6,7} is innovation not captured by traditional indicators, it includes innovation in business models, services, management, organization, design, innovation in the process of innovation itself.
- *Open Innovation* that relies on the open exchange of knowledge with partners such as suppliers, clients and customers, universities and research laboratories.
- *User-Led Innovation* that relies on collaboration and knowledge sharing with customers or industrial clients that modify and adapt products to suit their individual or specific needs.

Hidden Innovation, User-Led Innovation and Open Innovation are three aspects of the same issue, that the most important part of the innovation system for any company is its supply chain, in particular those parts that are closest to the client or customer. This is where the innovation-based battle for business is fought.

This has important consequences for how companies, especially companies that are global or want to go global, organise their innovation internationally. Nordic governments already acknowledge that about 95% of the world's scientific output is produced outside the Nordic region and that the future competitiveness of Nordic enterprises relies on their ability to tap into this global knowledge base. In a nutshell the knowledge required for innovation no longer exists at home. The only option is to go out and tap it at the source. That means in the market, in the existing supply chain, in possible future supply chain partners and anywhere bright-motivated people with specialised knowledge can be found.

Open Innovation

Many books and articles have recently been written about open-innovation and a number of Nordic countries are recognised as global leaders in the field. Outstanding examples from the Nordic countries include Nokia, Lego and Electrolux. Examples from other regions include Intel, Philips, CISCO, Apple and Procter and Gamble. They all have different models or styles of open-innovation. In all cases this approach

4 Innovation Nation

5 2006 NESTA Policy Brief entitled 'The Innovation gap: Why Policy needs to reflect the reality of innovation in the UK'

6 2007 NESTA Policy Brief entitled 'Hidden Innovation: How innovation happens in 6 low innovation sectors'

7 NESTA Policy Briefing TIN/22 Published March 2008 and entitled 'Towards an Innovation Nation'

is driven by a need to get greater value from innovation related investments, more and better return on investment at lower cost and in shorter time frames.

Business increasingly recognizes the need to develop and participate in 'Open- Innovation' systems and processes. Open-innovation is about the two-way traffic of knowledge for innovation where unused knowledge-assets are sold-on while those that are needed can be acquired. Companies see themselves at the centre of networks of partners that bring in ideas relevant for their own innovation needs as well as the resources and ability to act upon these ideas. They see themselves at the centre of networks of actors capable of assimilating knowledge and know-how they possess as part of their own innovation projects.

Procter & Gamble: Connect and Develop

Companies such as Procter and Gamble, British Telecom, Philips and IBM no longer rely on in-house research and development to support innovation.

The main open-innovation programme at Procter & Gamble is called 'Connect and Develop'. In 2000 it accounted for 20% of innovations at the company, by 2007 this had risen to 35% of all new products and had generated billions of dollars of annual revenue. The goal is for 50% of all innovations to originate outside the company.

The system connects 8,000 researchers, 600 partners and 5 business units around the world. According to P&G the future of R&D is in the 'collaborative networks that are in touch with the 99% of R&D that we don't do ourselves'. 80 internal R&D staff works as technology scouts. Thanks to the open innovation approach P&G enjoyed a product 'hit' rate of 90% in 2003 up from 70% in 2001. Since 2000 its cost of R&D has fallen from 5-6% of sales to 3-4% of sales. Open-innovation greatly increases its return on investment in research and innovation. It allows it to do more with less and to do it better. It is no accident that P&G now has 23 'Billion Dollar Brands'.

Systematically involving clients and customers in the process of innovation can increase the impact of innovation related investments on the bottom line. It means better products, services and processes, better prepared clients and customers, more revenues and more revenue sharing. This has an impact on markets and customers and how a company reaches them, the way in which a company delivers value to its clients and customers, the way in which revenues are created and shared among partners in the co-innovation process.

Open innovation enables a company to more closely link the development of new products, services and processes with the development of new business models. It is not only about partnerships but about building eco-systems that provide an opportunity to learn about potential partners, who is good, who can deliver, what can they deliver and how can we work with them? The ability to do this well is a valuable asset and companies that possess this capability have a distinct advantage over their competitors.

In competitive fields that require a high level of scientific and technological expertise companies have increasing difficulty in meeting their human resource needs. This is due to two main factors:

- A limited local talent pool
- Rapidly changing knowledge needs

Main drivers for the off shoring of R&D:

- Increased pressure from global competitors especially from emerging market multi-nationals and the threat from entrepreneurial start-ups in dynamic emerging markets
- Increased competition from emerging market multi-nationals
- Increasing R&D costs
- Shorter product-cycles
- Increased specialization

Novartis: The Global Dimension of Talent for Innovation Driven R&D

‘In the past it was possible to get 30% of the researchers in any given field under one roof. Today it is hard to get 1% ... the only solution is to bring them into a virtual lab ... networking like this is the only way to get critical mass in the future’⁸

Novartis spends 30% of its R&D budget on external collaboration with 120 biotech companies and 280 academic centers.

According to the many companies are increasingly international in their research and development activities. In 2003 the world’s biggest companies spent \$70.6B in R&D outside their home countries, up from \$33.9B in 1995.⁹

‘...availability of talent is key. Our R&D labs in Europe are finding it harder to recruit in certain areas, and then there is the use of Traditional Chinese Medicine to generate new products ...’¹⁰

It is for reasons such as these as well as the need to situate research, development and other innovation related functions close to important markets that IBM has established research centres all over China including most recently one in Beijing that will eventually become its global centre for research in Operations research and logistics.

The benefits of open models of innovation are:

- Fewer missed market opportunities and better product development
- More agility in meeting human resource needs
- More effective R&D because it is more relevant and better linked to innovation tasks

In ‘The Sources of Innovation’ Von Hippel explains how in different sectors, innovation occurs in different parts of the supply chain¹¹. He invented the term ‘locus of innovation’ to indicate that part of the supply chain where almost all the ideas for the what, why and how of new products, features, processes and services originate. His

⁸ David Tennenhouse, VP of Corporate Technology Group at Intel

⁹ OECD ‘Science, Technology and Industry Outlook 2006’

¹⁰ Ya Cai, Director of Unilever Research China

¹¹ ‘The Sources of Innovation’ by Eric Von Hippel. The MIT Press

more recent book¹² 'Democratising Innovation' focuses on the role of the client or user in innovation. He identifies a specific kind of user called a lead-user who is on the cutting edge of trends in the market for the product or device used, who demands more from what is being offered but whose needs are unmet. When this kind of user interacts with a company to help it adapt or improve its offer then great things can happen.

LEGO: Innovation by Design

Innovation at **Lego mainly focuses on design**. Lego carries out research on relevant technologies and on child cognitive sciences that provides input to an innovation process that is mainly focused on design. The innovation process itself is based on a design methodology called D4B meaning 'Design 4 Business'. Design teams include marketing and product managers as well as designers. Although most design work is carried out in Denmark, some is carried out at satellite offices located in key markets and regions such as the UK, the US, Italy and Japan. The job of the local design-offices is to design for local tastes and to monitor the emergence of new trends and technologies.

The International Dimension of Open Innovation

Collaboration and networking often across geographical boundaries play are playing an increasingly central role in innovation processes¹³. Smart people do not all work in any one company, organization or even country and most of the knowledge-resources a company needs to innovate will lie in another company, university or research centre in Europe or elsewhere.

¹² 'Democratising Innovation' by Eric Von Hippel. The MIT Press 2006.

¹³ Chesbrough in 'The Era of Open Innovation' published in 2003 in the MIT Sloan Management Review 44(3).

Nokia: University Collaboration in Beijing

Nokia Research Center employs about 800 people in a global network of locations spanning Europe, the US, Japan, Singapore and China. China, with 480 million mobile phone subscribers, is the largest and arguably the most dynamic mobile telephony market in the world. As part of its commitment to pursuing a policy of open-innovation Nokia recently signed a research agreement with the School of Information Science and Technology at Tsinghua University in Beijing. Tsinghua is one of the top Chinese universities. It has 6,200 Masters and 2,800 PhD candidates. Twenty Nokia staff will work alongside 30 professors and associates at Tsinghua University with more than 50 students on innovation related research topics.

Universities and research institutes all over the world work freely with industrial partners on contract research or innovation related scientific problem solving. They do so with no regard to the nationality of the company. In this sense knowledge is a global commodity available at a negotiated price to any buyer capable of identifying its provider and managing its provision.

Innovation does not just happen within a company but at:

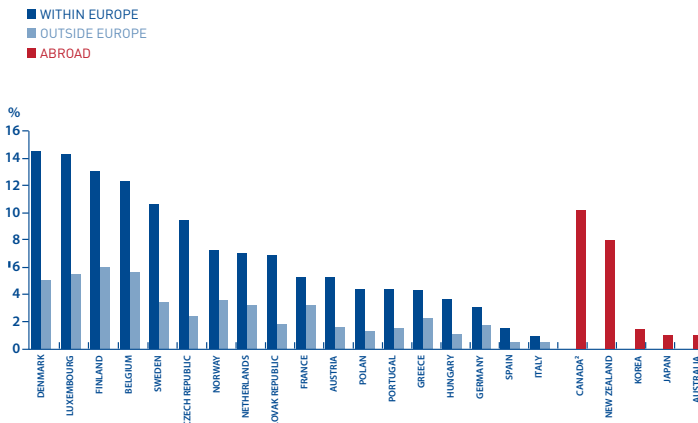
- Smaller companies especially in entrepreneurial start-ups
- Hot-spots where science, technology, finance and entrepreneurship converges
- Communities based on interaction with consumers or company clusters

Challenges that Innovative Companies Need to Address

As shown in the table below¹⁴, a substantial number of companies in each Nordic country are already involved in open-innovation initiatives. Many more will do so in the coming years. Those that have developed a capability in open-innovation at home will be well positioned to extend their open innovation systems to tap into knowledge, know-how and expertise abroad.

¹⁴ OECD- STI 2007, Chapter on Internationalisation of S&T.

Firms with foreign co-operation on innovation, 2002-2004¹ As a percentage of all firms



Companies that are good at open-innovation invest in developing their organisational boundaries making it easier to bring-in innovation related knowledge. They don't just invest in their core competencies; they invest in developing interfaces that allow new competencies to come in from elsewhere. These advanced capabilities take time and conscious effort to develop.

The literature on open-innovation points out that many companies don't realise the importance of collaboration and lack the resources to pursue it. Furthermore they lack the skills and experience in managing complex interactions that are necessary to benefit from the open-innovation approach. This is especially true when these interactions have complex international and cultural dimensions. They need opportunities to learn or acquire these skills. Good collaboration relies on trust and intermediaries can provide a medium for developing trust through assurance provided by personal introductions and the availability of open-innovation related intelligence.

Many companies and small and medium sized companies in particular can benefit from open innovation networks that extend to global hotspots, markets and talent-pools. Given the resources required and the risk inherent in developing new knowledge networks a system of Global Nordic open-Innovation Support Centres can accelerate the development of open-innovation networks by Nordic companies giving more companies more complete access to the knowledge they need to compete.

Quilts of Denmark: Open-Innovation Works for SMEs as Well

In 2000 'Quilts of Denmark' was founded with five people to make and distribute bedding. The founders soon realized that they were in a market dominated by price and that to grow they needed to find a way to change the game. They positioned themselves as 'providers of healthy sleep' and linked up with outside experts in sleep science and physiotherapy as well as with the Danish Asthma and Allergy Association to try to understand how they could address the challenge of providing people with better, healthier sleep. They focused on the idea of better temperature regulation as a key to providing deeper more comfortable sleep. They started to investigate thermally adaptive 'Phase Change Material' technologies originally developed at NASA, Quilts of Denmark brought together a team consisting of NASA, 'Outlast' a US company that developed and licensed the technology, as well as manufacturers to develop a new product line for bedding called TemptraKon. This has been very successful and they now export to over 30 companies around the world.

This is a real example of open-innovation in that almost all the knowledge required to create the new product was located outside the company. The managers brought in the know-how they needed on medical aspects of sleep and the technical aspects concerning smart materials. They had to draw upon a global pool of available cutting edge knowledge and in doing so they were able to go from concept to product in a very short space of time.

An international innovation infrastructure shared by Nordic countries and complementary to existing national efforts would allow Nordic companies and research organizations to extend their networks for open-innovation in a flexible and cost-effective way, and reap the benefits of globalisation.

All companies with global ambitions can benefit from a global service network that helps them develop and extend their systems for open-innovation that allow them to:

- Participate in new or emerging consumer markets
- Participate in burgeoning business-to-business markets
- Adapt products and services to local markets
- Reduce the overall cost of innovation
- Improving the impact of innovation related investments
- Acquire strategic knowledge-assets - patents, personnel or entire companies

Chapter 3: The Case for Asia

Innovation is increasingly stemming from new places - particularly China, India, South Korea, Russia and other emerging economies¹⁵.

China and India produce four million graduates each year¹⁶. Competition for universities in countries such as China and South East Asia mean that a lower proportion of these students are going to western universities such as those of the Nordic region. There is a possible mismatch between the supply and demand for STEM (scientists, technicians, engineers and mathematicians) skilled graduates.

The world of S&T is undergoing rapid changes along trends that emerged in the late 1990s. Increased government recognition of the importance of knowledge-intensive segments of their economies often led to the implementation of strategic policies to promote their development and the expansion of education and advanced training in support of this goal. MNCs, seeking new markets and a broad range of operating efficiencies and responding to opportunities abroad, increasingly took advantage of and drove these developments, resulting in a shift in the epicentre of world S&T activities, led by China's emergence, toward several rapidly growing Asian economies.

These pronounced shifts have occurred over a relatively short time and have had a differential impact on mature, developed countries. In Asia, China's rapid rise economically and across the S&T spectrum has made it the world's second-largest economy, and certain other smaller Asian economies are increasingly prominent on the world stage. By comparison Japan appears stagnant and, in fact, has lost world market share in a number of S&T areas. The EU's world position has also degraded, including in areas linked to high-technology trade. China's expansion of R&D was by far the most rapid and sustained of all. According to OECD figures, it had the fourth largest expenditures on R&D in 2000 (\$45 billion), which increased in 2005 to an estimated \$115 billion, further moving it up in rank. The average annual R&D growth rate of nine non-OECD economies (Argentina, China, Israel, Romania, Russian Federation, Singapore, Slovenia, South Africa, and Taiwan; there are no data for India) tracked by the OECD was about 15.5% from 1995 to 2005, compared with an OECD average of 5.8%.

¹⁵ <http://www.g2i.org/article/2007/02/eastern-promise>

¹⁶ NESTA Policy Briefing IGG/16 Published December 2007 and entitled 'Innovation Goes Global - why it is no longer enough to think of a national innovation system'

In their publication 'China the Next Science Superpower' James Wilsdon and James Keeley of Demos¹⁷ point out that Chinese public investment in R&D has increased at more than 20% per year since 1999. In 2006 the OECD announced that China had overtaken Japan and was now number 2 in the world in terms of overall R&D expenditure. In January 2006 China approved a new medium to long-term science and technology development plan. The plan indicates that China intends 60% of economic growth eventually to derive from advances in S&T. It intends to be in the top 5 countries in the world in terms of patents and science citations. Most of the top Chinese officials are technologists and believe in the science, technology and engineering. In his keynote speech announcing the plan on 9 January 2006 President Hu Jintao asked for China to become an 'innovation oriented society'.

China has 6 universities in the global top 100 for science. The Chinese Academy of Sciences is ranked fourth in the world for publications on Nanotechnologies, after UC Berkeley, MIT and IBM.

India: The New Trend in Global Sourcing of R&D

An article in a leading Indian business newspaper describes how to take favourable advantage of the new trend in global open innovation. As the article points out, Dr Satyam was awarded 75,000 USD by InnoCentive for a solution. Unlike earlier generations of scientists, who had to emigrate to the United States to apply their talents Dr. Satyam simply logged on the Web to view the problem and then logged on again so submit his proposed solution. He was delighted with the award. Seventy five thousand dollars go along way in India.¹⁸

Motorola was the first western company to establish R&D activities in China. By 2005 the number of companies with R&D activities in China had risen to about 750. Not all are doing this because they want to serve their local clients. Vodafone has no clients in China but it has a research presence there. It expects Chinese mobile firms such as Huawei and ZTE as well as entrepreneurial start-ups to create important technologies in the coming years. They want to build relations with these companies with a view to bringing their technologies back to Europe.

¹⁷ 'The Atlas of Ideas: Mapping the New Geography of Science' published in 2007 and available online at www.demos.co.uk.

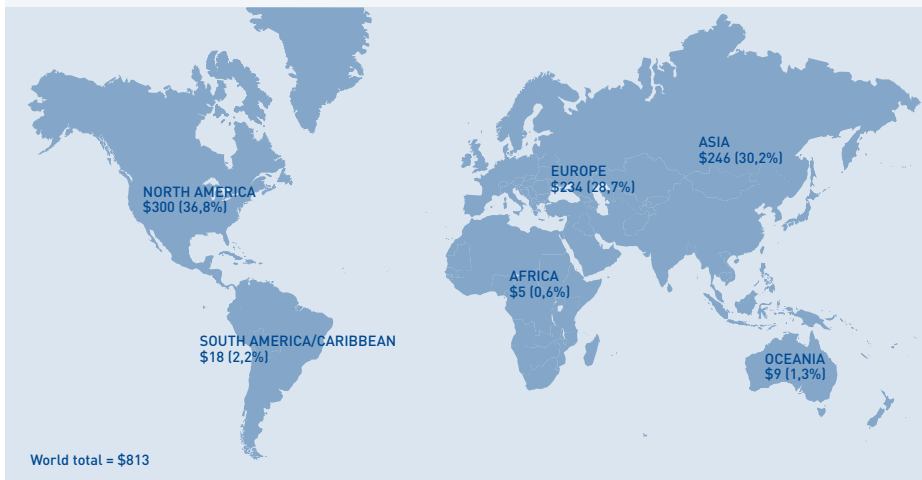
¹⁸ Henry Chesbrough: Open Business Models – How to Thrive in the New Innovation Landscape, HBS Press, p. 147.2006

Hotspots as ‘Machines’ for Producing Talent

Xi’an capital of Shaanxi province, home to the famous Terracotta Warriors, is also home to one of China’s largest software parks and a cluster of technical universities that produce 30,000 software engineers each year. How many cities in the Nordic region are capable of producing 30,000 software graduates each year? Xi’an is not the only such city in China. The northern port-city of Dalian hosts one of China’s largest software parks. What opportunities do cities such as these represent for innovative Nordic companies?

China is home to some of the fastest growing and most dynamic cities in the world. It has 90 cities with more than 1 million people. It has many potential innovation hotspots. The Economist Intelligence Unit defines a hotspot as ‘a place where companies can tap into existing networks of scientific and technical expertise; which has good links to academic research facilities; and provides an environment where innovation is supported and easy to commercialize.’¹⁹

Figure 0-19
Estimated R&D expenditures and share of world total, by region: 2002



NOTES: R&D estimates from 91 countries in billions of purchasing power parity dollars. Percentages may not add to 100 because of rounding.

SOURCES: Organisation for Economic Co-operation and Development, Main Science and Technology Indicators (2006); Ibero-American Network of Science and Technology Indicators, <http://www.ricyt.edu.ar>, accessed 5 March 2007; and United Nations Educational, Scientific and Cultural Organization (UNESCO), Institute for Statistics, <http://www.uis.unesco.org>

Science and Engineering Indicators 2008

Asia has become the dominant force in altering the global landscape for supply of engineers and scientists and in the global supply of research and innovation facilities. Especially China and India have become major actors in the global supply chain of human resources as well as in the global value chain of innovation. On top of China and India countries like Russia, South Korea also produce a significant number of scientists and show excellence within certain industry sectors and could be partners in respect of global Nordic innovation centres.

Recent analyses of the Nordic countries' national innovation systems show that there is already a shortage of science and engineering graduates within most industry and service sectors, and that with the demographics in mind this shortage is likely to be even more pronounced in the future. It is clear that the Nordic countries' supply chain of skilled technical and scientific personnel is not going to be solved entirely from increased in-house production of new science and engineering candidates. And within Europe the Nordic countries are below average in attracting students from emerging economies like India and China. Hence, the Nordic countries will have to look into where and how to source the required talent and knowledge for the future.

The Nordic countries are, however, part of an international innovation system, and if the sourcing of knowledge and access to talent is managed skilfully there are several good geographical options in Asia and elsewhere in the world where it would make sense to link up for the Nordic countries in concert. In this context India, China and South Korea seems the most obvious if we look at the relevant statistical indicators. But countries like Japan, Russia and Singapore should also be considered in this context.

Interactions between companies and their skilled, pro-active consumers have by one estimate created economic value worth €637B in the EU and €539B in the US²⁰. No such analysis has been carried out for the economies of Asia, but the capacity for innovation in these countries is beyond question and the prospect of capturing such economic value through interaction through user-lead innovation in Asia is a significant opportunity for Nordic companies.

20 Löffler and Schmidt in 'Disruptive Technology Trends: Capturing the Value at Stake' published in Mc Kinsey Technology Initiative Perspective 2008

Mapping China²¹

Annual rate of growth in government funded R&D budget	19 %	National Bureau of Statistics China, MOST 2004
S&T workforce	225 million scientists and engineers 1.15 million person years spent on R&D	National Bureau of Statistics China, 2004
Enrolment in tertiary education	15 million	Ministry of Education, 2004
Enrolment in postgraduate programmes	820,000	Ministry of Education, 2004
Number of science, medicine, and engineering undergraduates	6.500,000	Ministry of Education, 2004
Number of Science. Medicine and engineering postgraduates	500,000	Ministry of Education, 2004
PhDs awarded	23,500 (70% in science related subjects)	Ministry of Education, 2004
Number of students studying abroad (1978-2003)	700,000	Ministry of Education, 1978-2003
Number of overseas Chinese students returned to China (by 2003)	170,000	Ministry of Education, 2004
Number of colleges and universities	1731	Ministry of Education, 2004
Number of graduate schools, research institutes	769	Ministry of Education, 2004
Number of universities in global top 200	6 (Beijing, 14; Tsinghua, 28; Fudan, 116, China University of Science and Technology, 165 Shanghai Jiao Tong, Nanjing)	Times Higher Education Supplement, 2006
Number of universities in global top 100 for science	5 (Beijing 12, China University of Science and Technology 32, Tsingua 41, Fudan 63, Nanjing 70)	Times Higher Education Supplement, 2006

21 Source: China: The next science superpower? James Wilsdon and James Keeley, Atlas of Ideas, Demos 2007

Mapping India²²

Human capital creation		
Annual enrolments at the level of graduate and above	6.6 million in 95/96 9.86 million in 2004	National Council for Applied Economic Research – India Science Report 2005
Within this, the percentage studying engineering has almost doubled	6% in 95/96 11 % in 03/04 (8% growth from 95 to 2000 risen to 22% growth from 2000 to 2004)	Farrell et al.
Pool of young university graduates (those with 7 years or less of work experience)	Roughly 14 million This is 1.5 times the size of China's, almost twice that of the US, and it topped up by 2.5 million new graduates in science, engineering and IT every year	A study by UCG and CLSA Markets
Engineering graduates per year	Approx. 350.000 Predications claim there will be as many as 1.4 million by 2015	Mashelkar, ITPS, NSTMIS
Science PhDs per year	5000-6714	OECD, 2001/2002
R&D staff at work in science or industry	21 researchers per 1000 employed	
Size of R&D infrastructure	229 universities 96 deemed universities 13 institutes of national importance 400 government research labs 1300 approx. Industrial R&D units	Ministry of Human Resource Development of India 2006

Mapping South Korea²³

Inputs	Figure	Source
R&D expenditure 2005	US\$ 25 billion	MOST (2006)
R&D intensity 2005 (% GDP spent on R%D)	3%	MOST (2006)
Number of industrial R%D centres in 2005	12	KOITA
Number of R&D personnel in 2003	300.000	MOST (2005)
Researchers in R&D per 10.000 people	1.8 in 1970 16 in 1990 32 in 2003	MOST (2005)
Higher education enrolment rate	33% in 1990 81% in 2004	KEDI (2005)

²² India: The uneven innovator Kirsten Bound, Atlas of Ideas, 2007, Demos

²³ Source: South Korea: Mass innvation comes of Age. (Molly Webb).The Atlas of Ideas: Mapping the New Geography of Science, Demos, 2007

Mapping Japan

Inputs	Figure	Source
R&D expenditure	Billion USD \$ 131	OECD, STI 2007 ¹
R&D intensity 2005 (% GDP spent on R&D)	3.2%	OECD, STI 2007
Total number of researchers	705.000	OECD, STI 2007
High-Tech Infrastructure 0-100	69	Georgia Inst. of Technology, 07

Mapping Russia

Inputs	Figure	Source
R&D expenditure	Billion USD \$ 17	OECD, STI 2007
R&D intensity 2005 (% GDP spent on R%D)	2.4%	OECD, STI 2007
Total number of researchers	466.000	OECD, STI 2007
High-Tech Infrastructure 0-100	48	Georgia Inst. of Technology, 07

Russia - Tomsk Oblast, Siberia Unique Human Capital: Tomsk is the leading Russian educational and scientific centre. 30% of the Tomsk Oblast able-bodied population has higher education. The city Tomsk has around 100.000 people either studying or with a higher education mainly within hard sciences and engineering. Moreover, Tomsk has together with St. Petersburg and Moscow been selected among 52 regions of Russia to receive 15 billion rubles to be used for developing the region into a regional hot spot for innovation and science. Tomsk Polytechnic University produces some of the best engineers and scientist in Russia, and has gained a reputation for its excellence outside Russia as well. Co-operation agreements have been made with Singapore, Tokyo and Germany to mention a few. Tomsk has received high scores on its qualities regarding universities²⁴.

Mapping Singapore

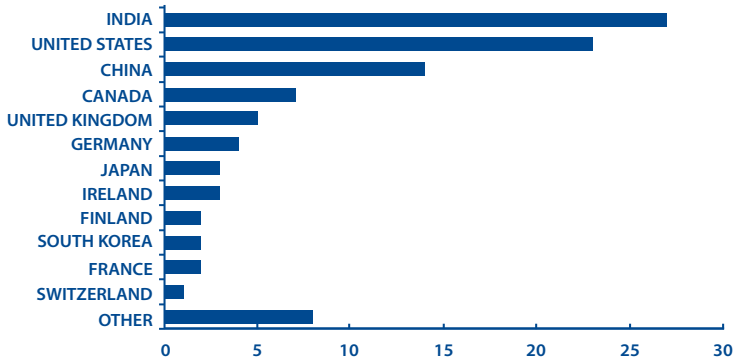
Inputs	Figure	Source
R&D expenditure 2005	USD \$ 3 billion	OECD, STI 2007
R&D intensity 2005 (% GDP spent on R%D)	3%	OECD, STI 2007
Total number of researchers	24.000	OECD, STI 2007
High-Tech Infrastructure 0-100	43.5	Georgia Inst. of Technology, 07

The case for Asia, especially for countries in Asia such as China, India and South Korea are further strengthened by a survey made the Economist Intelligence Unit where companies from all over the world have been asked which countries they see as best overall overseas location for doing R&D.

²⁴ Source: Project manager Jorn B. Andersen: Interviews with Invest in Tomsk, Tomsk Region Adm, RusSEZ, April 2008

Which of the following countries would you choose as being the best overall overseas location for R&D (please do not select your own country)?

(% respondents)



Source: The Economist Intelligence Unit

As rapid economic growth enables China and India to increase their investment in science and technology, Nordic companies and entrepreneurs are urged to collaborate on an international scale. A similar review to this Nordic one has been conducted in the UK. A review in which the UK's scientists have been dealt a stark warning: collaborate with emerging economies such as China, India and South Korea or lose your lead in science and technology to these 'innovation hotspots'. This is the central message of *The Atlas of Ideas*, an 18-month study by government think tank Demos, launched at an international conference in 2007.

Moreover, looking at one of the most developed open innovation system providers InnoCentive, it becomes clear that the trend in terms of solvers location by region is shifting rapidly towards emerging economies outside the United States and Western Europe.

InnoCentive solvers' location by region		
Country/region	2002 %	2003 %
United States	62	47
Western Europe	17	14
Russia, Eastern Europe	4	9
Asia-Pacific	6	13
India – South Asia	6	11

Source: Henry Chesbrough: Open Innovation Models, HBS Press, 2006 p.146

Chapter 4: Three models for global innovation support policies

The Nordic countries are pioneers in developing international systems for innovation support. Important national initiatives such as FinNode, Innovation Centre Denmark, Innovation Norway and the ITPS of Sweden are summarised in an annex to this document. The purpose of this section is to discuss possible options for Nordic global co-operation on innovation. The table below describes three models and their main characteristics. Each of the three organisational models depicted in the table signifies the landscape within which common Nordic innovation representations in Asia could look like. In the following the three organisational models are explained in more detail and given an assessment.

Three models for internationalising innovation support infrastructures			
	Project Model	Open innovation Model	Policy Model
Strategic goal	Facilitate co-operation between existing national Nordic innovation centres.	Sourcing knowledge through win-win external partnerships to capture maximum commercial value from Nordic innovation investment.	Instrument for tapping into global knowledge hot-spots and development of 21st century equivalent of global trade offices.
Essential function	Provide funding for innovation projects between existing national Nordic innovation centres or other Nordic representations.	Focus is on collaborative outreach programmes with leading global innovation hubs and knowledge centres.	Provide public service function to Nordic companies and institutions; offer some commercial services and office-location as well.
Financing	Projects will be financed from Nordic and national funds. Some contribution from co-financing of projects foreseen.	Primarily user-driven and based on income generated from delivering solutions and services to customers. Only initial public startup costs.	Primarily public financing of running costs of facility and staff salaries. Some financing from services.
Staffing	Staff and people within existing national Nordic innovation centres and other Nordic representations.	Local staffing with some supervision from a Nordic organisation.	Staffing like in existing national Nordic innovation centres, but with representatives from more of the Nordic countries.
Input	Co-ordination effort between existing national Nordic activities to spill over into a number of projects.	Strong alignment with current thinking and strategies of companies. Business building with a small staff requirement.	Well tested and known organisation with full time staff and integration in national policies for globalisation.
Policy outcome	Very dependent on public innovation funding, smaller strategic orientation.	High level of self-sustainability and future survival potential strong.	Strong national support once up running, well known concept for services.
Success factors	Culture of Nordic cooperation. Structural flexibility for centres to pursue projects.	Global innovation ecosystem building for Nordic companies and institutions.	Sourcing of knowledge and partners for Nordic companies and institutions. Global platform for improving growth conditions in Nordic countries.
Main challenges	No long term strategic orientation. Added value of service offering to companies unclear.	New way of organising innovation also for companies. Level of company support unclear before it has been tested on the market.	At Nordic level it might have conflicting lines with existing national innovation centre initiatives. The most costly and difficult to dismantle if it fails.
Branding	Relatively low brand recognition for the Nordic region given the ad hoc character.	Medium to high brand recognition for the Nordic region – probably highest in private industry circles.	Medium to high brand recognition – probably highest in government and public institutions circles.

Source: Jørn B. Andersen, "Three models for internationalising national innovation support infrastructures" 2008, unpublished paper forthcoming.

The 'Policy Model'

The 'policy model' denotes the kind of innovation centres and activities, which the Nordic countries already on a national base have established in Asia and elsewhere. Innovation Centre Denmark, FinNode, Innovation Norway and Sweden's ITPS offices are examples and all established in connection to embassies or representations. They are all more or less integrated with public services for export promotion, investment promotion, innovation and policy analyses, and can be seen as the accumulation of national interests having been implemented. In terms of staffing the 'policy model' is managed by Nordic officials seconded by traditional means of payment for diplomats or sector experts. In addition most have local staff employed as well, but this is a minor item of the overall budgets. The strong institutional affiliation to national ministries for foreign affairs and other sector ministries gives the 'policy model' a strong top-down dimension as regards goals, reporting, target groups and income targets. In terms of market sustainability all of the 'policy models', except Sweden, operate with some level of market generated income. Yet, none can be said to be fully market based. The working group has discussed all three models at the meetings for this review report. On the basis of the Nordic countries' experience with setting up the various 'policy models' this model was seen as probably being able to provide a Nordic benefit as an alternative to almost identical national representations being set up or existing in countries around Asia. On the other hand this option would be quite expensive and far beyond the budget estimated in the mandate of the working group. It would require a lot of administration and could be in competition to already established representations. Thus for the moment it would not be the best solution.

The 'Open Innovation' Model

In his groundbreaking book *Open Innovation*¹ Henry Chesbrough explains that 'competitive advantage now often comes from leveraging the discoveries of others'. He focuses on the observation that *'not all of the smart people in your industry work for you ... too much invention and innovation take place outside of your walls to ignore it'* and the consequences this has for industry.

The open innovation model is a new way of organising innovation in the global economy. In the context of Nordic cooperation it would represent a more structured way

of organising Nordic innovation centres in Asia than the project-based model. On the other hand, it is more flexible and less costly than the policy model. The essence of the open innovation model is to develop a system of centres linked to hot-spots in Asia that help companies develop the networks and linkages they require to support the opening up of their innovation activities in Asia. The 'open innovation model' distinguishes itself from the 'policy model' in only focusing on assisting Nordic companies in solving innovation problems through tapping into knowledge at its local source in Asia. It only operates with local staffing employed as consultants thus avoiding expensive contractual agreements if it fails. It is purely market based, which means that its success criteria can be boiled down to how attractive it will be to Nordic companies and their willingness to sponsor the initiative and pay for the services. Finally, the 'open innovation model' is based on how some of the leading global multinational companies manage to reap the benefits of globalisation through sophisticated arrangements for accessing R&D and innovation needs. By pooling the resources of the Nordic countries the 'open innovation model' might be able to offer Nordic SMEs global knowledge access arrangements hitherto only available to multinational companies. Given the novelty of the 'open innovation model' it could serve as a pioneering test case, and if successful it might have the added merit of developing services, which the 'policy models' can take up and bring into their mainstream business offerings. Finally, the 'open innovation model' and 'policy model' might over time develop into a Nordic hybrid providing Nordic companies with unmatched global business framework conditions. The 'open innovation model' should only be tested in hotspots where there currently is no Nordic 'policy models' in operation.

A network of Nordic open innovation centres was discussed as a prospective future scenario in the process. Nordic Open Innovation Centres in Asia should accelerate the adoption of models of open innovation among Nordic companies and institutions. The model would still need further development and testing, but could be an interesting model both to inspire national initiatives as well as joint Nordic initiatives. The group thus decided to recommend to test the model by financing pilot projects on functions of a possible future Nordic open innovation centre in Asia.

The 'Project' Model

The project-based model is the loosest form of co-operation of the three models. As implied in the table version of the model, it is based on co-operation between existing Nordic innovation centres in Asia and possible Nordic trade offices in Asia. One concrete example of the project-based model is the project Nordic Green, initiated by Innovation Centre Denmark in Silicon Valley, California.

Nordic Green '08, was a project where the stage had been set for a convergence of the emerging and advanced green technologies of Denmark, Sweden, Iceland, Norway, Finland, and Estonia with California's cutting edge green tech players and entrepreneurs, building partnerships to develop the next generation of collaborative global climate solutions. The project involved speakers and sponsorships from FinNode, Nordic Innovation Centre, Nordic Energy Research, Vinnova (Sweden) and Eesti Energia. And the project and related conference was a display of Nordic Cleantech companies²⁵. Nordic Green was partly financed by sponsors, partly by Nordic institutions and by the participants at the conference. On top of this the Trade Council of Denmark co-financed the project. There is however some questions connected to the project based model in view of common Nordic Innovation representations. If applied it is important that a project involves at least three Nordic countries, that the project is supporting existing innovation centre activities or building up new services that has an element of return of investment. Moreover, projects should support the goals of the Nordic globalisation initiative. If this is not the case the funding from a common Nordic innovation centre will dry up and in effect be a kind of Nordic aid function to national Nordic activities. Hence, some kind of metrics that can be used for assessment and management of the project-based model is necessary.

A project financing scheme for co-operation on innovation initiatives among Nordic representations in Asia could accelerate joint Nordic innovation initiatives and pave the way for more intensified modes of cooperation. Clear mandates from capitals to engage in Nordic co-operation as well as awareness raising of the possibilities and examples would however be necessary. The group recommends to establishing a joint Nordic financing scheme for this purpose, prioritising innovation in certain areas.

²⁵ <http://alwayson.goingon.com/page/display/23654>

Chapter 5: Financing scheme for Nordic innovation projects in Asia

A financing scheme for supporting Nordic innovation projects in Asia is seen as the most viable way for initial pan-Nordic co-operation on the issues of innovation and globalisation. The suggestion of the 'project model' should, however, not be seen as a final step for the prospects of common Nordic co-operation in the field of innovation and globalisation. Within a couple of years time there should be a sufficient number of projects to make an assesment of the potential for a further deepening of Nordic co-operation within global innovation. A further deepening could for instance be in the sense of shared Nordic open innovation centres in global hotspots. In what follows a brief explanation of the implementation for the 'project model' and the financing scheme is outlined.

Projects

Projects should be on issues linking up to the targets for the Nordic Globalisation Initiative. These targets may be summarised under the following headings:

Targets for the Nordic Globalisation Initiative

More Skilled Nordic Region	Explanation
	Promotion of top-class Nordic research in close co-operation with industry and commerce by summer 2008. In this connection, the possibilities of strengthening the co-operation between Nordic top research units and actors in the innovation business will be examined. For example, the following sectors will be given a special emphasis: promotion of innovations; climate, energy and environmental issues; and welfare research and health.
	Reinforcing co-operation in higher education will increase connections between Nordic educational establishments and promote the attractiveness of the Nordic countries for students.
More Visible Nordic Region	Explanation
	The Nordic countries will become more profiled as a region. A proposal on Nordic co-operation in the marketing and exports of the Nordic region to the growing markets, especially outside Europe
	An annual Nordic globalisation forum starting from 2008 will be assessed together with the Nordic Council. The objective of the forum is to seek joint solutions to the challenges of globalisation
Thriving Nordic Region	Explanation
	The Nordic co-operation must be reinforced in the energy sector.
	The Nordic region must be a forerunner in the reduction of greenhouse gases. The Nordic countries have a competitive edge e.g. in environmental protection, energy efficiency, renewable energy and the reduction of carbon dioxide emissions. Therefore, they want to carry out co-operation in increasing investment in the evaluation of technological possibilities and the identification of more significant technologies with respect to closer Nordic co-operation. Joint global marketing of the above strengths will be given special emphasis.
http://www.norden2007.fi/	

It is proposed that using a flexible system based on the principle of first come first-served can finance a number of projects. A 50% co-financing from the applicants will be a minimum requirement necessary for a project to qualify.

Projects and possible issues

- Project themes might address issues such as:
- The local positioning of Nordic design
- The adoption of Nordic 'clean-tech', ICT and biotech
- Creating a market for Nordic intangibles (IP, design or management know-how)
- Identifying relevant lead-user communities in the host country
- Mapping the status of open-innovation practises
- Promoting the Nordic countries as a region for education and study for overseas students
- Open-innovation initiatives and service testing's.

Nordic representations from any country in Asia may apply²⁶.

In order to make the initiative known and used it is important that it is being communicated to the relevant Nordic stakeholders at home and in Asia. Regarding communication it is suggested that the following Nordic representative organisations take responsibility for knowledge sharing nationally:

- Export Promotion Agencies: (FinPro, Innovation Norway, Trade Council of Denmark etc.)
- Investment Promotion Agencies: (Invest in Sweden, Invest in Finland etc.)
- Nordic Innovation and Technology Agencies: (Vinnova, TEKES, Forsknings-Innovationsstyrelsen etc.)
- The national actors mentioned will in concert with the Nordic Council of Ministers make sure that information material about the initiative and application procedures will be developed and distributed to the relevant Nordic stakeholders in Asia and in the Nordic regions.

Concerning the administration of the 'project model' it is suggested that one of Nordic Council of Ministers' agencies act as secretariat for the processing and answering of project applications. It is further suggested that each Nordic country appoint one or maximum two representative persons as members of a steering group officially approving recommended projects. To keep down the administrative overhead for a relatively small budget, projects should be financed twice a year, and with one application round in spring and one in autumn.

²⁶ Island has few representations abroad and will therefore be able to participate in projects with partners based in Island.

Annex I: Mapping Nordic Innovation

This annex outlines some quantitative measures of innovation in the Nordic countries, by looking at the rankings, inputs and outputs of the individual countries.

A well functioning and competitive innovation ecosystem is a prerequisite for being an attractive partner to other hotspots in the global economy. In the following section the Nordic countries' innovation performance and economic competitiveness is highlighted. The highlight will show that the Nordic countries' are generally doing quite well in comparison to most other European nations and regions. The highlight will however also reveal, that the individual strengths and weaknesses of the Nordic countries' innovation systems differ, which needs to be taken into consideration when launching common Nordic initiatives.

The European Innovation Survey (EIS) is an instrument developed at the initiative of the European Commission, under the Lisbon Strategy, to provide a comparative assessment of the innovation performance of EU Member States. The EIS 2007 includes innovation indicators and trend analyses for the EU27 Member States as well as for Croatia, Turkey, Iceland, Norway, Switzerland, Japan, the US, Australia, Canada and Israel. As such the EIS gives a good indication of the current standing of the Nordic countries' innovation performance in a global comparative perspective.

Based on their innovation performance, the countries included in the EIS 2007 fall into the following country groups²⁷:

The innovation leaders include Denmark, Finland, Germany, Israel, Japan, Sweden, Switzerland, the UK and the US. Sweden is the most innovative country, largely due to strong innovation inputs although it is less efficient than some other countries in transforming these into innovation outputs.

²⁷ http://www.proinno-europe.eu/admin/uploaded_documents/European_Innovation_Scoreboard_2007.pdf, p. 3

The innovation followers include Austria, Belgium, Canada, France, Iceland, Ireland, Luxembourg and the Netherlands.

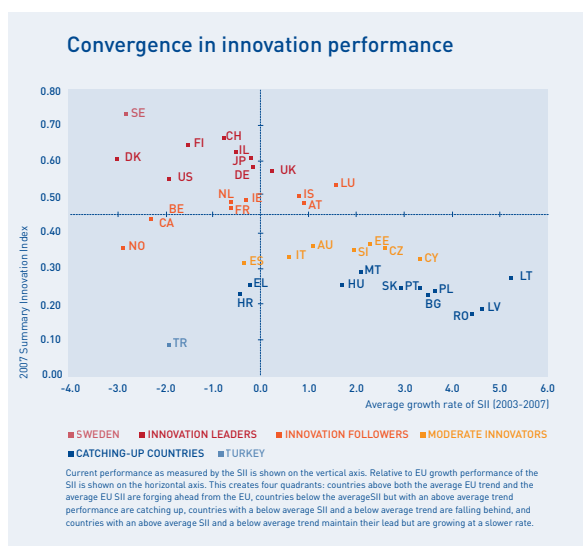
The moderate innovators include Australia, Cyprus, Czech Republic, Estonia, Italy, Norway, Slovenia and Spain.

The catching-up countries include Bulgaria, Croatia, Greece, Hungary, Latvia, Lithuania, Malta, Poland, Portugal, Romania and Slovakia. Turkey currently performs below the other countries.

As a region or group of nations the Nordics are doing well with Denmark, Finland and Sweden among the innovation leaders, Iceland in group two innovation followers and Norway within the group moderate innovators. An important result from this analysis is that the innovation leaders and the innovation followers have a relatively even and strong performance across all five dimensions of innovation used in the EIS. This tends to indicate mature innovation systems, although in all cases there are areas of relative weakness that require attention. In contrast, the moderate innovators and catching up countries tend to have a less even performance across the five dimensions, indicating that these countries may need to correct the imbalances in their innovation systems if they are to progress to higher levels of performance.

The figure²⁸ below illustrates the relative position of the European countries in view of innovation performance. It appears that one of the goals for common Nordic globalisation initiatives should be to strengthening the relative position of the region as a whole, as well as for each Nordic nation individually. Moreover, common Nordic globalisation initiatives have to offer each Nordic nation something additional to what national initiatives could achieve to be interesting. Otherwise the policy rationale and related cost-effectiveness for common Nordic globalisation initiatives might be hard to justify.

28 http://www.proinno-europe.eu/admin/uploaded_documents/European_Innovation_Scoreboard_2007.pdf. P. 9



At a more detailed level the EIS and European Innovation Trend Charts show among other things that none of the Nordic countries are among the European innovation leaders when it comes to Science and Engineering graduates (S&E graduates), and their relative weaknesses may be summarised as being:

Nordic Nation	Main challenges
Sweden	Decreasing rate of business R&D
Sweden	S&E graduates
Finland	Ensure creation of international high-level research and R&D
Finland	More horizontal collaboration between R&D and societal sectors and industries and increase foreign investments.
Denmark	Overall R&D investment modest compared to best performing countries
Denmark	S&E graduates
Norway	Below EU average business R&D
Norway	S&E graduates
Iceland	Level of S&E graduates, attraction of foreign PhD students

This weakness of human capital attraction is also consistent with OECD analysis, which show that the Nordic countries rank quite low when it comes to the share of foreign citizens among what the OECD calls 'professionals and technicians'. Sweden ranks higher than the EU average but below the OECD. Norway, Denmark and Finland rank even below the EU average, with Finland at the regional bottom.

A common Nordic initiative which e.g. gives better access to S&E graduates might therefore be additional and strengthening individual and overall regional innovation performance for companies and institutions within the Nordic region.

It should also be noted, that the position of the Nordic region is good but not outstanding, and if one for instance looks at Europe from the outside investors perspective²⁹ it appears that the UK and Ireland or German speaking Europe (Germany, Switzerland and Austria) are doing just as well. Moreover, both German speaking Europe and UK/Ireland has advantages over the Nordics in terms of market size, language, geographical location, number of world-elite universities and historical links to some of the world's leading economic hotspots. Hence, even though that the Nordic region is well positioned within Europe it should not feel too complacent.

Nordic Innovation System Variables³⁰

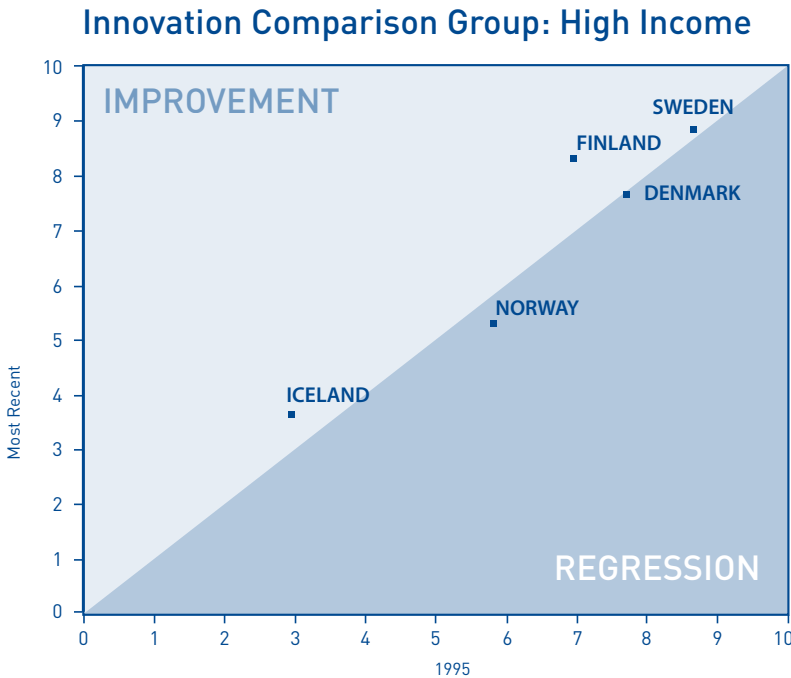
The Nordic countries plotted below the 45-degree line indicate a regression in their performance throughout the time from 1995 and about 10 years onwards. Countries that lie above the line signify improvement. The regression may be due to two reasons: the country either actually has lost ground in absolute terms over time, or it has improved more slowly than the comparative group of other high-income countries.

The mapping of the Nordic region's innovation system performance during the last decade shows the same pattern as above, namely that Sweden and Finland are the two strongest national innovation systems and that both have gained ground over time. The chart also shows that although Iceland has an overall lower ranking it has improved its performance. Denmark has neither gained nor lost ground whereas Norway has experienced declining performance.

29 Many Multinational Companies divide Europe into categories like German speaking, British Isles/Ireland etc

30 Source: World Bank, see http://info.worldbank.org/etools/kam2/KAM_page6.asp - accessed 28 March 2008

If we look at key input and output innovation variables for each Nordic country, it appears that Finland has the strongest innovation system. Finland's main relative weaknesses are in terms of foreign direct investment (FDI) received and FDI outflows as well as within researchers in R&D³¹.

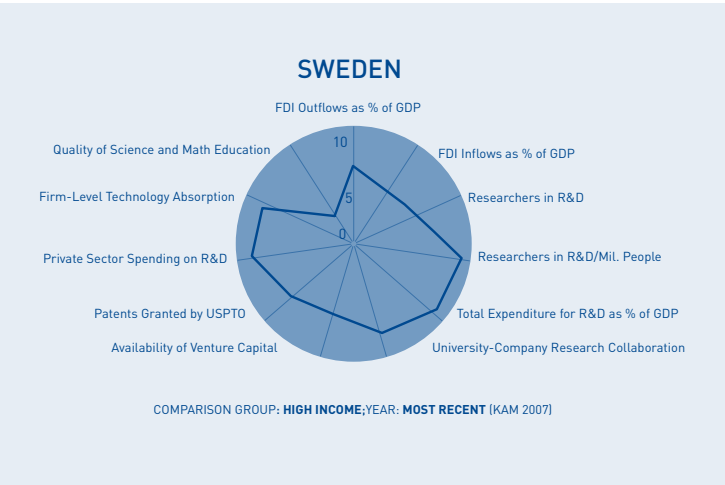


The mapping of the Nordic countries' reveals an overall strong competitiveness for all countries, yet looking at more specific innovation variables it appears that the relative weakness of all Nordic countries is researchers in R&D and the quality of science and math education, the latter expect for Finland. The solutions to this deficiency can take various forms. The Nordic countries may try to attract more foreign scientists and students to the region. This, however, is an activity, which the region is not very successful at doing according to the OECD.

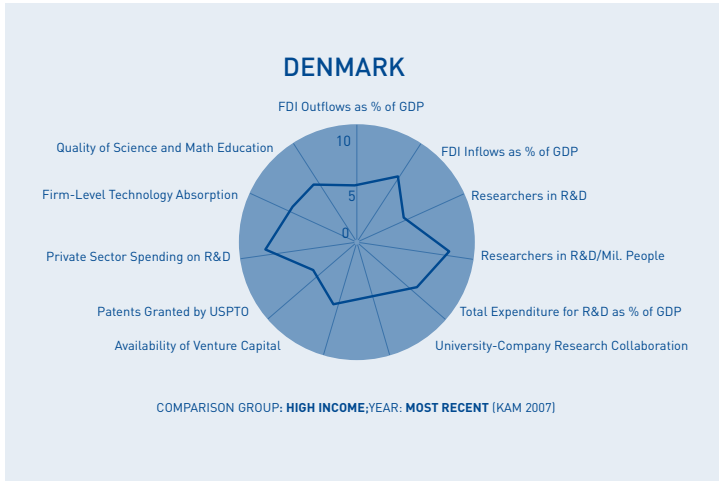
31 Source: the five Nordic innovation system variables profiles are from: http://info.worldbank.org/etools/kam2/KAM_page6.asp, based on own selection of variables accessed 28 March 2008



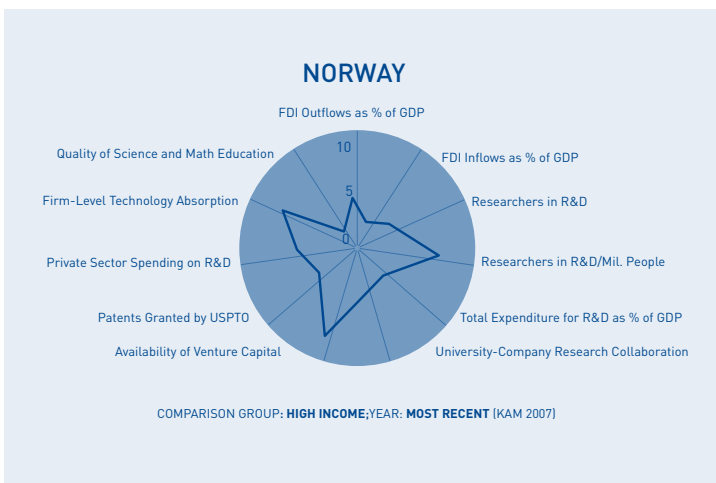
Sweden’s innovation system profile looks very similar to Finland’s and is more or less on par, except that Sweden’s weakest point is its quality of science and math education as well as researchers in R&D and FDI inflows.



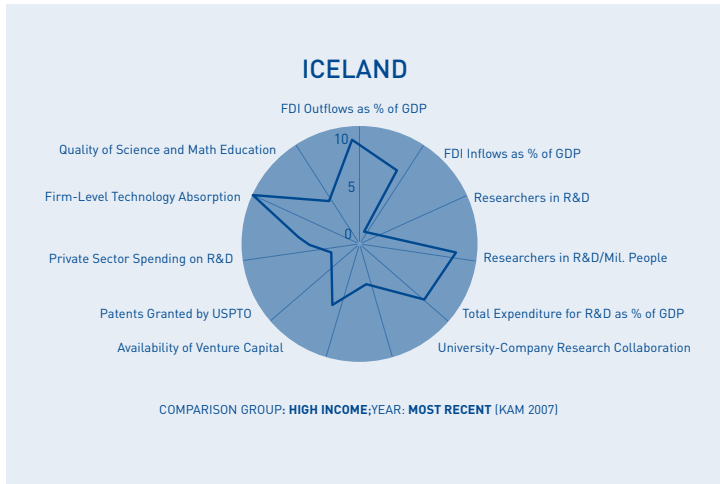
Denmark's profile is in accordance with the general picture from above, namely that it has an overall relative strong performance on most variables, yet at a slightly lower level than Sweden and Finland. Ratio of researchers in R&D is like Finland and Sweden a relative weakness for Denmark as well. One marked difference is Denmark's relative strength in attracting FDI as a proportion of its national economic activity.



Norway depicts an innovation profile which apart from availability of venture capital is weaker on all innovation input and output variables than the other Nordic countries. Like the other Nordic countries, Norway's weakest performance points combined are regarding its quality of science and math education and ratio of researchers in R&D.



Iceland is the Nordic country, which after Finland has experienced the biggest improvements within the last decade. Iceland shows the strongest firm level technology absorption and FDI outflows and inflows of the Nordic countries. Iceland's two weakest points are within quality of science and match education and ratio of researchers in R&D.



Another possibility for Nordic companies and institutions is to establish joint collaboration with knowledge centres outside the region and thereby tap into the talent mass of such hotspots. Collaboration can take different forms, as shown by the examples of the three models for internationalisation of innovation support infrastructures.

Annex II: National Nordic Innovation Centres in Asia

In order to assess the prudence of establishing common Nordic innovation centres in Asia, each the five Nordic governments have provided an overview for their existing innovation, technology and science related activities in Asia. It should be noted that during the review process, it became apparent that the Nordic countries have different organisational set-up for their global innovation support activities, excluding Iceland, which has no global innovation activities as such. Another issue for discussion has also been what constitutes an innovation centre, and in what ways does it distinguish itself from more traditional trade offices in terms of services offered and staffing and funding. Nevertheless, from the vantage point that an innovation centre is “*an organisational form focusing on providing innovation, technology, and knowledge related services to primarily companies and to a lesser extent public organisations and higher educational institutions, and with its physical location outside traditional export and trade council building structures*”, it appears that only Finland and Denmark have such innovation centres in Asia. More specifically both Finland and Denmark has opened an innovation centre in Shanghai, located in the same building with similarities in terms of scope and services.

FinNode and Finland's Innovation Centres

On top of internationalisation of Finnish companies, Finpro also plays a part in internationalisation of Finnish Innovation Environment. With an assignment of the Finnish Ministry of Trade and Industry, Finpro has prepared and operated new type of innovation centres in so-called new markets, where additional to commercial potential will become important sources of new know-how and innovation. There are three innovation centres already established: FinChi (Shanghai), FinNode USA (Silicon Valley), and FinNode Russia (St. Petersburg). FinNode Japan opened in June, 2008, and a feasibility study on FinNode India is underway. FinNodes act as a way of globalising the entire Finnish innovation eco-system. FinNodes' founding partners are Finpro, Sitra, Tekes, VTT and the Academy of Finland. Ministry of Employment and the Economy oversees FinNodes .

Projects: FinNodes are a platform for joint activities and projects initiated and managed by the five partners. Activities include promotion of R&D cooperation and researcher mobility, promotion of foreign direct investments, and foresight activities. In addition to the FinNode branded activities, each of the five FinNode partners continues to carry out their independent activities. Stimuli to activities come from the interaction between the founders, companies and research organisations in Finland.

TEKES interview, Kari Ruutu, Programme director Foreign R&D investments, 1. April 2008

Innovation Centre Denmark

Innovation Center Denmark, in Shanghai, Silicon Valley and Munich is one of the direct results of the globalization strategy designed by the Danish government in 2006 to help achieve the ambitious objective of becoming one of the leading knowledge-based nations in the world by 2015. The innovation centers are established by the Danish Ministry of Foreign Affairs and the Danish Ministry of Science, Technology and Innovation.

The mission of the centres is to provide access for Danish research institutions and companies to foreign knowledge-intensive hubs in order to enhance innovation in Denmark. More specifically, the innovation centers offer assistance in mapping the market for technologies, competition and potential business partners. Furthermore, the innovation centers provide access to venture capitalists and help small and medium-sized companies to become competitive by developing their business model.

Furthermore, Innovation Center Denmark in Shanghai is appointed the task of assisting in filling out the framework of the bilateral agreement on science and technology that was signed in September 2007 by the Chinese Ministry of Science and Technology and the Danish Ministry of Science, Technology and Innovation. The 2008-strategy for knowledge-based collaboration between Denmark and China is guiding the task.

Financing: The costs of running Innovation Center Denmark are covered by public funding from the Ministry of Foreign Affairs and the Ministry of Science, Technology and Innovation. As an integrated part of the funding mechanism, the innovation center has to contribute to its own funding by charging a fee for its commercial services, and partly from rental space offered to companies in the centers incubator facilities.

FinNode and Innovation Centre Denmark are what in this context can be considered 'policy models' in so far as they constitute the Nordic prime ministers' background for looking at possible common Nordic innovation centres.

A difference between the Finnish and Danish innovation centres is that Investment Promotion and nation branding are explicitly integrated into the Danish model, whereas this does not seem to be the case for the Finnish centre. On the other hand it seems that the Finnish model is more explicitly oriented towards the internalisation of the entire Finnish innovation ecosystem and its main actors than the Danish model is. Finally, 25 per cent of the cost of running the Danish innovation centre has to come from consultancy services and rental from its incubator.

If a less strict definition of innovation Centre activities in Asia is applied and broadened to include more traditional research and science focus, it turns out that Sweden, Norway, Denmark and Finland to varying degrees have such activities in connection to more of their embassies in Asia.

The Swedish Office of Science and Technology

The Embassy of Sweden has established a Swedish Office of Science & Technology in New Delhi. It is amongst a series of initiatives to further strengthen cooperation between Sweden and India.

India, thus, becomes only the fifth country where Sweden has established such an office. The others to host such an office are the US, Japan, Belgium and China. The office in New Delhi is expected to serve as a catalyst for research cooperation between Sweden and India.

In 2005, India and Sweden signed a MoU on science and technology to promote co-operation in ICT, biotechnology and environment technology. The office that has been set up by Sweden is a result of that. The office will facilitate co-operation on R&D and promote an exchange of knowledge between Sweden and India.

The Swedish Office of Science and Technology is part of ITPS (Swedish Institute for Growth Policy Studies) and acts as the liaison office for Swedish governmental agencies like VINNOVA, the Swedish Agency for Innovation Systems, NUTEK - Swedish Business Development Agency and STEM - Swedish Energy Agency.

The Swedish Embassy has also instituted two prizes at the recently set up Indian Institute of Space Science and Technology (IIST) at the Vikram Sarabhai Space Centre. The prizes are to be awarded to the two top ranking students of the MSc in space science programme at the IIST. The prize includes a week's familiarisation tour and exposure to global space research programme in Sweden. **Financing:** 100 % financed from public funding

Innovation Norway
Innovation Norway was established in 2004 as a merger between several former public and semi-public entities responsible for innovation, trade promotion, investment promotion, technology transfer, guidance to inventors and promotion of tourism in Norway.
Innovation Norway's objective is to stimulate to innovation in business and industry in Norway through internationalisation and innovation, to foster regional development, to promote Norwegian industry and Norway as a tourist destination.
According to its objects clause, Innovation Norway is to be backer and promoter of entrepreneurs, newly founded and small and medium-sized enterprises that seek to grow, as a rule in an international market. The organisation's role is to provide or arrange financing, link customer enterprises to know-how and help them build networks for their innovation projects. IN has offices in more than thirty countries worldwide, in Asia the following offices: China – Beijing, Shanghai, India – New Delhi, Japan – Tokyo, South Korea – Seoul, Singapore, Malaysia – Kuala Lumpur, Thailand – Bangkok and Vietnam – Hanoi.
Financing: Innovation Norway's offices abroad are partly financed through user fees, but a large part of the financing comes from public funds. The degree of public financing varies from office to office.

If we look at the different activities on a continuum from market innovation towards more basic science and research that the Nordic countries currently have in Asia the following characteristics can be displayed.

Market innovation	Basic science	
Finland	Denmark	Sweden
Norway	Norway	Norway
»		

Finland's FinChi has the strongest market orientation in so far as all the costs of running FinChi in Shanghai are financed through the income from rental office space to 25-30 companies³².

With the requirement of covering 25 per cent of its costs through commercial services and offering office space for rent, Innovation Centre Denmark also has a strong market orientation built into its operations.

Innovation Norway also covers part of its costs through user fees and income from services rendered to the industry. The degree of public funding of Innovation Norway's offices abroad varies from destination to destination.

32 Telephone interview with: Seppo Laine, Senior Adviser, FinPro, 25 March 2008

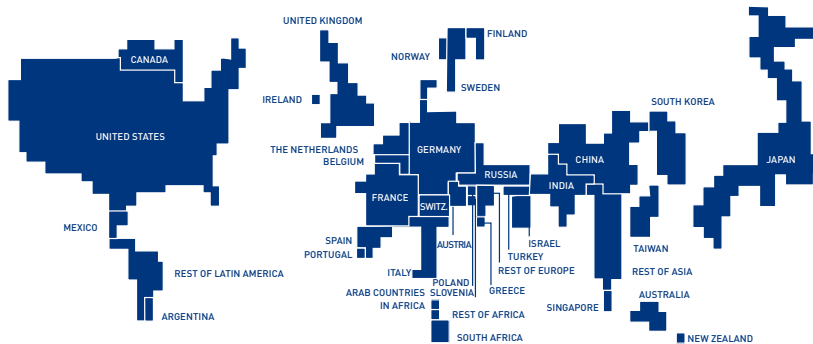
What can be concluded is that the Nordic countries have chosen different models in terms of client focus and financing for their initial innovation, technology and science activities in Asia. This corresponds also with findings of the study made by NORIA, which concludes that:

The consulates and trade/export councils (organized differently in the different countries) are focusing primarily on their national activities, i.e. to provide services to public and private stakeholders. They normally charge for their services. It is not likely that these stakeholders will see any particular benefits from closer Nordic collaboration, unless such activities could show demonstrable value-adding effects. There are two Nordic technology incubators in Shanghai, a Finnish one that has existed for some years and a Danish one that has only just opened. The incubators will primarily pursue national interests but they may benefit from exchange of information and experience, and some value-adding services. There may be scope for clustering of activities in certain fields, such as environment, energy, and sustainable mega-city development. Most Nordic countries have a national business association in China. They are linked to a national network of associations but generally operate quite independently at the local level.³³

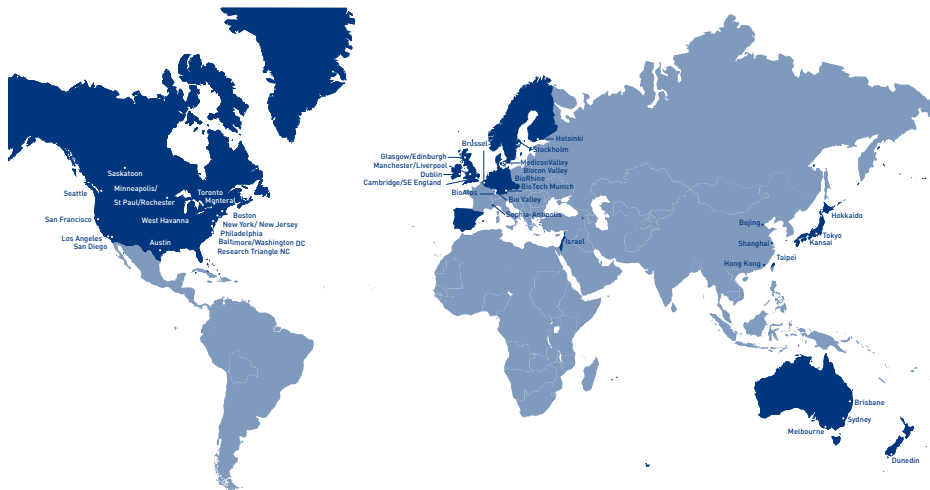
33 Nordic 'Triple Helix' Collaboration in Knowledge, Innovation, and Business in China and India. A Preliminary Study, Nordic Institute of Asian Studies, 2007

Annex III: Global Hotspots

Global Map of Research Investments



Global Map of Biotech Hotspots



Source: mbbnet.umn.edu/scmap/biotechmap

Annex IV: Terminology

A Terminology Primer of “Open Innovation” Terms	
Co-development	Working with outside partners in the development of new products and/or services. Can be a subset of joint venturing or open innovation initiative. May include peer-to-peer or supplier/customer co-development.
Collaborative innovation	Similar to concepts contained in definitions of open innovation and co-development, but can also include formal networks or consortia that come together in an alliance to study common issues and/or develop new products/services.
Joint venture	Usually a formal legal arrangement between partners in a joint development and/or business initiative. Risks and rewards are negotiated and shared formally.
Open innovation	Popularized by Chesbrough’s book “Open Innovation,” this term refers to the broad concepts of leveraging external sources of technology and innovation to drive internal growth. Also entails the spin-off and outsourcing of unused intellectual property.
Open-source models	Derived from the term used in the software development industry, where informally structured collaborations take place (usually without ownership or remuneration) to create a shared outcome from which all can benefit.

Closed versus open innovation ³⁴		
	Closed innovation	Open innovation
Corporate ethos	Not invented here – we can and will do it	Best from everywhere
Role of customers	Passive recipients	Active co-innovators
Core competency	Vertically integrated product and service design	Core competitive differentiation and collaborative partner management
Innovation success metrics	Increased margins/revenues reduced time-to-market, market share within existing market	R&D Return on investment, breakthrough product or business models
Attitude towards IP	Own and protect	Buy sell – the corporation is a knowledge broker using both licensing and commercial development to monetize IPR
Role of R&D and operations	Design, develop and market in-house inventions	Optimize performance of owned assets both in-house and external development; do enough R&D internally to recognize significant external R&D.

³⁴ Source: Forrester – Innovation Networks, June 17, 2004

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Nordic co-operation

Nordic cooperation is one of the world's most extensive forms of regional collaboration, involving Denmark, Finland, Iceland, Norway, Sweden, and three autonomous areas: the Faroe Islands, Greenland, and Åland.

Nordic cooperation has firm traditions in politics, the economy, and culture. It plays an important role in European and international collaboration, and aims at creating a strong Nordic community in a strong Europe.

Nordic cooperation seeks to safeguard Nordic and regional interests and principles in the global community. Common Nordic values help the region solidify its position as one of the world's most innovative and competitive.



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Establishment of Nordic Innovation Centres in Asia?

In this review, the Nordic countries look at the next steps required for meeting the challenges of staying competitive in a global knowledge and innovation driven economy.

Competition in a global knowledge economy means among other things that knowledge increasingly becomes a commodity, which can be sourced from anywhere around the world. The Nordic countries have been among the first to internationalise their national innovation systems. They have done so by setting up international innovation centres and technology offices in global innovation hot spots such as Silicon Valley, Shanghai, Beijing, St. Petersburg, München and Tokyo. The report suggests that the Nordic countries pool some of their resources and test out the potential gains from co-operation between their existing national export promotion and technology and innovation offices in Asia. Moreover, the report suggests that the next generation of innovation policies will be on the theme of open innovation and how to manage global sourcing of knowledge. The report is interesting reading to any individual interested in the new movements in innovation policies and globalisation.

