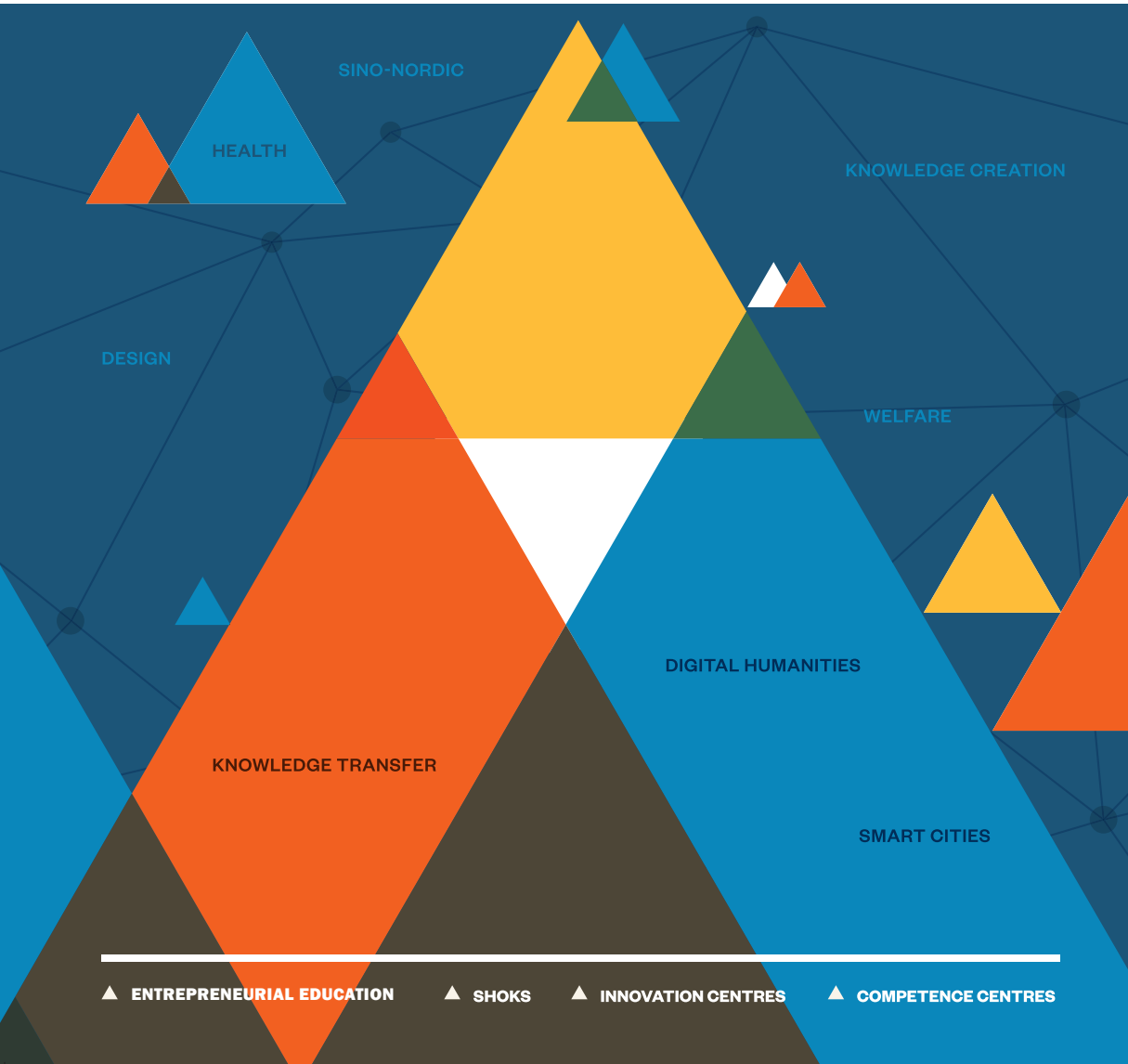
The Knowledge Triangle Programme

Methods and Tools in Design, Culture, Smart Cities, Health, Welfare and Entrepreneurship

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Halina Gottlieb and Monika Mörtberg Backlund

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Introduction and Summary

Sweden's Innovation Strategy in 2004 underlined the importance of collaboration between education, research and the private sector. This strategy was based on the idea that education and the knowledge sector play a key role for societal development. This was later formalised as part of the Knowledge Triangle concept of the Work Programme during Sweden's Presidency of the Council of the European Union in 2009.

In 2011, the Nordic Ministers of Education and Research initiated the Nordic Knowledge Triangle Programme with the aim to stimulate collaboration between stakeholders from these sectors. The programme supported existing cross-sectoral networks and built new constellations in the Nordic countries within the fields of design, culture, welfare and entrepreneurship. Four networks were established in this first stage of the project:

- METIS – a Nordic network whose primary goal is to improve, strengthen, and make more effective work connected to commercialisation at Nordic universities.
- NORDTEK – network of rectors of Nordic institutes of technology setup to create an arena where Nordic knowledge triangles can be established with a focus on the fields of industrial design and welfare technology.
- Culture KICK – established with the aim to facilitate an exchange of Nordic research and knowledge in the field of design with a focus on innovation in the field of cultural heritage through practical and theoretical applications of ICT.
- NeRo – network with a focus on welfare technology in the healthcare sectors of the Nordic countries.

In 2012, the programme was extended to include China – a country considered an increasingly important partner for Nordic universities and companies involved in innovation. Six Sino-Nordic networks were built around societal challenges such as public health, welfare, green energy, and sustainable cities: Sino-Nordic Welfare Research Network (SNoW), Sino-Nordic Network in Ethics of Research and Public Health, Urban Governance for Sustainable Cities Network, Dynamics and Reliability of Renewable Energy Systems, China in Turbulence: Paths Forward for Nordic Business and Food4Growth.

The Knowledge Triangle Programme – Methods and Tools in Design, Culture, Smart Cities, Health, Welfare and Entrepreneurship is a joint publication which presents the activities and results of the abovementioned Nordic and Sino-Nordic networks built during the Knowledge Triangle Programme in the period 2011–2015.

1. Policies and Measures of the Nordic Council of Ministers to Stimulate the Development of the Knowledge Triangle Network

1.1 Background

The Nordic cooperation is one of the oldest and most comprehensive regional cooperation in the world. It is based on shared values and a will to generate a dynamic development and enhance regional competence.

The Nordic Council of Ministers, which was founded in 1971, is the official inter-governmental body for cooperation in the Nordic region. Representatives from the governments in Denmark, Finland, Iceland, Norway, Sweden, Greenland, the Faroe Islands and Åland meet regularly at the Council of Ministers to discuss and develop activities of common interest for the Nordic regions. The presidency of the Council, which is held for a period of one year, rotates between the five Nordic countries.

The Nordic Council of Ministers consists of ten councils of ministers focusing on different policy areas. The Nordic governments' cooperation in the field of research and education is led by the Nordic Ministers of Education and Research. Their overall aim is to ensure that the Nordic region maintains a leading position within the fields of knowledge and competencies. Key concepts in reaching these goals are freedom of movement, innovation, visibility and international engagement.

1.2 Initiatives to Stimulate Interaction between Education, Research and Innovation – Nordic and Sino-Nordic Knowledge Triangles

In all the Nordic countries policies are continuously developed to provide high quality education, research and innovation in order to stimulate a knowledge-based economy and to increase the competiveness of the region. There is also a common understanding between the countries that a positive development of a knowledge-based economy should be based on well-functioning interaction between universities and other knowledge producing institutions, industry and the public sector. The term "knowledge triangle" referring to the interaction between education, research and innovation is, however, not explicitly used in all of the Nordic countries. In spite of this lack of common terminology the interactions between the actors within these fields are regarded as being of crucial importance and several policy measures are taken in accordance with the concept. In fact, the ability of the Nordic countries to develop new products and services from existing knowledge is recognised internationally and it contributes substantially to the competiveness of the region. In 2011 the Nordic Council of Ministers undertook an investigation of activities and strategies with the aim to analyse and compare policies developed and applied in the spirit of the knowledge triangle in the Nordic countries. The investigation showed that the idea behind the concept is very much alive in the Nordic region and that cooperation between education, research and innovation is increasing in all of the Nordic countries.[1]

With this background the Nordic Ministers of Education and Research, in 2011, initiated a three year project with the aims to contribute to a deepened knowledge about the interaction between universities and other innovation actors and to promote increased applications of research results in product and services. The funds allocated to the project were directed to support the establishment of Nordic knowledge triangle net-

[1] Melin, G., & Blomkvist, L. (2011, June). *Kunskapstriangeln i Norden, kartläggning av strategier och genomförda aktiviteter*. Faugert & Co Utvärdering AB.

works for mutual learning between relevant actors and to support mobility between the participants in the networks. Three thematic areas were identified for this initiative:

- Health.
- Nordic culture and design.
- General knowledge creation.

The announcement of the initiative met with huge interest and from all the applications four networks were selected for financing.

In 2012 the Nordic Ministers of Education and Research decided on an additional three year initiative for the knowledge triangle, this time including both Nordic and Chinese actors. The background for this decision was based on the awareness that international collaboration within higher education has grown rapidly the last decades and that China is becoming an increasingly important partner for Nordic universities, innovation actors and companies. With the initiative the Council wanted to contribute to the development of the Nordic Center at the Fudan University in Shanghai as a centre for Sino-Nordic collaboration within the knowledge triangle and also to increase Nordic visibility in the Shanghai area. The overall aim was to strengthen collaboration between Nordic and Chinese universities and other innovation actors by establishing an exchange of ideas, knowledge and experiences regarding common challenges. No specific thematic areas were selected for this project although the fields climate/energy, "green growth", health and welfare and "the Nordic Model" were highlighted as of special relevance. The interest was considerable also for this initiative and from several qualified applications six network projects were selected for financing within a variety of thematic areas.

This report presents the Nordic and the Sino-Nordic networks and gives an overview of the activities performed in the different thematic projects within the respective networks. The experiences and the concrete results from the work are described by each of the project leaders.

References

Melin, G., & Blomkvist, L. (2011, June). Kunskapstriangeln i Norden, kartläggning av strategier och genomförda aktiviteter. Faugert & Co Utvärdering AB.

2. Literature Review

2.1 Terminology

There is no accredited definition of the concept of the "knowledge triangle", but all explanations conveyed so far by policy-makers, practitioners and academics alike point to the interaction between education, research and business sector – the three fundamental factors that contribute to the creation of a knowledge-based society and foster innovation.

In the mission assigned by the Swedish Government to the Board for Innovation Systems, Vinnova, to assemble a working team for the execution of the knowledge triangle, it is stated that "the concept of the knowledge triangle refers to systematic and continuous interaction between research, innovation and education, and the value of investments in these areas can be created by such interaction."[2]

Possibly the first use of the term in a document was made in 2005, in the *Reform of the universities in the framework of the Lisbon strategy*,[3] where it was underscored that "Europe must strengthen the three poles of its knowledge triangle: education, research and innovation. Universities are essential in all three. Investing more and better in the modernization and quality of universities is a direct investment in the future of Europe and Europeans." The reform, issued five years after the launch of the Lisbon strategy, was aimed to give the strategy some fresh momentum as the European economy had failed to deliver the expected performance in terms of growth, productivity and employment. The goal of the Lisbon

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[2] VINNOVA. (2010, 16th September). *Government Decision: N2010/5929/FIN*. Retrived June 2013, from http://www.vinnova.se/PageFiles/54610448/Kunskapstriangeln_slutrapport110630.pdf

[3] EU Commission. (2005). *Mobilising the brainpower of Europe: enabling universities to make their full contribution to the Lisbon Strategy*. Retrieved June 2013, from http://europa.eu/legislation_summaries/education_training_youth/lifelong_learning/c11078_en.htm

Strategy established in March 2000 was to make the European Union "the most competitive and dynamic knowledge-based economy in the world,"[4] but after a mid-term review of the strategy in 2004, it was reported that there was still insufficient investment in research and development and the European university system was fragmented and remote from the industry field.

The idea of enabling interaction between education, academic research and innovation was however hinted at before that, in 2004, by the Swedish Government, in its *Innovation Strategy for Sweden*: "Many innovations and technological discoveries have their origins in academic research. Well-functioning interaction between universities, higher education institutions, research institutes and the business sector is therefore vital."[5]

Even though it does not denominate the term of the "knowledge triangle", it is however a vision which was carried on in the *Work Programme for the Swedish Presidency in the EU* in June 2009, when the concept was finally legitimated:

> "The Presidency will continue the work that has begun and aims to propose governance mechanisms for the effective use of these resources and better cooperation between policy areas, e.g. in the context of the knowledge triangle (…) The focus will be on the issue of the role of higher education institutions in promoting cooperation within the knowledge triangle."[6]

The whole strategy of implementing the knowledge triangle was to be further discussed at full-length within the conference "The Knowledge Triangle Shaping the Future of Europe" in September 2009, and in the following month of the same year, the EU Education, Youth and Culture Council meeting at Brussels established the principles of the policies which address the challenges of applying the knowledge triangle framework.

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[4] Lisbon European Council. (2000, March). *Presidency Conclusions*. Retrieved June 2013, from http://www.consilium.europa.eu/uedocs/cms_data/docs/pressdata/en/ec/00100-r1.en0.htm

[5] Ministry of Industry, Employment and Communications, Ministry of Education. (2004). *Innovative Sweden. A strategy for growth through renewal*, p. 16. Stockholm: Åtta.

[6] Swedish Presidency of the EU. (2009). *Work Programme for the Swedish Presidency in the EU,* p. 40. Stockholm: Regeringen. Retrieved June 2013, from http://www.europarl.europa.eu/meetdocs/2009_2014/documents/envi/dv/sv_workprogramme_/sv_workprogramme_en.pdf

The concept of "knowledge triangle" stems however from a number of other previous ideas which were incorporated in policies and strategies of numerous governing programmes prior to 2004. In other words, the concept is essentially a spin-off and can be regarded as an evolution of the "Innovation System" and "Triple Helix".

2.1.1 The Innovation System

The Innovation System idea, which has gained an immense popularity since the 20th century and has been introduced in various policy programmes for economic growth and development, is at the base of the knowledge triangle concept. The approach considers research to be only one part of the whole process of innovation and that innovation does not occur linearly, from research to development, production and new products, but instead implies constant reciprocal action between different sources.

Otherwise stated, innovation emerges as a result of an interactive process between several actors, including companies, universities and research institutes, an idea which is integrated into the knowledge triangle model. All these organizations are embedded in a web of interrelationships. An innovation system is therefore "a network of organisations within an economic system that are directly involved in the creation, diffusion and use of scientific and technological knowledge, as well as the organisations responsible for the coordination and support of these processes."[7]

The innovation system approach has been adopted quite rapidly in the Nordic countries as a new field of policies and was present even as early as the 1980s, in Finland, when the concept was applied to national growth plans. In Denmark, the so called DISKO project has accomplished an extensive national study of the Danish innovation system in 1999. The DISKO-project involved general economists, business economists and social scientists with an expertise in innovation, human resource management, labour markets and education issues. In Sweden, the National Board for

[7] Dantas, E. (2005). *The "system of innovation" approach, and its relevance to developing countries*. Retrieved June 2013, from http://www.scidev.net/global/policy-brief/the-system-of-innovation-approach-and-its-relevanc.html

Innovation System (VINNOVA) was founded in the year 2000 and in Norway, a merging of several small agencies to the new agency Innovasjon Norway was completed in 2004.

Even though the genesis and accuracy of the term and concept of the innovation system was criticised to lack real scientific substance,[8] the concept of the innovation system was very much employed in all kinds of contexts that were about economic growth, regional development and societal planning. Politicians, policymakers, scientists, and many others from the mid-1990s have endorsed the idea of the innovation system because they needed "a language in order to define a new societal organisation as well as a new order." They were consequently creating innovation systems out of a "need for a new world view and a new diagnosis of an era".[9]

As the innovation system approach can be applied to different levels of the economy, at regional, national, local or sectoral levels, the EU and the OECD have adopted and implemented this concept, viewing it as a scientifically grounded ideology for economic growth.

2.1.2 The Triple Helix

The concept of the Triple Helix, first introduced by Professor Henry Etzkowitz, describes a new innovation model that views the collaborative process of industry, governments and universities as beneficial for supporting innovation and a knowledge-based economy. The focus on innovation sources is thus not restricted to the scope of a single institution. Product development in industry, policy-making in government or the creation and dissemination of knowledge in academia (colleges and universities), result from the interaction between the three spheres, and not separately.

Each institution brings its own contribution in the triple helix relation: industry creates the locus of production; the government operates the contractual relations that guarantee stable interactions and exchange; the uni-

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[8] Miettinen, R. (2002). *National Innovation System. Scientific concept or political rhetoric?* Helsinki: Edita.
[9] Uhlin, Å. (2006). The Idea of Innovation System and the Need for a New Horizon of Expectation. In Mariussen, Å., & Uhlin, Å. (Eds.), *Trans-National Practises. Systems Thinking in Policy Making*. Stockholm: Nordregio. Retrieved June 2013, from http://bildanden.se/Filer/the_idea_of_innovation_systems.pdf

versity provides new knowledge and technology. Although the government is not specified in the knowledge triangle concept as directly as in the Triple Helix concept, it acts as a facilitator which operates the systemic interplay between the three forms of activities: education, research and business.

A key feature of the Triple Helix which can also be identified in the knowledge triangle is the cooperation and the diverse input and feedback that occur between the actors. In the vision of Etzkowitz, the involvement of the actors goes to such an extent that "each institutional sphere also takes the role of the other, performing new roles as well as their traditional function."[10] This idea entails the restructuring of institutions and the emergence of hybrid organizations such as technology transfer offices in universities, government research labs and business and financial support institutions such as venture capital for new technology-based firms that are increasingly developing around the world.

Another important characteristic of the Triple Helix that was also enhanced in the policies that adopt the approach of the knowledge triangle is represented by the major role of the university in the knowledge society. Both concepts view universities as the source of regional economic development and position universities at the core of the innovation web. According to knowledge triangle policy-makers, a necessary condition for universities to satisfy their mission of creating and promoting innovation and thus support economic growth is "to be more open and responsive to the needs of the labour market and society"[11] as there is not enough feedback from research and businesses into curricula and educational practice.

However, in the Triple Helix concept the university is considered to have a larger role in the knowledge-based society. As Professor Etzkowitz reflects, the university in the Triple Helix is no longer just a source of human resources and knowledge, but it can also provide technology: "The university begins to play a new more direct role in the "capitalization of

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[10] Etzkowitz, H., Dzisah, J., Ranga, M., & Zhou, C. (2007, January/February). Special Feature: The Triple Helix Model for Innovation. *Tech Monitor*, p. 15. Retrieved June 2013, from http://www.techmonitor.net/tm/images/7/7d/07jan_feb_sf1.pdf

[11] Quintin, O. (2009). *The changing role of universities in the knowledge triangle*. Presidency Conference: The Knowledge Triangle: Shaping the Future of Europe, p. 2. Retrieved June 2013, from http://ec.europa.eu/dgs/education_culture/quintin/Goteborg-The-Knowledge-Triangle-31-08-09.pdf

knowledge" by organising technology transfer to existing firms and by starting new firms in addition to its traditional supporting role of transferring knowledge."[12] Another article also emphasized a more futuristic mission of the higher education institutions: "The transformation of a university from a teaching to a research and thence to an entrepreneurial institution is vital."[13]

Both the triple helix and the knowledge triangle concept share the vision of universities providing students with entrepreneurial skills as they represent "a continual source of innovation, both within the university and through their regular movement to other institutional spheres upon graduation."[14]

2.2 The Swedish Presidency and the Gothenburg Conference

The concept of the "knowledge triangle" was largely discussed during the second half of 2009, when Sweden took over the Presidency of the Council of the European Union. Even though the issue was tackled at an ideological level, it broke new ground in the field of innovation systems and knowledge transfer and prepared the necessary conditions to forming a European and global environment favourable for innovation and its immediate impact on sustainable economic growth and competitiveness.

According to the Swedish Presidency, the key to enhancing economic growth is through innovation. Nevertheless, in order to strengthen the innovation capacity of the EU and its competitiveness, which will trigger solutions to the emerging societal problems in the long run, it is imperative to implement an approach of linking academic research and

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[12] Etzkowitz, H. (2007). *University-Industry-Government: The Triple Helix Model of Innovation*, p. 1. Retrieved June 2013, from http://www.eoq.org/fileadmin/user_upload/Documents/Congress_proceedings/Prague_2007/Proceedings/007_EOQ_FP_-_Etzkowitz_Henry_-_A1.pdf

[13] Etzkowitz, H., Dzisah, J., Ranga, M., & Zhou, C. (2007, January/February). Special Feature: The Triple Helix Model for Innovation. *Tech Monitor*, p. 14. Retrieved June 2013, from http://www.techmonitor.net/tm/images/7/7d/07jan_feb_sf1.pdf

[14] Ibid., p. 11

knowledge production with an entrepreneurial spirit. This vision has been considered to have reciprocal beneficial effects towards all three actors of the knowledge triangle and facilitate "transition from idea to product, from lab to market, and from student to entrepreneur"[15] (EIT Mission).

For example, universities will have close connections with cutting-edge research in order to provide high quality education and students will benefit from a customized education that will make them more attractive to future employers. In return, companies will be able to leverage knowledge developed by public research centres and benefit from a workforce with skills tailored to their needs. The research institutions will benefit from a skilled workforce and will take advantage of new opportunities of business investments. Furthermore, researchers, students and entrepreneurs are much less efficient in attaining the results needed and demanded by the market and consumers if they work in isolation.

Consequently, in the context of climate change, economic crisis, employment deficiency and changing patterns of global competition, one strategy for Europe to address these societal challenges was represented by efficient long-term investments to knowledge-based innovations to deliver value in terms of prosperity and quality of life. In this regard it was determined that "The concept of the knowledge triangle relates to the need for improving the impact of investments in the three forms of activity – education, research and innovation – by systemic and continuous interaction."[16]

However, it has been observed that the resources destined for research and innovation were not used efficiently in order to enable the transition of Europe to an eco-efficient economy. In addition to that, the framework of stimulating innovation and conducting research had to be reconsidered because several other challenges in the innovation landscape were needed to be dealt with: fragmentation of the innovation system, lack of entrepreneurial culture, inability to support and restore en-

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[15] EIT Mission. (n.d.). Retrieved June 2013, from http://eit.europa.eu/about-us/mission/

[16] Jacobsson, G. (2009). *The Knowledge Triangle Shaping the Future of Europe. Summary report from the conference 31st August – 2nd September, Göteborg, Sweden*, p.7. Stockholm: The Swedish National Agency for Higher Education.

terprises, inconsistent usage of the existing research base, and insufficiency in developing, attracting and retaining talented individuals.

The focus was directed therefore on methods on how EU was to use its research resources more efficiently, where research resources should be used and how these investments could be better coordinated and managed.

2.2.1 Methods proposed within the Gothenburg Conference

The discussions of the methods (see Annex 1) to implement the knowledge triangle during the conference mainly touched on the various efforts that universities can undertake. Several speakers such as Tobias Krantz, the Minister of Higher Education and Research in Sweden, and Marius Rubrialta, Secretary General for Universities in Spain, talked about integrating universities with local businesses as a step forward to increase university participation in the knowledge triangle. Krantz used the example of Chalmers University in Gothenburg cooperating with Astra Zenica and Sahlgrenska Hospital. Britt Lööw, CEO of Swedish incubator INOVA, presented how they work with the local university, supporting and connecting researchers to entrepreneurs that might be able to realize their ideas.

Another suggestion made by Pam Fredman, Chairman of the Association of Swedish Higher Education, called for a higher rate of matchmaking between students and their future employers, plus a closer contact between various institutions in all parts of the knowledge triangle. Therefore, a higher mobility of staff and students might serve to create closer interactions between different sectors. Though Mrs. Fredman pointed out that regulations on both national and European levels make this difficult, a solution could be that qualification from companies can function as credits or grades within universities. Julia King, Vice Chair of Aston University of Texas, suggested changing polices to make it beneficial for engineering students to work in engineering companies or letting business professors run and develop business strategies. Deborah L Wince-Smith of the Council of Competitiveness explained that integrating universities and industry is a must. She draws attention to the gap between the training and potential industries and pointed out that the education does not meet the needs of companies.

Julia King and Mauri Pekkarinen, Finnish Minister of Economic Affairs, suggested that governments and other funding bodies must focus more strongly on helping businesses develop links with universities and other research centers, so that research can also approach a more business-like standpoint and meet the demands of the market. Nicola Markova, then president of EURODOC, suggested that doctoral candidates and researchers can help build up the knowledge triangle by having them work in companies. They represent links between education, innovation and research, and they can contribute more to strengthening the relationships within the knowledge triangle if doctoral graduates were given more recognition overall in Europe.

Another topic brought up at the conference underlined the need to increase the autonomy and flexibility of universities. Jean-Marc Rapp, the President of the European University Association, argued that the leaders of universities should be able to design their own management and academic structures as well as to select staff and programs. The focus was also turned towards the idea of giving greater flexibility to students so they can begin their education in one country and finish it in another. Margret Wintermantel also added that universities would also benefit from integrating different academic disciplines across the board as well as integrating diverse competences, which may lead to changing higher education polices. Günter Stock, President of the Berlin-Brandenburg Academy of Science and Humanities, put forth that good teaching is necessary; students need to learn how to form networks and receive a higher degree of cultural training. Mr. Stock argued that the humanities would help understand what Europe needs in light of its common cultural heritage. During her speech, Deborah L Wince-Smith also stressed that the arts and humanities must integrate with the physical sciences to produce more innovation. She said that "we need engineers who think like artists and artists who think like engineers."[17]

[17] Jacobsson, G. (2009). The Knowledge Triangle Shaping the Future of Europe. Summary report from the conference 31st August – 2nd September, Göteborg, Sweden, pp. 22–23. Stockholm: The Swedish National Agency for Higher Education.

2.3 EU Methods of Applying the Knowledge Triangle

2.3.1 Methods of Creating Relationships within the Knowledge Triangle

The mission of applying the knowledge triangle model in practice was assigned to the European Institute of Innovation and Technology (EIT), it was the first EU initiative to fully integrate all three sides of the knowledge triangle: higher education, research and business. The collaboration of all three sides and the effective sharing of knowledge, information and skills for common usage are carried out by way of so-called Knowledge and Innovation Communities (KICs) where universities, research institutes, businesses and public institutions take a shared responsibility (see Annex 2). The preliminary condition for the knowledge triangle to function is thus through local, regional, national and international cooperation.

A Knowledge and Innovation Community (KIC) is a legal entity consisting of a thematic partnership (20–30 core partners) from all sides of the knowledge triangle and across Europe. A special characteristic of KICs is that, apart from its core partners, it continually incorporates new affiliates, associates or network partners that can engage in its activities, without taking part in the KIC's governance, making it thus operate like a living network. Its goal is to establish innovative webs of excellence across the knowledge triangle and create a platform where ideas, skills and business models from a diverse range of partners can be transformed into innovations that will accelerate growth.

A major challenge when creating the KIC structure, and establishing extensive networks from both the public and private sector, was the geographical and professional differences, as well as the independency, that characterized all of the core partner organizations. In addition to this, the majority of potential partners were also competitors. However, a legal and financial commitment for a period of 7 years, a result-oriented nature of their partnerships and the creation of a range of activities that foster communication and a community sense, convinced members to overcome their reservations about the network.

The first three KICs were built as innovation test beds with the objective to discover good practices on how the knowledge triangle could be implemented. They addressed the most challenging current issues: Climate Change Mitigation and Adaption (Climate-KIC), Sustainable Energy (KIC InnoEnergy) and Future Information and Communication Society (EIT ICT Labs). Each of these KICs has 5 or 6 Co-location Centres (CLCs) structured with respect to their national and regional innovation context.

A co-location centre is a geographical location where all the collaborative activities of the KIC partners are carried out. It aims to bring together people from different organizations, sectors, disciplines and countries, with different roles in the innovation chain, and foster knowledge transfer in the most effective way. The partnerships established within the Co-location Centers of Climate-KIC and KIC InnoEnergy are extended to a national level, whereas those founded in the Co-location Centres of EIT ICT Labs are limited to their regions of origin, and thus called geographical "nodes".

2.3.2 Methods of Managing the Relationships within the Knowledge Triangle

All three KICs have adopted an entrepreneurial corporate culture, meaning that each has its own CEO and Executive Board that coordinate the KIC strategy and business plan, and each aims to develop a portfolio of assets with market value. The KIC InnoEnergy runs as a commercial company under Dutch law, while Climate-KIC and EIT ICT Labs have adopted the model of limited liability non-profit associations under Dutch and Belgian legal form.

Another method of KICs that solved the issue of governing a community-driven form of collaboration was the adoption of a matrix management system. This new structure is very advantageous for a multi-stakeholder administration as it enables sharing information from KIC Education, Entrepreneurship and Innovation agendas in a top-down approach and the distribution of project initiatives from Co-location Centres in a bottom-up approach. The new approach led to open and user-driven innovation.

The funding model of the KICs distinguishes itself through an entrepreneurial spirit as well. This implies that EIT provides a seed investment

of up to 25% of the total KIC budget and the remaining 75% of funds must be drawn from private sources, other EU instruments or from its own activities. Between 2010 and 2012, 78.5% of the KICs' total budgets were from outside sources, and in approximately 15 years from now, KICs are expected to become self-sustainable.

All investments are channelled to achieve positive impact on European society and economy and thus partners that want to benefit from the funds, are eligible only if their activities are relevant and add value to the European innovation agenda. Even if the funding model demands a certain degree of costs and resources from the companies committed to the KIC, during the first two years of EIT's existence, the private sector has shown engagement and a positive attitude towards participating in the KIC. The investments entailed several advantages for industrial partners such as: access to new technologies, a network of talent and expertise in research, ready-made market analysis, and creative ideas from SMEs and entrepreneurs.

2.3.3 Methods of Integrating Education in the Knowledge Triangle

KICs integrate innovation, education and business development by also offering education programs focusing on innovation and entrepreneurship. These are developed in partnership with European Business Schools, capitalizing on their expertise in forming the programs; courses are also designed by universities, researchers and industry.

PhD students are allowed to initiate and realize projects within the KIC's network structure, which helps them connect with potential future employers or future business partners. In this way they are given access to meeting places of both business and academia. The University of Krakow is a perfect example of this initiative. The university built closer ties with local industries and is now considered a full partner of the KIC networks.[18]

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[18] Allinson, R., Izsak, K., & Griniece, E. (2012). Catalyzing Innovation in the Knowledge Triangle. *Technopolis Group*, p. 16. Retrieved 2nd July 2013, from http://eit.europa.eu/fileadmin/Content/Downloads/PDF/Key_documents/EIT_publication_Final.pdf

There are universities which also offer Master's programs in cooperation with KICs. The Royal Institute of Technology in Stockholm is one of these universities which offers a Master's program within the EIT ICT Labs.[19]

EIT ICT Labs Master School was set up as a joint venture between KIC universities and business schools. During 2012 about 200 students were admitted into the program and almost 20 universities around Europe are attached to it. The EIT ICT Labs Master School differs from other Master's programs through the scale of the partnership; it is one of the largest European ventures in higher education. The EIT ICT Labs Master School is a two year program in which students can choose two universities in two different European countries and build a curriculum of their choice based on their skills and interest. The degree combines technical competence with a set of skills in innovation and entrepreneurship. The standardized minor of Innovation and Entrepreneurship was devised in cooperation with the connected schools and is linked to the CLC businesses. Students will cross borders, receive education from different institutions and gain links to industry. The program guarantees internships with industrial partners and plans to expand these internships to other companies within the EIT network.

In addition to this, KICs assist young professionals even after they have graduated by building alumni networks to keep in touch with not just each other, but also with the broader KIC community. Through all these measures, KICs are thus changing the higher education landscape in Europe by utilizing the knowledge of actors that would normally not be accessible to students.

[19] Royal Institute of Technology, Sweden (n.d.). *EIT Master's Programmes in Energy and ICT*. Retrieved 2nd July 2013 from http://www.kth.se/en/studies/programmes/eit

2.3.4 Methods of Integrating Research into the Knowledge Triangle

Bridging the gap between research and production has proven to be one of the most vital aspects of KICs. Although Europe has a leading position when it comes to knowledge and creating technology, it lacked the capacity to turn it into new products. The high level of industry participation in the KIC community helps to solve this problem. As innovation is not a linear process, but one with many feedback loops, KICs act as an important vehicle to chain together research with the transfer of knowledge and to the commercialization of the research through partner companies. A part of the KICs' business support also includes presenting their ideas to research partners, bridging the gap between research and innovation.

Research is linked to businesses by the KICs' innovation projects; EIT ICT Labs intends to create world-class ICT businesses by industrializing research results at a faster rate while Climate-KIC offers a framework for identifying potential markets for climate innovative research.

In a more general perspective, KICs serve as demonstrators as they deliver proofs of concept to investors and make research institutes think in terms of real market-based products. In addition to that, EIT funding makes it easier to promote innovation among investors.

2.3.5 Methods of Integrating Business into the Knowledge Triangle

KIC activities also aim at business development and entrepreneurship. All KICs have a range of supportive functions for entrepreneurs to start their businesses and translate their ideas into reality. These focus on areas like technology, human resources and market assessment. The KICs are also able to provide pan-European support by finding potential partners for businesses and research institutions in other regions. KICs also bring together competitors in an environment where they can collaborate and trigger innovation.

KICs are running projects that aim both at research and finding ways to market it as successful products. Ideally, each KIC will deliver 20–25 projects annually by 2014. Projects are required to develop clear products that aim at addressing specific opportunities found through market studies. By

analyzing the market, KIC partners find promising new technologies or redesign their projects to be more practical. KIC projects are directly linked to business development, and by integrating these projects into local regions, it can help new companies to find customers more easily.

2.4 Methods of Implementing the Knowledge Triangle in the Nordic Countries

According to a study conducted by the Technopolis Group in 2011, activities of connecting all three parts of the knowledge triangle have been carried out in the Nordic countries, particularly in Sweden, Denmark and Norway. However, only in Sweden is the knowledge triangle term actually used in documents and national policies when it describes the strategies that target the interaction between education, research and innovation.

The activities (see Annex 3) that are thought to be in line with the concept of the knowledge triangle include a variety of methods such as: developing entrepreneurship national and local programs and funds, creating new organizational arrangements (in the form of centres, clubs, offices, councils or SHOKs in Finland) as the place of interaction between representatives of the knowledge triangle, creating online platforms, reorganizing or reforming the educational program of universities and establishing business incubators.

2.4.1 Denmark

In Denmark, the Ministry of Education, Ministry of Science, Ministry of Culture and the Ministry of Finance and Economy have together developed a national strategy that involves an active investment in entrepreneurship throughout the entire Danish education system, as a means of turning knowledge and ideas into practice in collaboration with research and the private sector. As a direct result of this, in 2010 the Danish government established a Fund for Entrepreneurship – Young Enterprise in 2010 – which supported training for teachers, students and pupils.

An increasing number of universities in Denmark adopted organizational reforms that aim to reach the effects of the knowledge triangle framework, even though they do not use the term per se.

The agenda of the Danish Technical University (DTU) for the period 2008–2013 encourages an active and close collaboration between technical and natural sciences, researchers and students, and between the university and the surrounding community. The techniques used to link the university to industry take the form of business consulting, internships or project-based assignments for students within the business sector. There are also options for co-funded PhDs and Enterprise PhDs (ErhvervsPhD), a scheme administered by the Ministry of Science.

Aarhus University (AU) has gone through major organizational changes. The university has reduced the number of independent faculties by creating multidisciplinary and collaborative faculties: Arts, Science and Technology, Health and Business and Social Sciences. The four core activities that the university focuses on are research, training, knowledge exchange and education. These measures have had a major impact on the emergence of interdisciplinary subjects that produce easy collaborations between scientists, students and company representatives. Moreover, the university has an Interdisciplinary Centre for Entrepreneurship and Innovation (ICEI), which assists the university in all areas and fulfils the role of a centre of excellence for Entrepreneurship Education. The centre stimulates the university's contact with the community and private companies, government agencies and organizations.

Following the model of Aarhus University, the University of Copenhagen defined twelve interdisciplinary research themes and engaged its students in different entrepreneurial activities. In addition to this, the University of Copenhagen Entrepreneurship Clubs, which was established out of students' initiative, functions as an interdisciplinary centre that enables students to be part of projects in cooperation with the industry, and provides graduate students with a mentoring program for their career choices. The University of Copenhagen has also become involved in several scientific networks. These methods contributed to strengthening the collaboration between universities, government institutions and private companies.

The IT University of Copenhagen (ITU) runs a number of activities which encourage cooperation between students, researchers and busi-

nesses. With the help of an electronic platform, ITmatchmaking, students can meet a large number of potential employees, search for internships, project collaborations and trainee positions. The efforts are directed towards designing the university's education programs and research in close contact with the industry. The methods used range from organizing internships, workshops, seminars, guest lectures and funding research activities. The University of Southern Denmark (SDU) has a special manner of cooperation with the private sector. In order to enhance the exchange of knowledge, the faculties of the University of Southern Denmark work together with various external partners and businesses in different special centres. These centres promote specific initiatives and activities to strengthen the interaction and knowledge exchange between education, research and industry. For example, students and researchers benefit from training on commercialization, patenting, partnerships and business collaborations. There is also a centre of excellence for teaching entrepreneurship, called IDEA Entrepreneurship Centre, which provides the necessary tools, knowledge and networks for students, educators, businesses and alumni. These range from courses, trainings, seminars, networking activities and coaching for new entrepreneurial ideas and business.

2.4.2 Norway

Norway has also implemented a national agenda that focuses on an entrepreneurial approach that supports the cooperation between universities with industry, and the commercialization and implementation of research results. Joint activities in Norway between education and industry on the one hand, and research and industry on the other, can serve as a good example of methods to implement the knowledge triangle.

A Council, which consists of university, college, business or NGO representatives, has to be established in every university and college in order to increase the number of collaborations between universities, colleges and the business community. The government has determined that universities need to pursue their social task and has introduced industrial relevance as a criterion in the institutional quality assurance system of education. In addition to that, companies that operate research activities have a different tax deduction system.

There are also 21 research-driven innovation centres in Norway that stimulate innovation through close cooperation between the business community and research. These centres are co-financed by research-intensive companies, the research institutions and the Research Council of Norway. The system of these centres has been well received by industry and the participating research partners.

In 2008 the government launched a program for Enterprise-PhDs designed to promote industry based long-term research, requiring the same high scientific quality as in other graduate programs. Doctoral students had to be employees at a company and work on issues of strategic importance for business development. The program provides opportunities for specialization and depth on relevant issues to the individual companies, and is expected to help boost industrial research skills, create arenas for collaboration between industry and universities, and encourage industry to increase research investment.

Young Entrepreneurship is another organization which, in interaction with the National Agency for Education and the industry working with entrepreneurship in education, offers programs for the whole education system, from primary to higher education in collaboration with industry. The purpose of the organization is to strengthen collaboration between industry, businesses and schools to inspire future research and development.

The Norwegian University of Science and Technology is the host of four centres of research-driven innovation. These centres have the role to consolidate the relationships between the Norwegian research environments and the business area, by supporting long-term research that promotes innovation with benefits for business competitiveness. The university benefits from a Technology Transfer Office which assists with policy, rights and commercial activities and has a portal that helps its students to stay in contact with the industry through projects or papers, a method that emphasizes the interaction between education, research and business.

In 2010, the University of Oslo, adopted a new strategy called Strategi2020 that goes hand in hand with the knowledge triangle's purpose. The goal is to turn the university into a leading international university where research, education and innovation must be in close interaction. As part of achieving this objective, the University of Oslo is bound to find solutions for commercializing its research input and promote an entrepreneurship

education model among researchers and students. The concept of innovation is regarded through knowledge sharing and development of relationships between the university and businesses, agencies and organizations.

2.4.3 Finland

The activities and strategies of the Development Centre for Technology and Innovation, Tekes, and the Academy of Finland are oriented towards supporting innovation and research and its immediate utilization, while the Research and Innovation Council of Finland focuses on all the three parts of the knowledge triangle. However, there is no mention of the concept of the knowledge triangle; instead the Council speaks about ERI (Education, Research, and Innovation).

Financed by Tekes, the Academy of Finland and by the businesses, a new form of cross-sectoral centre, called SHOK (Strategic Centres for Science, Technology and Innovation) has been established. They function as platforms for networks between researchers, doctoral students and industrial representatives. Within these centres, long-term (up to ten years) projects are carried out with the goal to achieve scientific breakthroughs and innovations that can address major societal challenges.

An example of a university that offers several interdisciplinary courses, training courses and research, and attaches great importance to cooperation with the surrounding community is Aalto University. This is a new university that emerged as a result of the union of three Finnish universities: Helsinki School of Economics, the University of Art and Design, and the Helsinki University of Technology. The opportunity to conduct interdisciplinary research within the university leads to an increasing interaction between experts from different fields which is expected to extend in larger programs that deal with societal needs. Moreover, the university has set up cross-disciplinary environments for learning, teaching and research called Factories. These centres facilitate research groups and students to work together with companies or public bodies. Another method employed by Aalto University of strengthening the interaction between research, education and innovation, specific to the knowledge triangle concept, consists in the foundation of the Aalto Center for Entre-

preneurship, which offers innovation, commercialization and start-up services for researchers, students and other stakeholders.

Tampere University of Technology is in close collaboration with the business community, which is viewed as a preferred partner in industrial research and development projects. The university has initiated close ties with Nokia Research Center and in 2007 it established the Nokia Innovation Center together with the University of Tampere and Nokia. The Center provides facilities for joint projects, meetings and discussions, and a place to organize public lectures for both universities and Nokia's partners.

In addition to this centre, Nokia together with the Technical Centre Hermia and other businesses and universities in Tampere developed Demola, an open innovation environment in which students can implement development projects within the framework of their course of their studies, starting from ideas and needs of companies, project partners, organizations or international Demola Network partners.

On 1st January 2010, the universities of Joensuu and Kuopio followed the model of Aalto University and merged together into the University of Eastern Finland. The new university set up its goal towards offering interdisciplinary courses and education beyond the boundaries of the university through close cooperation between research and teaching within the community. For this purpose, the University of Eastern Finland is part of the Kastalia network. This network includes 15 institutions conducting teacher training across a broad spectrum of disciplines and its purpose is to develop professional "teacher-education students" profiles and to find ways for cooperation in different fields and academic activities. The University of Helsinki is another example of connecting education to research. Here all researchers are expected to participate in teaching and all teachers are expected to participate in research. An example is the multidisciplinary Center for Research on Activity, Development and Learning (CRADLE), where research on learning and entrepreneurship is central. Another example of cross-border activities are identified at the Network for Higher Education and Innovation Research (HEINE). The network aims to strengthen research and education in the natural sciences, technology and innovation, and the economy, and to produce scientific knowledge that is relevant to educational policy making and that contributes to the development of higher education.

2.4.4 Iceland

In Iceland, there has been a strong focus on linking research to innovation, and some universities make efforts to strengthen the role of education in society through a close cooperation of students with researchers and companies.

At the University of Iceland and the University of Reykjavik, there are well-developed structures for knowledge transfer between research and industry, such as business incubators. Students are involved in innovation activities and encouraged to start businesses.

Aimed at the implementation of entrepreneurial activities, a special fund established by the Ministry of Education, Science and Culture allows students to engage in research and development projects during the summer semester. Reykjavik City Council also contributes to the fund. Once submitted project applications are evaluated the most interesting are supported. In this way, students bring into effect their ideas in development projects under teacher supervision while they come in contact with the company.

The Icelandic Centre for Research or Rannis engaged in research and innovation activities concerning the better utilization of scientific knowledge and internationalization. A strategic programme has been set out, the Strategic Research Programme for Centres of Excellence and Research Clusters, which reinforces science and technologic research between different parties nationally, as well as internationally.

2.4.5 Sweden

Due to the high priority that the integration of the knowledge triangle had in the strategy adopted by the Swedish EU Presidency in 2009, the concept has gained momentum throughout Sweden and it has often been referred to among the activities of universities, research and in innovation polices.

After the completion of its Presidency period, the Swedish government asked a dozen universities to report the activities that had as an objective the interplay between the three poles of the knowledge triangle. An interdepartmental working group was also assigned to address the knowledge triangle issues in the research and innovation bill for 2012, and the Agency for Innovation Systems, Vinnova, was commissioned to oversee, consult

and identify the methods that have been efficient in Sweden or those that must be improved in order to strengthen the continuous interaction between education, research and innovation. The Key Actors Programme coordinated by Vinnova, can be seen as a knowledge triangle initiative as it focuses on increasing the competence level of key players in the Swedish innovation system.

Umeå University has restructured its management in the spirit of the knowledge triangle. There are three vice presidents in charge of the management of research, education and collaboration, and innovation sector so that faculties and departments will be more connected to each other and can collaborate more easily with internal and external stakeholders.

Another example of an organizational solution to adopt the knowledge triangle was applied at Örebro University, where each of the university's seven schools benefit from an Innovation Council. These councils contribute a lot to enlarging the university's network of contacts from public and private areas. Through the council members' joint expertise and input, they help identify present and future challenges that businesses and society are coping with, and assist the university to better respond to them.

Chalmers University of Technology has also come up with a unique organization model that allows interaction between researchers, teachers, students, entrepreneurs and the community. They created eight structures called "Arenas of Advance" in order to enable cooperation between the three poles of the knowledge triangle. The arenas have a scientific profile and aim to address the needs of society and contribute to a sustainable future. For this reason, five of the Arenas of Advance received financial government support.

The University College West adopted a work-integrated learning profile as they have close and ongoing contact with over 500 workplaces during the whole educational programme and very often they alternate courses with paid work in the area they train for.

At Jönköping University, entrepreneurship courses are integrated into most educational programs and a lot of entrepreneurship activities are sponsored by over 800 companies. Moreover, the university financially supports the Business Lab, a place where students and staff have access to a variety of resources to start and grow businesses. The Business Lab

started with around 100 firms in 2010, out of which about 85 were started by students at the university.

The Royal Institute of Technology in Stockholm is involved in the European Institute of Innovation and Technology activity to make Europe a global leader in innovations and support sustainable energy. The Royal Institute of Technology has thus become a core partner in two Knowledge and Innovation Communities: EIT InnoEnergy and EIT ICT Labs. The university searches for models and good practices from other leading technical universities in Europe so that it can consolidate itself as an entrepreneurial university and great effort is directed towards creating an industrial faculty that will actively work with researchers and companies.

Mid Sweden University has developed a flexible education program that is based on collaboration with industry and organizations so that it can include elements of creativity and entrepreneurship. SkarpÅre is one of the course packages initiated by regional stakeholders to educate and train individuals to manage innovation processes. Students develop their own ideas or contribute with ideas on behalf of external businesses in the fields of tourism, sports and outdoor products.

Researchers at Mid Sweden University work on joint projects with industry and the public sector. With this in view, the university has built up centres where researchers actively collaborate with external actors. The Centre for Political Communication Research and the European Tourism Research Institute (ETOUR) are two examples of these centres which function as a large research unit that supports the commercialization of research results.

Another promoter that encourages the partnership between academic researchers and the business sector is represented by a research fund for universities called the Knowledge Foundation. This non-governmental foundation finances research at Sweden's sixteen new universities and higher education institutions for the purpose of strengthening Sweden's competitiveness and ability to create value, as universities play a significant role in knowledge creation and research.

2.5 Methods in the USA

2.5.1 Regional Innovation Clusters in the United States

In the United States of America, similarities with the knowledge triangle model are reflected in the Council on Competitiveness' strategy of developing and implementing a framework of regional innovation clusters as innovation-based economic growth drivers, which later turned into the initiative to create regional innovation hot spots to enable cooperation and knowledge transfer, as the Council's flagship National Innovation Initiative in 2005 shows.

This objective called for establishing forms of effective regional leadership that would be in charge of operating the mechanisms which link each region's individual assets such as people, institutions, capital and infrastructure, and solve the competing interests among cities, counties and towns. Partnering with the Economic Development Administration (EDA) of the U.S. Department of Commerce, the Council engaged in creating a new public-private partnership and focused on helping "regions acting like regions" which means that "action must be strategic, focused on the long range use of assets to enhance global competitiveness."[20]

In the Council's view, the regions and an effective regional leadership must focus on strategic projects and seek existing regional organizations which are able to facilitate meetings, develop agendas, etc., and eventually "serve as systems integrators and enablers of collaboration."[21] Examples of successful leadership for regional collaborations has showcased that while the leadership body is usually a coalition, there is always an organization that regulates activities and provides convergence at the regional level.

Economic regions and political jurisdictions are not contained in the same boundaries in the United States. However this aspect has been seen as an advantage as a lack of strict boundaries allows a region the flexibility

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[20] The Council on Competitiveness. (2010). *Collaborate. Leading Regional Innovation Clusters*, p. 8. Retrieved 2nd July 2013, from
http://www.compete.org/images/uploads/File/PDF%20Files/Final_Collaborate.pdf

[21] Ibid., p. 6.

to create partnerships based not just on proximity, but also on opportunity. Moreover, the regions can pursue strategies that adapt to changing circumstances and respond to market demands. The only condition for regional collaboration to function efficiently is to align its actions to the three C's: Conversation, Connection and Capacity.

The regional conversation aims to intensify regional awareness and may take the form of annual town meetings, citizen forums, regional reports, articles and studies about the region published in local media, etc. The regional connection refers to the interaction between regions or actors coming from different disciplines which also take the form of networks. According to the Council on Competitiveness, these interrelationships are better facilitated and coordinated by economic development intermediary organizations or private and public partnerships that have been proven to build bridges between industry, academia and the public sector. The regional capacity underlines the need of taking advantage of any existing regional resources that may contribute to increasing the economic competitiveness of the region, such as companies leveraging universities' networks or sources of capital.

2.5.2 Community Colleges and Industry-Based Curricula

In the United States, community colleges are a form of higher education which spans for up to two years. After graduation, students can either continue their post-secondary education at a traditional four-year institution or enter the local labour market.

Community colleges are considered to play a major role in filling the gap between education and innovation because of their partnership efforts with employers to align college curricula with workforce needs.

Many community colleges have pursued the idea of developing their curricula in agreement with employers' skill demands. The methods vary from contracting with employers to including employers as one of many partners and cooperating with industry groups to prepare workforce tailored training to their students, receive general guidance on workforce issues, acquire equipment and create internship opportunities for its students. The outcomes of college collaboration with businesses often take the shape of apprenticeship programs or certification programs which

address the companies' specific competence needs. Through these programs, the curriculum becomes highly integrated with industry content, more uniform and standardized, and students improve skills relevant to the workplace realities, making expectations coherent for both students and employers.

McDonald's "English Under the Arches" program is one example of a partnership between community colleges and businesses. Developed with the help of an advisory panel of "national adult English as a second language"-experts, McDonald's managed to integrate into the College of Lake County in Illinois curriculum "specific workplace knowledge, terms, forms, and skills necessary to become a successful manager at a McDonald's franchise."[22] The modules were taught by Internet and telephone by community college instructors recruited by McDonald's. The program immediately gained recognition by some state institutions which considered it as "an innovative national model of immigrant integration and of corporate support for English literacy development."[23]

The "Essential Skills Program" at the Community College of Denver, in Colorado, is another example of creating an educational module specially designed to address the changing local labour market needs in various industries. It lasts up to four months during which time students combine internship experience with classes and thus receive both college credit and work experience. The program teaches basic skills in IT, financial services, accounting, community health, early childhood education and, after its completion, students are offered an Essential Skills Certificate which is acknowledged by local businesses. According to a report from the Breaking Through initiative at the Community College of Denver, the program contributed to increasing the employment rate up to 86% for those who completed the program.

However, a partnership at a much larger scale, between a number of community colleges and employers, has been established with the help of

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[22] U.S. Department of Education, Office of Vocational and Adult Education. (2001). *Integrating Industry-Driven Competencies in Education and Training Through Employer Engagement*, p. 5. Retrieved 2nd July 2013, from http://www2.ed.gov/about/offices/list/ovae/pi/cclo/brief-4-employer-engagement.pdf

[23] Ibid., p. 6.

the National Science Foundation, in order to create a standardized curriculum that incorporates industry skills and competences. Initially set up as a partnership between the Kentucky Community and Technical College System and Toyota to modify technical education in line with workforce requirements, the Automotive Manufacturing Technical Education Collaborative (AMTEC) now consists of 30 community colleges and 34 businesses, including Toyota, Ford, General Motors, BMW, and it operates in 12 states. The curriculum designed by AMTEC is comprised of 12 courses and 62 modules that can be changed and adapted to local training needs.

The whole consortium is summoned twice a year to plan further partnerships, establish career pathways and future industry skill needs, helping thus to "bridge important language and cultural gaps between education and industry."[24]

The benefits are numerous for all the three actors involved: students, community colleges and businesses. While students get a customized training connected to the workforce requirements and community colleges build an industry-recognized curriculum, companies ensure future highly trained workers and interact with other businesses.

Funded by the Joyce Foundation "Shifting Gears", the Regional Industry Skills Education (RISE) is a regional partnership between the Wisconsin Department of Workforce Development and the Wisconsin Technical College System, aimed to provide training opportunities for low-skill adults and support the creation of career pathways in Wisconsin. Through RISE, colleges in Wisconsin have a direct collaboration with employers who are working in the advisory committees for occupational and technical degree programs at each of the state's 16 technical colleges.

In other words, the RISE initiative engages the state's businesses in the process of policy innovation in designing a new career pathways model and bridge programs at its technical community colleges. As a consequence, adult learners will find it easier to transition to post-secondary education programs and meet labour market needs.

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[24] Ibid., p. 8.

Even though many partnerships have been formed to bridge the gap between education and industry, researchers claimed that more information on how to build innovative partnerships should be promoted, a more open communication between employers and colleges should be practiced and a more central shared knowledge base should be constructed to facilitate access to solutions found by others who faced similar implementation challenges.[25]

2.6 Methods in Canada

In Canada, there are a number of national innovation policies and provincial and regional programs that encourage the emergence of university-industry linkages and knowledge transfer. The Canadian government's Science and Technology Strategy, *Mobilizing Science and Technology to Canada's Advantage*, is focused on an agenda that promotes a more competitive and sustainable Canadian economy with the help of science and technology. One of the core principles of The Strategy and its policy commitments is to focus on developing new partnerships or leveraging existing collaborations between business, academic, and public sectors because "Through partnerships, the unique capabilities, interests, and resources of various and varied stakeholders can be brought together to deliver better outcomes."[26]

Therefore, the federal government has set the goal to pursue public-private research and commercialization partnerships in order to promote the development of the country's entrepreneurial advantage.

The means to accomplish this is to strengthen federally funded programs such as the Networks of Centers of Excellence (NCE) Program, which connects university and industry researchers, and to create new business-oriented research NCE networks, called Business-Led Networks of Centers of Excellence. As of 2007, these centres have spun off 117 com-

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[25] Ibid., p. 10.

[26] Canada's New Government. (2007). *Mobilizing Science and Technology to Canada's Advantage*, p. 11. Ottawa: Publishing and Depository Services.

panies and helped the development of more than 6,000 qualified professionals, including researchers, post-doctoral fellows, graduate students, and technicians.[27]

Moreover, efforts are focused towards facilitating the transfer and commercialization of technology from Canadian universities to the private sector. A financial contribution of $350 million supports the operational expenses of eight Canadian research and commercialization centres capable of global leadership in areas of national strategic importance, most of them affiliated or under the governance of universities, and finance other centres that promote initiatives of research collaborations between researchers in the public and private sectors. The federal government also prompts the cooperation between community colleges and local firms with the goal to emulate the regional innovation systems by providing $48 million over five years.

All the councils of the networks, centres and college initiatives are supported and supervised by a tri-council private-sector advisory board established by the federal government. Comprising an examination and a comparison on how the university-industry knowledge transfer takes place in Canada and in other countries, a research report issued within the Program on Globalization and Regional Innovation Systems at Munk School of Global Affairs, also underlines the role of intermediaries, or innovation support organizations, in enabling the transfer of knowledge, diffusion of know-how, bridge information gaps between universities and firms, provide structures and dynamics, or, at a local level, establish networks, offer resources and consequently help improve private sector innovation.[28] These intermediaries may be identified in the embodiment of Technology and Innovation Centers, Centers of Excellence, Competence Centers, Innovation and Commercialization Centers, Business Incubators, Accelerators or venture capital firms.

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[27] Ibid., p. 56.

[28] Bramwell, A., Hepburn, N., & Wolfe, D. (2012). *Growing Innovation Ecosystems: University-Industry Knowledge Transfer and Regional Economic Development in Canada,* p. 30. Retrieved 2nd July 2013, from http://www.utoronto.ca/progris/presentations/pdfdoc/2012/Growing%20Innovation%20Ecosystems15MY12.pdf

According to the Hauser Report,[29] the Technology and Innovation Centers make an important impact on achieving the objectives of governmental and public national and regional innovation programs, policies and strategies on bridging the gap between academic research and commercial exploitation.

Although the federal government launched Business-Led Networks of Centers of Excellence (BL-NCEs) and the Centers of Excellence for Commercialization Research (CECRs) which have similar functions as Technology and Innovation Centers, Canada lacks an appropriate level of research infrastructure support. According to the Canada Foundation for Innovation, the country needs to found Canadian physical innovation hubs that will gather "researchers and business leaders, entrepreneurs and intellectual property experts, and technicians and students."[30] Universities, academic researchers and students alike can reap numerous benefits out of the creation of this type of innovation centre: "companies have access to the talent and specialized equipment that is often beyond their reach" and "researchers and graduate students are exposed to the entrepreneurial culture of business."[31]

Patry and Moorman also argues that the "technology push model" employed by the Centers in Canada must be shifted to "demand pull models",[32] where the focus is on covering the knowledge needs of industry and society and not just on research institutions. In addition to this, similarly to the SHOK model in Finland, research projects' agenda should be initiated by business personnel in collaboration with researchers, and not just by university-based academics.

Another weakness of Canada's established Centers which damages its effectiveness to foster innovation is attributed to the focus on producing

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[29] Hauser, H. (2010). *The Current and Future Role of Technology and Innovation Centers in the UK.* London: Department of Business Innovation and Skills.

[30] Patry, G., & Moorman, D. (2012). Technology and Innovation Centres: The Key to Improving Collaboration? *Policy Options,* p. 66. Retrieved July 2013, from http://www.irpp.org/assets/po/the-liberal-renewal/patry.pdf

[31] Ibid., p. 68.

[32] Ibid., p. 68.

sector-wide benefits, instead of directing its efforts towards addressing knowledge needs of individual companies.

When looking at the most successful model for a national network of Technology and Innovation Centers according to the Houser Report, namely the German model of Fraunhofer Institutes, Patry and Moorman suggest that Canada can also follow the example of committing to use research for economic interests and with a customer service orientation in mind.

2.7 Methods in Australia

Australia's national strategy *Powering Ideas – An Innovation Agenda for the 21st Century* is a ten-year reform agenda to make the country more productive and more competitive by strengthening the national innovation system.

To achieve this goal, the Australian Government has adopted seven National Innovation Priorities, part of which underline the need to stimulate a "culture of collaboration" between researchers and industry, and within the research field to enable knowledge flow and value creation. This objective urges a series of actions "to double the level of collaboration between Australian businesses, universities, and publicly-funded research agencies over the next decade."[33] In addition, the 2020 vision highlights the collaboration between researchers, businesses and governments to foster value from commercial innovation and to address national and global challenges.

The Australian Government addresses the problem of a fragmented innovation system by encouraging collaboration and improving relationships between researchers and industry by just "persuading people to talk to each other"[34] and by setting up formal partnerships, resource-pooling arrangements, exchanges of personnel, etc.

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[33] Commonwealth of Australia. (2009). *Powering Ideas: an Innovation Agenda for the Twenty-First Century*, p. 8. Canberra: Department of Innovation, Industry, Science and Research.
[34] Ibid., p. 60.

An instrument to enhance the links between researchers and industry is to leverage the Cooperative Research Centers Program which, since 1990, has worked to promote public-private research partnerships. Furthermore, funding of the program has been directed to the humanities, arts and social sciences. The mission of the program for the coming years also focuses to engage more small and medium-sized companies. However, in order to maximize the full potential of smaller firms, the government has developed another initiative called Enterprise Connect. This new action supports and provides assistance to small and medium-sized businesses, encourages small companies to add value through collaboration with larger firms and public research institutions and tap into a national network of centres. In the long run, Enterprise Connect will also spur the development of regional innovation clusters and networks.

Efforts were also made to support the capacity of public research institutions, promote the research results and make them widely accessible. In order to maximize the number of research groups, the Australian Government invested in research infrastructure and increased university research funding, by providing competitive project grants, research awards and fellowships and through an Education Investment Fund for research and teaching infrastructure.

The Joint Research Engagement Scheme promotes research collaboration between universities, industry and end-users. Funding under this scheme is allocated on the basis of demonstrated research excellence and demonstrated ability to attract funding from other sources. Moreover, the Collaborative Research Networks Scheme supports smaller, regional, and less research-intensive universities to work together with other institutions to increase their research capacity and arrange themselves into hubs and spokes for better cooperation.

2.8 Methods in Asia

The partnership between universities and industry in the fields of science and technology in Asia utilizes many mechanisms. These range from informal exchanges between scientists to formal arrangements which involve long-term relationships between institutions. The formal partner-

ships in Asia refer to the forms of technology[35] (understood as machinery, equipment, know-how and information) transfer within universities, consulting services, knowledge transfer and collaborative projects. The scope and method of establishing working relations between universities and industry vary from country to country.

The developments of U-I (University-Industry) collaboration in many Asian countries have been the result of concentrated public policy efforts responding to globalization and loss of competitiveness. As a result of this, the focus of the collaborations skews heavily towards technology and looking for ways to innovate and gain advantages within newer areas of technological research. The government of Japan, for instance, chose to focus heavily on life sciences as well as nano- and information technologies.

Many of the efforts have focused on the relaxation of regulations and changing laws to allow for greater interaction and movement between universities, industry and institutions for technological and knowledge transfer. Another measure adopted was ensuring funding schemes which bring adequate financial resources to research at universities. While industry, universities and other institutions should be free to develop working relationships, it is generally believed that governmental responsibility lies in establishing laws and practices that would give incentives towards collaborative research activities. A major problem for Asian universities has been the lack of staff trained to handle the complex and multidisciplinary work of U-I collaboration. There is a need to train individuals on how the two communities, academia and industry, work.

2.8.1 Japan

During the late 1990s, the Japanese government started to become interested in establishing a supportive relationship between universities and industries. This was mainly because Japan was losing its competitive advantage over other countries such as the U.S., China and South Korea. Jap-

[35] Nezu, R. (2005). Technology Transfer, Intellectual Property and Effective University-Industry Partnerships, p. 4–5. Japan: Fujitsu Research Institute.

anese companies became interested in utilizing the research opportunities and advanced knowledge developed by universities.

Academia was also falling behind their Western counterparts by not interacting with the industry. Universities were forced to look over polices and methods to adapt them to new realities. Universities being state-owned were perceived as a hindrance and as of 2004 the legal status of Japanese universities changed to independent administration agencies instead of government institutions, allowing them greater leeway to manage their own affairs and partnerships. The universities would make their scientific knowledge available to businesses and commercialize it, as well as use high calibre private sector laboratories that may be useful for their purposes.

The law not only aims at making universities more responsive to the needs of a changing society by giving them more freedom, but it also makes them accountable for creating value for Japanese society. The changed legal status of universities in Japan allowed them to own the research and technology they develop. University spawned ventures are the result of commercialized research, and they increased in Japan after faculties of universities could work outside the campus, which was prohibited when universities were government institutions. Japan has looked at the overall creation of such ventures as a measure of U-I collaboration. As a consequence, between the period of 2002 and 2005, over 1,000 such ventures have been initiated.[36]

2.8.2 China

China has a long history of knowledge transfer from universities to industry though in the beginning it was a side effect of the Communist Party calling upon universities to contribute towards the increase of production.

After the changes of policy that took place during 1980, universities were allowed to make their own decisions based on market situations, and develop their own research. They were given considerable freedom in

[36] Nishio, K. (2005). Japanese University-Industry Partnerships for the Promotion of Innovation and Technology Transfer, p. 10–11, 34. New York: World Intellectual Property Organization.

seeking to build profit-making spin-offs or to collaborate outside of academia. Consultant services, contractual research and enterprise incubation has allowed university faculties to work with the private business sector. Also, a large part of funding for scientific research in Chinese universities is coming from private investors.

Just like Japan, China has a large number of university-spawned ventures. Towards the end of 1990, China relaxed a number of regulations and laws, and desired to create mechanisms for students to be able to work part-time at companies and receive training from professionals. The Chinese government also advocated measures for universities to establish transfer offices that could work with the industry. The offices that emerged were mainly concerned with technology transfer and were modeled after similar ventures in the USA in 2005. China had 70 science parks and incubators at universities, as well as thousands of new enterprises created by universities.

2.8.3 South Korea

In order to narrow the economic gap between itself and other countries like Japan, the Republic of Korea has focused on a closer working relationship between universities and businesses. Several laws have formed the basis of U-I collaboration in Korea, legislations that freed universities to pursue research in commercial areas. Universities in Korea are able to work with businesses for commercial purposes and researchers at universities have the possibility to work in private sector companies. Moreover, the laws have changed the legal status of university professors, allowing them greater flexibility to cooperate with the industry.

During the turn of the 20th century, the Industry University Cooperation Foundation was established. The foundation has an office at every university and it manages legal and cooperative issues between the university and the companies it collaborates with. The emphasis of the foundation just like its counterparts in Japan or China, is mainly on technology and technology transfer between the collaborative parties.

The private sector heavily invests in research and development in South Korea, the result being that universities find it attractive to work with private enterprise as their laboratories receive better funding and

equipment and can maintain a high level of research. Students also prefer universities with close working relationships to industry as it increases the chances for job opportunities after graduation.

2.8.4 Singapore

Singapore discovered the need for innovation and deeper collaborations between universities and industry much earlier than their neighbours. Having only two universities at the turn of the 20th century, both of them had a long history of collaborating with industry.

This culture of interaction developed through many activities such as internships, research collaboration and industry participation in the academic departments. Unlike other Asian countries that changed laws in order to facilitate U-I cooperation, Singapore already had a long history of the two communities working together and many of the problems associated with technology transfer were already solved by using common business laws and practices.

2.8.5 Thailand

While Thailand has become a global production hub through high levels of foreign investment, the country's own private sector has not been active in pushing research. While the Thai government is aware of the benefits of U-I collaboration, according to the 2005 Fujitsu Report,[37] there was no real framework established. However, existing U-I collaboration can be found at an informal level.

Collaboration between a university and a company can start when someone in a private business runs into a technical problem and then seeks help from the university that he/she has graduated from. In other cases, owners or executives of companies were friends with university professors

[37] Nezu, R. (2005). Technology Transfer, Intellectual Property and Effective University-Industry Partnerships, p. 28. Japan: Fujitsu Research Institute.

and invited them as corporate advisers and consultants. In addition to this, many engineers have part-time jobs as teachers at universities.

The Thai government supports efforts like these and guides the two sectors to work together so they can develop new innovation. As the lack of formal mechanisms or offices that act as go-betweens, processes are very difficult to track, so far the collaborations between industry and universities in Thailand are only informal and based on the connections of people within both of the sectors.

2.9 Strategies of Implementing the Knowledge Triangle until 2020

The European Union's ten-year strategy for growth, called *Europe 2020*, represents an economic reform agenda, broken down to seven milestones, or "flagship initiatives" to better coordinate and monitor the progress of its targets:

- Innovation Union.
- Youth on the move.
- A digital agenda for Europe.
- Resource-efficient Europe.
- An industrial policy for the globalization era.
- An agenda for new skills and jobs.
- European platform against poverty.

The European Institute of Innovation and Technology (EIT) plays an important role in achieving the objectives of some of these flagship initiatives, particularly: "Innovation Union", "Youth on the Move", "Resource-efficient Europe" and "An industrial policy for the globalization era" through the knowledge triangle's driving forces of research, education and business. Moreover, the EIT, through its KICs model, meets the requirements of the European Council in order for the Europe 2020 strategy to be operational as an entrepreneurial culture and collaboration across boundaries (at a regional, national and international level) between inno-

vation players. In addition to this, the EU and its member states can leverage the highly integrated long-term partnerships that have already been consolidated within the KICs to carry out their plans until 2020.

The Knowledge and Innovation Communities, through their interdisciplinary and cross-collaborative nature, approaches the societal challenges established in Horizon 2020 in a holistic and complementary way to other initiatives in this area. As a result, the research and innovation funding programme, Horizon 2020, proposed financial contribution to the EIT to the amount of EUR 3.18bn over the period 2014–2020. The goal was to allow the three KICs to grow and to create six more KICs and to set up 40–50 co-location centres across EU by 2018, so that the EIT can become a leading innovation institute in its own right.

The 6 new expected innovation hubs or KICs, which must be created in areas which provide clear innovation potential, have been established on the following themes:

- Added-value manufacturing.
- Food4future – sustainable supply chain from resources to consumers.
- Innovation for healthy living and active ageing.
- Raw materials – sustainable exploration, extraction, processing, recycling and substitution.
- Smart secure societies.
- Urban mobility.[38]

According to the proposal for the EIT "Strategic Innovation Agenda", the EIT will act as an investor, which means that it will monitor, support and assist all the KICs in how they implement the knowledge triangle activities, as well as evaluate its own performance of accomplishing the Horizon 2020 goals.

[38] European Commission. (2001, 30th November). The Strategic Innovation Agenda of the European Institute of Innovation and Technology (EIT): the contribution of the EIT to a more innovative Europe, p. 17. Brussels.

As part of the knowledge triangle, education and training has also been reinforced as key elements in the framework of the new Europe 2020 strategy for smart, sustainable and inclusive growth. Increasing investments, policy measures and reforms in the field of education and training are consequently important in order to address the issues established in four of the Europe 2020 strategy flagships: "Youth on the Move", "Agenda for new skills and jobs initiatives", "Digital Agenda and Innovation Union" and "European Platform against Poverty".

In the period up to 2020, as reported by the European Council in May 2009,[39] the primary goal of European cooperation is to carry out the development of education and training systems in the Member States in the context of a strategic framework. One of the framework objectives, which aims to "enhance innovation and creativity, including entrepreneurship, at all levels of education and training",[40] can be pursued by promoting a well-functioning knowledge triangle of education-research-innovation: "special attention should be paid to the synergies between education, research and innovation".[41]

The creation of partnerships between education, cultural actors, enterprises, research institutions and creative industries will favour innovation and entrepreneurship in all forms of learning, and will make skills and competences relevant to the needs of citizens, the labour market and society at large.

The need to strengthen the knowledge triangle in order to meet the "Europe 2020" targets, is reiterated in another document issued by the Council of European Union in 2011, where it underlines the need of the member states to work in partnership with cross-sectoral stakeholders to achieve innovation and growth: "Promote reinforced cooperation between higher education institutions, research institutes and enterprises with a

[39] Council of the European Union. (2009, 12th May). *Strategic framework for European cooperation in education and training – Europe 2020*. Official Journal of the European Union.
[40] Ibid., p. 4.
[41] Ibid., p. 5.

view to strengthening the knowledge triangle as the basis for a more innovative and creative economy."[42]

The strategy for Sustainable Development approved by the Nordic Council of Ministers in 2008,[43] which sets an overall goal until 2020, aims to address the current societal needs in a sustainable way. Even though some of the actions targeted to sustain the strategy are not precisely named as a knowledge triangle model, it is indicated that it is important that all the three areas must be engaged in pursuing a sustainable development: "Nordic education, research and innovation initiatives shall contribute to knowledge and technology that supports sustainable development."[44]

2.10 Conclusions

While the knowledge triangle is rarely if ever referred to as such outside of Europe, many of the base ideas, such as collaboration between universities and the industry, universities creating spin-off companies, as well as establishing intermediary offices to handle the complex work of the different sectors collaborating can be found around the world.

The knowledge triangle was the focus of the Swedish Presidency of the Council of the European Union in 2009. Out of all the Nordic countries, only Sweden refers to the actual term Knowledge Triangle in national policy documents. However, a series of entrepreneurship initiatives and actions have been identified in many of the Nordic countries, which often involve all three parts of the triangle.

All countries reviewed understood the major role of universities in fostering innovation locally and regionally, and different reforms and mechanisms have been studied or put in practice in order to help higher education strengthen ties between research and innovation.

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[42] Council of the European Union. (2011, 4th March). Role of education and training in the implementation of the "Europe 2020" strategy. *Official Journal of the European Union*, p. 3.
[43] Nordic Council of Ministers. (2009). *Sustainable Development – New Bearings for the Nordic Region*. Copenhagen: Scanprint.
[44] Council of the European Union. (2011, 4th March). Role of education and training in the implementation of the "Europe 2020" strategy. *Official Journal of the European Union*, p. 31.

In the USA and Canada, universities are critical to the success of regional economic innovation systems through their production of knowledge and development of skilled personnel, while in some Asian countries, universities have a societal responsibility, being actively responsible for the development of knowledge economies. For this they need not only to turn research results into globally competitive products, but also to receive input back from research institutions and, most importantly, from businesses and integrate them into university curricula. In the USA, community colleges provide a good example of how academia can integrate their curricula with industry content and align students' competences to workforce realities.

The improvement of curricula is also the focus of the European Institute of Innovation and Technology by targeting strong multi-disciplinary and entrepreneurship skills, mobility of staff between academic and industrial and other societal sectors, and improving on learning and teaching methods.

The implementation of the knowledge triangle agenda is undertaken in a sustainable way in the EU countries. According to the European Council, actions of collaboration across boundaries among innovation players contribute to the realization of the Europe 2020 strategy. This entails that strategic partnerships of businesses, academia and public agencies are crucial for facilitating innovation and solving societal challenges. In addition, the engagement of companies, academic research and higher education in a strategic dialogue and collective effort, can lead to the establishment of new companies, joint ventures, etc., and eventually to shared value creation that influences markets and industries.

The only challenges that need to be addressed are those of leadership and coordination of these strategic partnerships, as the Council on Competitiveness in the USA points out when the regional innovation clusters or hotspots are discussed.

Both in the USA and Canada, theorists and practitioners have advocated the need of having an intermediary organization strategically placed to manage interactions, coordinate activities, establish an agenda and guide the projects of different local or regional stakeholders such as technology and innovation centres, centres of excellence, competence centres, innova-

tion and commercialization centres, business incubators, accelerators or venture capital firms.

In Europe, these organizations take the form of KICs and Co-location Centres and in the Nordic countries there are new organizational arrangements such as centres, clubs, offices, councils or SHOKs in Finland as the place of interaction between representatives of the knowledge triangle.

These intermediaries, created by public bodies as in the EU or by private enterprises as in the USA, are more efficient in organizing a strategic agenda and in bridging the interests of the actors involved provided that they are external, and capable of providing the necessary innovation resources.

The solution applied by the European Institute of Innovation and Technology (EIT) of creating an organizational framework that administrates, supervises and guides the implementation of the KT model at a local, regional and national level, has facilitated activities of networking across the three poles of the knowledge triangle. Thematic communities with their co-location centres as platforms of collaborations and physical meeting places have led to establishing synergies and interconnectivity between the three elements of the KT and to developing entrepreneurial activity, both by encouraging new business creation (supporting the creation of start-ups, spin-offs and small and medium-sized enterprises) and through promoting entrepreneurial education in the KICs.

The legal entity set up for each KIC increased their influence and helped them reinforce the relationships between different partners and to secure stronger levels of collaboration. Moreover, the value of KICs is highly appreciated by stakeholders as it has attracted companies, research institutes and universities with reputations for world-class excellence.

In the Nordic countries many universities focused on re-organizing their structures, creating multi-disciplinary subjects and establishing centres of excellence, online platforms, etc., to involve students in entrepreneurial activities. In addition to this, a top-down approach has been adopted by many of the Nordic governments. Through national and local programs and funds, investments in activities of encouraging collaboration between education, research and innovation were also carried out. The government of Norway, for example, has determined that universities need to align their programme to the market demands, and has intro-

duced industrial relevance as a criterion in the institutional quality assurance system of education.

The Nordic countries' model of creating platforms of collaboration demonstrates that the success of the knowledge triangle implementation depends largely on how much support in terms of regulation, funding, equipment, etc., the authorities provide to enable companies, universities and research institutions to come together and overcome their differences in orientation and competitive interests. However, top-down planning and measures should be complemented with bottom-up initiatives, which means that independent actions from actors involved in the knowledge triangle must be carried out to foster innovation and economic growth. For instance, universities should become more entrepreneurial and autonomous in establishing their educational programs and management, whereas companies should integrate a collaborative framework approach in their business model in order to create networks, strengthen collaborations among a wide diversity of actors and explore innovative ideas from different areas of knowledge. Research institutions, as well, should become open innovation environments to enable stakeholders open access to research and innovation resources in order to commercialize and add value to their research results.

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Annex 1

Countries	Methods Discussed during the 2009 Gothenburg Conference 31st August – 2nd September Swedish Presidency of The European Union	Speakers
Sweden	Integrate education with local industry. Example: The collaboration between Chalmers – Astra Zeneca – Sahlgrenska Hospital. Forge careers in both academia and business. Also match different people and competences. More autonomy for universities, allow students to complete courses at different universities in different countries.	Tobias Krantz, Minister of Higher Education and Research. 31st August, Opening Session.
	Closer contact between teachers who pursue research thereby enriching education and students. A higher mobility for staff and students to create interaction between universities and companies.	Pam Fredman, Chairman of the Association of Swedish Higher Education. 31st August, Opening Session
	Universities must become more autonomous and value-based. Universities will need both public and private funding, while preserving their own agendas.	Sverker Sörlin, Royal Institute of Technology, Sweden. 2nd September, How Universities can Take on Increasing Societal Demands and Remain Powerhouses of Intellectual Freedom.
	Universities have to be more open to the demands of the market. Universities need to find new skills and relevant funding to commercialize its research results.	Thomas Andersson, Vice-Chancellor, Jönköping University 1st September, On the Entrepreneurial University.
	An off-campus incubator that allows entrepreneurs and researchers to connect. Support and provide facilities to researchers to develop their ideas.	Britt Lööw, CEO of Inova. 1st September. Higher Education and Regions.
UK	Universities must recognize their status as special businesses that must adapt to changing situations. Mobility must be enabled between industry and academia. People in various programs need to be able to work with each other. Funding bodies must help smaller companies come in contact with and forge links to universities.	Julia King, Vice-Chancellor of Aston University, UK. 2nd September. Is There a Need for National and European Strategies to Achieve the Knowledge Triangle?

Countries	Methods Discussed during the 2009 Gothenburg Conference 31st August – 2nd September Swedish Presidency of The European Union	Speakers
	New mechanisms must help universities integrate with industry. Universities must also integrate different disciplines, measure economic impact by starting businesses. They must provide skilled and flexible people for the future workforce. Researchers and students must be able to move more freely between academia and industry.	Adrian Smith, Director General of Science and Research. 2nd September. Is There a Need for National and European Strategies to Achieve the Knowledge Triangle?
	Universities must become connected. Capacity for this must be nurtured in both the university and local actors. Central government and private sector must work together. Make more people span the boundaries between industry and university. Develop joint planning and building bridges between actors.	John Goddard, Deputy Vice Chancellor, Newcastle University. 1st September. Higher Education and Regions.
Germany	With more autonomy, the universities will become more flexible. Multidisciplinary cooperation; if different competencies are integrated, the policies of higher-education will change. Regional partnerships as well as better careers and mobility for researchers and technology transfers should be encouraged.	Margret Wintermantel, Präsidentin der Hochshulrektorkonferenz, Bonn. 1st September. Sustainable Competences in a Competitive Europe.
	Good teaching, more time spent with students and better training of graduate students. Students must be trained to form networks.	Günter Stock, President of the Berlin-Brandenburg Academy of Science and Humanities. 1st September, The changing Role of the Universities in the Knowledge Triangle.
	Universities can play an important role in their regions. Make them more visible by helping start-ups. This requires university culture to change. Different actors must be brought together locally to support the university and create joint strategies. In Rhine Westphalia, 16 different growth areas work together creating a cluster of cooperation that aids economic growth.	Silke Sthal-Rolf, Senior Consultant, European and International affairs, cluster agency of the state of North Rhine Westphalia. 1st September. The Role of Universities in Regional Growth.

Countries	Methods Discussed during the 2009 Gothenburg Conference 31st August – 2nd September Swedish Presidency of The European Union	Speakers
Various	Measure universities on the employment rate of their graduates.	Jan Figel, European Commissioner for Education, Training, Culture and Youth 31st August, Opening Session
	Use EIT to promote the crossing of institutions. Establish a ranking system for universities to grade their excellence.	Janez Potocnik, European Commissioner for Science and Research. 31st August, The Significance of the Knowledge Triangle in the Future of Europe.
	Use KICs as a model on how to integrate the Knowledge Triangle.	Martin Schuurmans, Chairman, EIT 31st August, Towards a European Vision of Innovation.
	More autonomy for universities to design academic and administrative structures, select leadership, decide on programs and manage funds. Build a model of partnerships between university and business. Cooperation across borders, student exchanges, joint degrees, networking and more opportunities for students and researchers.	Jean-Marc Rapp, President, European University Association. 31st August, Universities Integrating the European Higher Education Area and the European Research Area.
	Universities must open up and become responsive to the needs of both the labor market and society. People must be equipped with lateral, creative skills that create tomorrow's jobs. Universities must partner with businesses; improve graduate's job opportunities, make universities more flexible and broaden funding. As well as partner with other universities in Europe.	Qdile Quentin, Director General, DG Education and Culture, European Commission. 1st September. The Changing Roles of the Universities in the Knowledge Triangle.
	KICs forge links between academia and business. The University Business Forum – a platform for finding cooperation and partnership. Erasmus financial support for education-business projects.	
	All parts of the triangle must be convinced of their importance of one another. Education and research must be linked. Support to doctoral students must be distributed equally.	Ligia Deca, Chairperson, European Students Union. 2nd September. We Are the Future.

Countries	Methods Discussed during the 2009 Gothenburg Conference 31st August – 2nd September Swedish Presidency of The European Union	Speakers
	Universities need autonomy and more diversity. Universities must specialize based on their strengths instead of going by a single model.	Jose Manuel Silva Rodriguez, Director General, DG Research, European Commission. 2nd September. Is There a Need for National and European Strategies to Achieve the Knowledge Triangle?
Switzerland	Universities are strengthened by having students study different disciplines.	Patrick Aaebischer, President, Ecole Polytechnique Fédérale de Lusanne 1st September, Putting Life Science to Use.
Finland	Reform universities, allowing for greater economic and administrative autonomy. Adopt demand-based innovation; demand must be communicated to academia and research results transferred to the business sector.	Mauri Pekkarinen, Minister of Economic Affairs. 2nd September. Is There a Need for National and European Strategies to Achieve the Knowledge Triangle?
USA	A university's culture matters, programs must be built around big ideas and leading scholars. Gateways must exist between universities and the outside world so that knowledge can flow in and out, enabling platforms for different users of knowledge. Informal groups in the US have been set up to talk about, for instance, new technologies. Adopt an open innovation; establish multiple doorways between universities and the outside world. As well as more participation of universities in various networks. In the US, research areas are attractive because they are well funded and oriented commercially.	Mary Walshok, Vice President, UC San Diego 1st September, On the Entrepreneurial University.
	Students must be trained both in science and technology and in the humanities and art. Example: The subjects must be integrated the same as at West Point Naval Academy. We need engineers who think like artists and artists who think like engineers. Philosophy and art contribute to innovation. Students must have the skills to start and finance businesses. Universities and industry must come together and collaborate. Legislation can help companies commercialize their products.	Deborah L. Wince-Smith, President, Council on Competitiveness. 2 September, The American Challenge.

Countries	Methods Discussed during the 2009 Gothenburg Conference 31st August – 2nd September Swedish Presidency of The European Union	Speakers
China	10% of students in China now go to a second university to get a second campus experience. A greater diversity among universities; faculties must present their uniqueness and differentiate themselves from other universities. Offer scholarships for studying abroad as well as having academic staff receive education abroad. Bring universities, public bodies and industry together.	Tao Zhan, President, Jilin University. 2nd September, The Chinese Strategies.
Spain	Interaction of universities with local and regional companies is necessary, as well as partnerships between universities, research centres and industry.	Marius Rubiralta, Secretary General of Universtities, Ministry of Education. 2 September. Is There a Need for National and European Strategies to Achieve the Knowledge Triangle?

Annex 2

Actions	Methods of Integrating the Knowledge Triangle in the EU
Creating Networks	Create partnerships within legal entities called Knowledge and Innovation Communities. Establish physical locations to enable the operation of partners' activities – Co-location Centres. Knowledge and Innovation Communities connect with regional institutions and businesses on a regular basis. Co-location Centres strengthen the existing networks as well as provide a larger European arena for creating new relationships. CLCs can cross-promote networks and businesses across Europe.
Managing Networks	Adopt an entrepreneurial corporate culture Implement a matrix management system favourable for a multi-stakeholder community
Integrating Education	KICs offer education programs focusing on innovation and entrepreneurship. EIT ICT Labs Master School – a unique Master's program where students have the opportunity to work with top European research facilities and leading business partners. The graduate will receive a double degree: Technical major and Innovation Entrepreneurship minor, after studying in two different European countries. PhD students work with and realize projects within the KICs structure, giving them access to platforms where business and academia meet. KICs built alumni networks for graduated students, keeping them in touch with the KIC community.
Integrating Research	High level industry participation in KICs helps research facilities turn their results into products. KICs can deliver proofs of concept to investors as well as act as demonstrators.
Integrating Business	KICs provide support for entrepreneurs to realize their ideas. KICs provide pan-European support that can connect entrepreneurs and businesses across the European network. Market analysis help KIC partners to redesign their projects to be more practical or to find promising new technologies. New businesses are assisted to find customers both in the local region and in Europe.

Annex 3

Countries	Year	Methods of Implementing the Knowledge Triangle in the Nordic Countries – Technopolis Group Report 2011	Institutions Organisations Universities
Denmark	2010	Investment in entrepreneurial activities throughout the educational system Fund for Entrepreneurship – Young Enterprise	Ministry of Education Ministry of Science Ministry of Culture Ministry of Finance and Economy
		Business consulting, internships and project-based assignments for students within the business sector	Danish Technical University
		Co-funded PhDs and Enterprise PhDs (ErhvervsPhD)	Danish Technical University Ministry of Science
		Multidisciplinary and collaborative faculties: Arts, Science and Technology, Health and Business and Social Sciences Interdisciplinary Centre for Entrepreneurship and Innovation (ICEI)	Aarhus University
		12 interdisciplinary research themes The University of Copenhagen Entrepreneurship Clubs (interdisciplinary centre which enables students to interact with the industry) Involved in scientific networks	University of Copenhagen
		ITmatchmaking (electronic platform for students and companies) Internships, workshops, seminars, guest lectures and funding research activities in collaboration with businesses	IT University of Copenhagen (ITU)
		The faculties work together with various external partners and businesses in different special centres Students and researchers benefit from training on commercialization, patenting, partnerships and business collaborations IDEA Entrepreneurship Centre (courses, trainings, seminars, networking activities and coaching for new entrepreneurial ideas and business)	University of Southern Denmark (SDU)

Countries	Year	Methods of Implementing the Knowledge Triangle in the Nordic Countries – Technopolis Group Report 2011	Institutions Organisations Universities
Norway		National agenda that focused on entrepreneurship Established a council which consists of university, college, business and NGO representatives Companies that conduct research activities fall under a separate tax deduction system	Norwegian Government
		Co-founded and co-financed 21 research-driven innovation centres	Research-intensive companies Research institutions The Research Council of Norway
	2008	Enterprise-PhDs	Norwegian Government
		Entrepreneurship programs for the entire education system	Young Entrepreneurship The National Agency for Education The industry
		Four centres of research-driven innovation Technology Transfer Office	The Norwegian University of Science and Technology
	2010	Strategi 2020 (commercializes its research input and promotes an entrepreneurship education model among researchers and students)	The University of Oslo
Finland		SHOK (Strategic Centres for Science, Technology and Innovation) – encourage collaborations between researchers, doctoral students and industrial representatives.	Tekes The Academy of Finland The business world
		Interdisciplinary research and training courses Cross-disciplinary environments – Factories (centres where students, companies, public bodies and researchers meet) Aalto Center for Entrepreneurship	Aalto University
	2007	The Nokia Innovation Center	Tampere University of Technology The University of Tampere Nokia
		Demola – an open innovation environment for students and businesses	Nokia Technical Centre Hermia Other businesses Other universities in Tampere
	2010	Interdisciplinary courses Kastalia network	University of Eastern Finland

Countries	Year	Methods of Implementing the Knowledge Triangle in the Nordic Countries – Technopolis Group Report 2011	Institutions Organisations Universities
		Multidisciplinary Center for Research on Activity, Development and Learning (CRADLE) The Network for Higher Education and Innovation Research (HEINE)	University of Helsinki
Iceland		Business incubators	University of Iceland University of Reykjavik
		Special fund to develop projects between students, researchers and companies	Ministry of Education, Science and Culture Reykjavik City Council
		The Strategic Research Programme for Centres of Excellence and Research Clusters	The Icelandic Centre for Research
Sweden		Key Actors Programme	Vinnova
		Three vice presidents in charge of education, research and innovation	Umeå University
		Seven innovation councils for each school with internal and external members to develop the university's external relations	Örebro University
		Eight "Arenas of Advance" – scientific centres that promote interaction between the three poles of the Knowledge Triangle	The Chalmers University of Technology
		Connected to 500 work places during the whole educational programme	University College West
		Basic courses in entrepreneurship are integrated in most educational programs Entrepreneurship activities are sponsored by over 800 companies Business Labs	Jönköping University
		Core partner in two Knowledge and Innovation Communities: EIT InnoEnergy and EIT ICT Labs	The Royal Institute of Technology
		Skarp Åre – project in collaboration with regional businesses to allow students to manage innovation processes Centres of research to cooperate with companies and the public sector	Mid Sweden University
		Research funding for Sweden's 16 new universities and higher education institutions	The Knowledge Foundation

3. Overview of the Nordic Networks

3.1 METIS, Andreas Scheibenpflug and Niclas Östlund

3.1.1 Background

Research and innovation are two important factors for creating growth and welfare. Interdisciplinary and international collaborations between academia, society and industry are key success factors for fostering innovation.

The Nordic countries have a long tradition of cross-border collaboration and our social structures are very much alike. However, there are challenges and disparity on the national level concerning valorization of research. Furthermore, in Sweden and Norway research and development within academia represent a larger share of GPD compared to the U.S, which shows the significant economic value of research conducted in, relatively, smaller economies like the Nordic countries (Fagerberg *et al*., 2005).

By accelerating and further improving the process of transferring research results to society, the value of research would increase and also contribute to competitive advantages and prosperity of the Nordic region. A network designed for, and dedicated to, improving conditions for innovative researchers in cross-border collaborations would be of substantial value for Nordic universities as well as for technology transfer organizations.

3.1.2 Project Participants

SLU Holding AB (Inc.) – Swedish University of Agricultural Sciences (SLU)
SLU Holding AB (Inc.) is a wholly owned subsidiary of SLU with own governance which facilitates the transfer of SLU's outstanding research to the private sector for society's use and benefit.

Tech Transfer Unit – University of Copenhagen
KU is one of Europe's leading research institutes with internationally recognized Life Science research. The Tech Transfer Unit at KU has a track record of many successful partnerships with both private and public actors.

NMBU Technology Transfer Office – Norwegian University of Life Sciences (NMBU)
NMBU is a key player in Norway within focus areas such as: biotechnology, environmental technology and engineering. The NMBU TTO's commercial-ization activities are closely linked to university-industry collaborations, student entrepreneurship as well as IPR management.

Campus Kjeller AS (Inc.)
Campus Kjeller AS is a facilitator of commercialization and innovation processes at five major Norwegian Research Institutes as well as from the university colleges in the Kjeller region, including NMBU. Campus Kjeller has an excellent track record of turning research ideas into internationally successful companies.

3.1.3 Long-Term Effects

The long term goal of the METIS network is to contribute to the growth and development of the Nordic region through enhanced collaboration in research valorization and by making business opportunities visible, particularly in the green sectors, and help attracting more investments. METIS also serves as a basis for increased cross-border cooperation between related Forestry, Veterinary and Agricultural universities in all Nordic countries. That is, to continue to build on and develop the established network, both qualitatively and geographically.

All project member share extensive experience and knowledge with regards to technology transfer and academic entrepreneurship. The project participants work with the "knowledge triangle" as an organizational philosophy, which implies that increased knowledge about innovation and entrepreneurship in basic education is an important objective of the METIS network.

3.1.4 Project Aim

The goal is carried out in three steps: first the group members create a sustainable framework for knowledge sharing in order to improve individual, regional processes and organizations, e.g. increasing the deal flow of innovative ideas, validation of commercial potential and finding customers. Secondly, the network identifies and illuminates barriers on different levels that hamper cooperation across the borders. Thirdly, the network members develop new concepts for cross-border collaboration regarding commercialization of innovative ideas based on academic research.

3.1.5 Focus and Delegation of Responsibilities

In order to make the project manageable and focused, topical issues will be are divided into four thematic areas or "work packages" (see activities below). Each participating partner has the responsibility to formulate goals and objectives, plan and organize workshops for one thematic area. The idea is that a small team is more efficient and generates more concrete results. However, key groups (e.g. researchers) are invited and involved locally to share experiences and thus provide valuable input to the planned workshops.

3.1.6 Activities

- Work Package 1 – "Deal Flow".
- Work Package 2 – "From market valuation to commercial exit".
- Work Package 3 – "Private and public funding".
- Work Package 4 – "Cross-border collaboration and joint innovation projects".

3.1.7 Participation of Stakeholders

METIS' primary stakeholders are researchers at each university in general and especially those involved in cross-border collaborations. The results are disseminated as an "Inventors Guide", i.e. a publication that provides hands-on help. Moreover, an important stakeholder with regards to the project

aim is "NOVA University Network", where a mutual sharing of information can help to strengthen both parties. During the project period (until December 2013), members get together for a total of four network meetings. The network's "kickoff" took place on February 2012 at SLU, Uppsala.

3.1.8 Project Management and Contact Information

The METIS network is managed by SLU Holding:

- Andreas Scheibenpflug, andreas.schebenpflug@slu.se, www.slu.se/sluholding
- Niclas Östlund, Niclas.ostlund@slu.se, www.slu.se/sluholding

3.2 Culture KICK, Halina Gottlieb and Dagny Stuedahl

3.2.1 Background

The network Culture KICK – Knowledge, Innovation, and Commercialising Knots for Design Research within Digital Heritage – facilitates the exchange of design methods and conceptual frameworks which are relevant for both practical and theoretical approaches to innovation using ICT in the cultural heritage field. The activities invite technological and humanistic perspectives to design of cultural heritage interpretations, and serve to build a bridge between the humanities, social sciences, art and design in academia, heritage practice and innovative media enterprises. In this way, the network is connected to the existing NODEM network, and built on their competencies of organising knowledge transfer between stakeholders in research, innovation and practice with special focus on three knowledge fields: ICT technologies for cultural heritage, interaction design and museum studies.

NODEM (Nordic Digital Excellence in Museums) was established in 2003 and was supported by the Nordic Council of Ministers, and has during eight conferences in the period 2003–2014, connected stakeholders from academia, museums practitioners and SMEs into a community with

about 10,000 members. This application addresses the need for interdisciplinary knowledge exchange between academia and innovation expressed by members of NODEM community.

3.2.2 Participants

- Dr. Dagny Stuedahl (Project Leader), University of Oslo, Norway.
- Dr. Halina Gottlieb (Project Leader), Interactive Institute Swedish ICT, Sweden.
- Prof. Gunnar Liestøl, Department of Media and Communication, University of Oslo, Norway.
- Prof. Andrew Morrison, Institute of Design, The Oslo School of Architecture and Design, Norway.
- Prof. Marjo Mäenpää, Aalto University, School of Art and Design, Department of Art and Media in Pori, Finland.
- Ass. Prof. Ane Hejlskov Larsen, Department of Aesthetic Studies, Faculty of Humanities, Aarhus University, Denmark.
- Prof. Ole Sejer Iversen, Department of Information and Media Studies at the University of Aarhus, Denmark.
- Ass. Prof. Oluf Danielsen, The Danish Research Centre on Education and Advanced Media Materials, University of Roskilde, Denmark.

3.2.3 Aim

Development of Coherent Cultural Heritage Technologies

Culture KICK aims to address problems of coherence by focusing workshop presentations on the challenges of R&D-based collaborations related to the themes of the workshops. Research participants in the network are invited because they all base their practice-based research on collaborations with cultural heritage institutions and SMEs. In order to overcome these barriers, the concept and methodology of knowledge transfer is developed and piloted within the Culture KICK network and disseminated in the NODEM community.

3.2.4 Long-Term Effects

Sustainable Structures of Knowledge Exchange and Transfer
Culture KICK addresses problems of sustainable knowledge exchange and transfer by using a participatory approach based on existing Nordic research projects that triangulates the creative industry, cultural heritage institutions and research. By means of exchanging methods and approaches in ongoing research projects, Culture KICK establishes sustainable structures for cooperation that integrate existing practices for knowledge transfer in research projects involved, as well as involving needs from the private sector and SMEs.

3.2.5 Focus

Culture KICK will focus on:

- *Curatorial Challenges and New Forms of Participation*
  Curatorial challenges and the role of new visitor activities and enactments, such as participation and interaction integrating digital media in performing arts, the role of digital tools and artefacts for new forms of agency on behalf of curators, and the role of virtual museum-based outreach for curatorship.
- *Tangible and Intangible Heritage*
  Ongoing Nordic and Asian initiatives to develop platforms for the documentation, dissemination and communication of intangible and tangible heritage related to voluntary and institutional initiatives of collections.
- *Design Methods and Models for Digital Cultural Heritage*
  Initiatives that build on the Scandinavian tradition of participatory design of ICT that have developed a framework for user involvement in development.

3.2.6 Delegation of Responsibilities

Each participant of Culture KICK contributes with defined responsibilities related to the activities listed below, and thereby bridge research and practice. They also have the responsibility of involving participants from the creative industry and cultural heritage institutions to contribute with presentations of prototypes, mock-ups and design concepts from their projects and thereby participate in the activities of the network.

3.2.7 Activities

- Three exploratory, interdisciplinary workshops that build on existing research on topics, needs and possibilities relevant to cultural heritage institutions and creative industry partners, and focus on methods, concepts and approaches to innovation in the Nordic digital heritage field.
- An online platform with existing R&D projects from cultural heritage institutions and ICT- and creative industry in Nordic countries, moderated and connected to the existing community website for NODEM.
- Training packages for all stakeholders.
- A concluding seminar in conjunction with the NODEM 2013 conference (open to the NODEM community and the public).
- Two Know-how Books following themes of the workshops, bridging research findings and everyday practices for people working in the cultural heritage sector (available online and in print) .

3.2.8 Project Management and Contact Information

- Project management: Dr. Dagny Stuedahl, University of Oslo.
- Facilitation management: Dr. Halina Gottlieb, Interactive Institute Swedish ICT.

NODEM 2014 Warsaw

Photo Credit: Museum of King Jan III's Palace at Wilanów.

Stockholm City Hall Dinner, NODEM 2013 Conference

Photo Credit: Jakob Gottlieb.

Culture KICK Workshop 2012, Oslo

Photo Credit: University of Oslo.

Culture KICK Booth at NODEM 2014 Warsaw

Photo Credit: Museum of King Jan III's Palace at Wilanów.

Culture KICK Workshop 2012, Stockholm

Photo Credit: Interactive Institute Swedish ICT.

NODEM 2013 Conference, Stockholm

Photo Credit: MediaGymnasiet.

Culture KICK Booth at NODEM 2013 Stockholm

Photo Credit: Halina Gottlieb.

3.3 NORDTEK – Knowledge Triangles, Hallen Borg, Peter Göranson and Anders Warell

3.3.1 Background

NORDTEK is a network for rectors and deans of the technical universities in the five Nordic countries. To be a member you have provide education in advanced engineering up to a Master's and PhD level in a technical research field. All the Nordic universities who fulfil these requirements are members. The members represent 23 universities and more than 100.000 students, teachers and researchers.

This summary outlines initial activities in establishing a new Nordic network "The NORDTEK – Knowledge Triangle Project" supported by the Nordic Council of Ministers. The network aims to support and initiate the establishment of knowledge triangles with respect to research, education and innovation by bringing together Nordic participants from industry, academia and the public sector.

The NORDTEK Knowledge Triangle project is divided into two subprojects: Knowledge Triangle in Welfare Technology and Knowledge Triangle in Design.

3.3.2 Welfare Technology

Background

The demographic challenges in the developed countries including the Nordic countries play an important role not only at the political level. It also directly or indirectly affects many other parts of our society from the educational level to business development and opportunities for future growth and export. Thus, the NORDTEK network of welfare and assistive technologies is built on the concepts of the knowledge triangle, which focuses on education, research and innovation, and the interplay between them.

The institutions of the NORDTEK network, which educate students at the Master's level of engineering, have a natural focus on combining applied research with education and innovation that fits well with welfare technologies. At the beginning of the project the group conducts a survey and roadmap of current Nordic activities of welfare technologies and pro-

jects. In this initial part we see a potential to collaborate with other network who are engaged with similar topics.

Through a number of workshops and seminars, members of the NORDTEK network exchange experience and information on welfare technologies, and coordinate and strengthen the collaboration among the Nordic educational institutions. Other stakeholders – users, companies and public institutions – are involved in the seminars/workshops through ongoing collaborations between the members and national stakeholders. The aim of the network is not only to strengthen collaboration and share information among the members of the NORDTEK network, but in general to stress the importance of joint work and participation in e.g. European projects among Nordic organizations.

Activities

Every year a minimum of 2 workshops/seminars are held, each with a particular focus on different aspects of the knowledge triangle and their interplay, e.g. research/innovation and education/research.

- Seminars: These bring together the majority of the network members in discussions on on-going projects, needs etc. and aim to be a meeting point for elaboration on a wide range of topics.
- Workshops: These focus on defined topics of specific interest to network members in which participants explore possible applications of state of the art methodology etc.

3.3.3 Design

Initial Vision

The new network brings together participants from the NORDTEK institutions, industry and societal organisations around research, education and innovation related to design. Aesthetics, sustainability and user centred design are important aspects in this work. An explicit aim is to create conditions for future initiation of mutual research and innovation projects, connecting a variety of actors and stimulating mobility. Particularly, collaboration initiatives integrating the interests of industry and academia,

supported by a mobility programme, is encouraged and facilitated through the network.

Many of the academic network members are based at technical faculties, which affects the focus of the network. Central areas of mutual interest may include structured methods and systematic approaches for addressing design related issues in product– and process development, and the development and transfer of knowledge between the various actors of the network.

Experiences from other networks such as Nordcode, the Nordic Network on Communicative Product Design (www.nordco-de.net), have shown that it is important to build personal relations by bringing together participants in shared activities, preferably with some continuity.

Activities

Actual activities are specified in dialogue with network members, particularly the members of the Steering Group, in order to best meet needs related to the formation of knowledge triangles. There are two types of events organised within the network:

- Yearly seminars. These bring together the majority of network members in discussions on on-going projects, needs etc. and aim to be a meeting point for elaboration of a wide range of topics.
- Special Interest Group (SIG) Workshops. These focus on defined topics of specific interest to network members and features expert tutorials and workshops in which participants explore possible applications of state of the art methodology. A number of SIGs are active simultaneously throughout the duration of the network. All SIGs are expected to meet at common events, thus facilitating collaboration and transparency between SIGs. Targeted collaborative projects (with participants from academia, industry, organisations, in any constellation) are likely to spring out of the work of each respective SIG.

The initial activities in the project aim to establish the network and create a basic platform for dialogue and exchange.

An important task of the network is to initiate activities and projects, which enables the network to live independently beyond the initial three years of funding.

3.3.4 Participants

- Denmark: Aalborg University, Technical University of Denmark, University of Southern Denmark.
- Finland: Aalto University, Tampere University of Technology, Lappeenranta University of Technology, Åbo Academy University, University of Uleåborg, University of Vaasa.
- Iceland: University of Iceland, Reykjavik University.
- Norway: Norwegian University of Science and Technology, University of Stavanger.
- Sweden: Royal Institute of Technology, Lund University, Chalmers University of Technology, Linköping Institute of Technology, Uppsala University, Umeå University, Luleå University of Technology, Blekinge Institute of Technology, Karlstad University, Mid Sweden University.

3.3.5 Project Management and Contact Information

Project Leader

- Peter K. Göranson, email: peter.goranson@nordtek.net

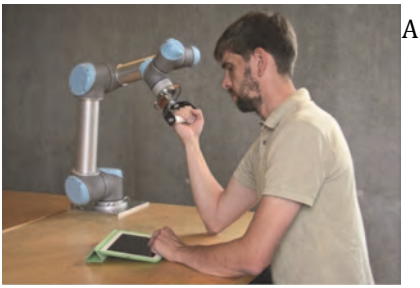
Welfare Technology

- Associate Prof. Kasper Hallenborg, PhD, hallenborg@mmmi.sdu.dk, The Maersk Mc-Kinney Møller Institute, University of Southern Denmark.

Design

- Associate Prof. Anders Warell, PhD, anders.warell@design.lth.se / Viktor Hiort af Ornäs, PhD, viktor.hiort@design.lth.se, Division of Industrial Design, Lund University.

Exhibitions and seminars – Welfare (A, B, C, D, E) Technology for training and rehabilitation, Robot Laboratory


A


B


C


D


E

Photo: Conny Heidtmann.

3.4 NeRo, Jette Bangshaab, Ole Faaborg, Maria Holm and Henrik Svensson

NeRo consists of NIW (Nordic Innovation Network for Welfare Technology) and NORDROAD.

3.4.1 Nordic Innovation Network for Welfare Technology

Background

This network aims at solving the following challenge: a decreasing number of social healthcare professionals and an increasing number of elderly citizens are expected in the next decades. This calls for a better utilization of the caring staff resources, which to some degree is expected to be met by using more welfare technology.

Aims and Long-Term Effects

The main purpose is to establish a Nordic online platform for collaboration, coordination and knowledge sharing – named "Nordic Innovation Network for Welfare Technology". This innovation network contributes to

- connecting the various Nordic research and innovation environments with the municipalities and institutions actually working with the welfare technology and the companies developing welfare technology
- creating an overview of initiatives going on in the Nordic countries in the field of social welfare technology
- increasing possibilities of Nordic collaboration projects
- positioning Nordic Welfare innovation in Europe and internationally.

Main Activities

The main activities are to:

- develop, establish and run an online platform
- select and run relevant and important themes
- support knowledge sharing among the participants
- produce a report of each theme in the form of a PDF-document.

The knowledge sharing could be for example learning from projects in other Nordic countries who have tried a technology or solutions within the theme.

An example of a theme in NIW is "Cognitive support using new technology". Using the latest information and communication technology, like tablets and smart phones with third party applications (apps), presents an opportunity to better structure daily life and support memory for an increasing number of users with mental disabilities like ADHD or dementia.

Participants

Professionals from companies, universities and public institutions in the Nordic countries that work within the field of welfare technology for disabled and elderly persons.

Methods, Timeline and Participation of Stakeholders

The network is funded for 3 years, with a secretary initially at the Danish Centre for Assistive Technology in Denmark, who is running the online platform and a coordination group. In 2012, the Danish Centre for Assistive Technology emerged from the National Board of Social Services and took over the project management of NeRo.

The coordination group for the network consist of two persons from each Nordic country, who, through their position and network, is able to contribute to getting the right people, organization and companies involved in the network, start initiatives across borders, and in conjunction with the group, set the strategy for the network, and propose new themes. The responsible team are selected among Nordic stakeholders of welfare technology e.g. NAV in Norway.

Focus
The focus is on supporting Nordic knowledge sharing in the field of welfare technologies for disabled and elderly people.

Delegation of Responsibilities

- Secretary incl. platform operations: Danish Centre for Assistive Technology (2011–2012) and the National Board of Social Services (2012–2014).
- Coordination group: Two delegates from each Nordic country within innovation areas and social welfare technology.
- Responsible Team: For each theme, an external relevant professional from a Nordic country who is an expert and moderator is chosen.

3.4.2 NordRoad – Nordic Roadmap for Welfare Technology

Background
This network cooperates on the development of a Nordic roadmap for welfare technology. In this process the network cooperate on mapping welfare technologies within the health care domain, develop a model for assessing these technologies from a Nordic perspective emphasizing central relations between health care professionals and patients/citizens and finally, from this point towards future Nordic directions for welfare technology.

Aims and Long-Term Effects
The main purpose is to work towards a Nordic roadmap for welfare technology which can contribute to:

- improve reflections on the design and use of welfare technologies within the health domain
- create overview of current best practices and future next practices
- point out possible Nordic directions for welfare technology within the health domain.

Main Activities

The main activities are to:

- map best practices of welfare technologies in the four participating Nordic countries
- analyse best practices
- work towards next practices via future scenarios and roadmaps for welfare technology.

The Nordic partners cooperate on this research agenda via seminars and virtual cooperation.

For dissemination, a concluding conference will be organized together with a project publication.

Participants

Participants include:

- UCN: University College Northern Denmark (http://www.ucn.dk).
- University of Turku (http://www.utu.fi/en/).
- University of Tromsø.
- (http://www2.uit.no/ikbViewer/page/startsida).
- Umeå University (http://www.umu.se/english).

Methods, Timeline and Participation of Stakeholders

The network is funded for 3 years, with seminars every year towards a concluding roadmap and dissemination in the form of a publication and conference in the final year.

Focus

The focus is on supporting Nordic cooperation in the field of welfare technologies.

Delegation of Responsibilities

- Secretary incl. economic responsibility and e-platform: Danish Centre for Assistive Technology.
- Project management: UCN.
- Network responsible: each partner is responsible for a seminar. Agenda and process is coordinated in cooperation with UCN who are responsible for the overall progress.

Finland Greets Denmark – Riitta and Ole

Photo Credit: Dan Ole Faaborg.

Working Group NordRoad

Photo Credit: Dan Ole Faaborg.

Hopes for the Future

Photo Credit: Dan Ole Faaborg.

NordRoad Conference in Aalborg

Photo Credit: Dan Ole Faaborg.

The NordRoad Group in Umeå Sweden

Photo Credit: Dan Ole Faaborg.

Exhibition Research

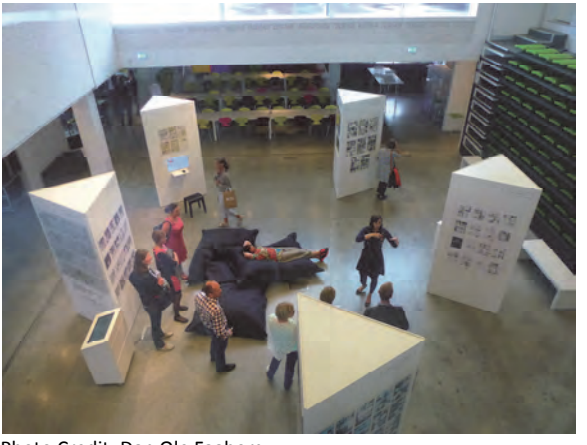


Photo Credit: Dan Ole Faaborg.

4. Overview of Three Sino-Nordic Networks

4.1 China in Turbulence: Paths Forward for Nordic Business, Riitta Kosonen

4.1.1 Background and aim of the project

China has become a major player in the world economy in the past two decades. This process started with China gaining the status as the "world's factory" based on cheap labor, which attracted also Nordic companies to establish low-cost manufacturing in China.

Recent years have, however, witnessed the Chinese manufacturing sector moving upwards in the value chain, as the Chinese economic policy is increasingly emphasizing investment in innovation and cutting-edge technologies. This has opened up new business opportunities for Nordic firms operating in China, but also changed their competitive landscape with local firms gaining prominence as competitors.

At the same time, China is facing major social, economic and political challenges such as a shrinking working-age population, social tensions and environmental risks. From the perspective of Nordic businesses, these factors create uncertainties on different levels. On the one hand, it is increasingly difficult to predict the direction to which the Chinese operating environment will develop. On the other hand, due to the weight of China in the world economy, major internal changes are likely to have global implications as well. In order to succeed in such a turbulent environment, Nordic firms should be able to efficiently gather and process information on different levels and from multiple perspectives.

In reality however, firms often face resource constraints which prevent them undertaking any knowledge-creation efforts beyond their own immediate business needs. The problem is often not the availability of in-

formation as such, but rather the businesses' lack of analytical capabilities needed for processing and interpreting various and sometimes conflicting signals. In contrast, in today's knowledge-based economies the role of universities as possessing such capabilities is increasingly acknowledged. In this project, Nordic universities' knowledge and research expertise on China will be brought to use by Nordic businesses in China.

The aim of the project is to introduce a concept, in which knowledge creation about developments in China is undertaken by the network of businesses, universities and public sector actors. The hub of the network is the Nordic Centre at the Fudan University, which acts as a bridge between Nordic firms operating in China, Nordic scholars doing research on China, and Nordic business associations in China. The knowledge creation model establishes a dialogue between Nordic universities' academic knowledge on China and their methodological expertise, and Nordic firms' practitioner knowledge which is often of a tacit nature. The processing of signals from these two sources helps creating future-oriented knowledge that helps Nordic firms in their decision-making in China. In addition, the network serves as a platform on which businesses can establish links with university students as their potential human resource base for their Chinese operations. Finally, the university partners can utilize the knowledge and contacts created in the project to develop education that meets the needs of businesses.

4.1.2 Project Participants

The knowledge creation network is constructed by a consortium of Nordic universities as project partners. The Fudan University Nordic Centre plays the role as the local hub for the network in China, in addition to which the project engages Nordic businesses and organizations in the Shanghai and Beijing regions. These include the Finnish Business Council Shanghai and Beijing, Finland- China Innovation Center FinChi, Danish Chamber of Commerce in China, Swedish Chamber of Commerce in Shanghai and Beijing, Norwegian Business Association in Shanghai and Icelandic Business Forum.

The project consortium is represented by leading Nordic scholars with expertise on China. The disciplinary perspectives of the project partners include international business, international economics, economic geog-

raphy, political economy, and cultural studies. This multidisciplinary approach makes it possible to build a comprehensive understanding on factors underlying China's future growth prospects and the many influences that they have on Nordic businesses. These include both the risks associated to the socio-economic and political development, and opportunities that the technological upgrading of the Chinese manufacturing offer for Nordic companies.

Aalto University School of Business, Center for Markets in Transition (CEMAT), Helsinki, Finland

CEMAT is a leading international research and education unit which focuses on emerging markets and economies. CEMAT has a long track record in combining institutional theories with intensive field work and face-to-face interviews in China. CEMAT has also developed various ways to continuously deliver results from ongoing and finalized research in dialogue between researchers, the business community and public sector actors.

Copenhagen Business School (CBS), Asia Research Center, Denmark

The Asia Research Center in CBS conducts high quality research on topics such as politics and business group formation in China, public management in China, and China in the global economy. The Asia Research Center is an active actor in Sino-Danish cooperation in the fields of higher education and research on Asia, as well as in the science, technology and innovation sphere.

University of Gothenburg School of Business, Economics and Law, Center for International Business Studies, Sweden

The University of Gothenburg has a long track record in the research of international trade and investments, regionalization, international business integration in Eastern Asia, and the free trade negotiations between the European Union and Asian counterparts. The Center for International Business Studies has expertise in analyzing the era of global spatial reconfiguration and the resulting corporate restructuring in the global automotive industry, including the Chinese investments and acquisitions of Nordic companies.

Nordic Institute of Asian Studies (NIAS), Copenhagen, Denmark
NIAS is a Nordic research and resource center that focuses on modern Asia from a predominantly social sciences perspective. NIAS provides a platform for Nordic universities and research institutions to participate in order to strengthen collaboration in the Nordic countries. In addition to its wide range of knowledge and skills, NIAS has built a broad network of people and institutions with expertise on Asia and is active in organizing international conferences and workshops. Furthermore, NIAS is known for its activity in providing information resources, commentaries on current affairs, and contacts with media, government and businesses.

The project also benefits from the participant's research collaboration with Chinese research organizations, such as Fudan University and the Institute of Finance and Trade Economics of the Chinese Academy of Social Sciences.

4.1.3 Activities and Participation of Stakeholders

"China in Turbulence" is a research and networking project where a conceptual model of a Nordic-Chinese knowledge creation network is developed and operationalised. The model builds on up to date and forward-looking empirically based research, which combines the expertise and disciplinary perspectives of the participants.

The key components of the empirical research process are collaboration with Nordic businesses and business associations, a combination of different data gathering methods and involvement of firms in the analytical process. The research process starts with the invitation of Nordic firms in China to participate in a survey, the results of which are later triangulated and unpacked in thematic interviews at the respondent firms. At the next stage the research material is discussed and analyzed in brainstorming sessions of the project partners, and finally delivered to the use of Nordic businesses and their supporting organizations in China.

An essential part of the delivery is wrapping up the results and organizing events at the Fudan University Nordic Centre bringing together university scholars, students, and representatives of the Nordic businesses and their supporting organizations in China. Such events serve as a platform not only for disseminating the results of the project but also for gen-

erating future avenues for research. In addition, these events provide the participating firms a forum to establish linkages with university students, and increase the knowledge about Nordic firms in China as potential employers among the student community.

4.1.4 Project Management and Contact Information

China in Turbulence – project is managed by CEMAT:

- Project leader: Professor Riitta Kosonen, riitta.kosonen@aalto.fi
- Coordinator for the network: Piia Heliste, piia.heliste@aalto.fi

Brainstorming in Copenhagen

Photo Credit: Piia Heliste.

Claes Alvstam, Geir Helgesen and Riitta Kosonen

Photo Credit: Piia Heliste.

Director Geir Helgesen, Nordic Institute of Asian Studies

Photo Credit: Piia Heliste.

Executive Vice Director Liu Chunrong, Fudan-European Centre for China Studies

Photo Credit: Piia Heliste.

Professor Riitta Kosonen,
Aalto University

Photo Credit: Piia Heliste.

Professor Kjeld-Erik Brodsgaard,
Copenhagen Business School

Photo Credit: Piia Heliste.

Professor Claes Alvstam,
Gothenburg University

Photo Credit: Piia Heliste.

Lu Wei, Claes Alvstam and Liu Chunrong

Photo Credit: Piia Heliste.

Liu Chunrong, Kjeld-Erik Brodsgaards and Geir Helgesen

Photo Credit: Piia Heliste.

4.2 Urban Governance for Sustainable Cities (UGN)

4.2.1 Background

China is facing rapid growth of mega-cities and huge regional urban clusters, massive suburban expansion, demolition of existing neighbourhoods and urban structures, commodification and gentrification of city centres, and rapid transformation of urban, peri-urban and intra-urban land-use patterns. At the same time, we can see migration patterns and social stratification resulting in new spatial uses such as central business districts, gated communities, "villages-in-the-city", and insulated migrant communities. China's cities also produce urban infrastructure and spaces that address the demands for business, social and cultural innovation.

These changes create new pressures on basic infrastructure and on the environment and raise serious questions about the sustainability of urban social, economic and cultural processes and their governance. Whereas much literature on China's cities has focused on specific aspects of urban development such as physical, economic, social and cultural processes, there has been less attention to the overarching challenges faced by urban governance regimes to address sustainability issues in structuring and organizing political, social, economic and cultural practices, either top-down or bottom-up.

It makes a lot of sense to study sustainable urban governance in China since we are not only presented with rapid urban expansion at an unprecedented scale, but also due to the institutional and cultural context with a highly organized, yet decentralized state apparatus that is not only focused on political and social control of urban development processes but also to experimentation with new types of political, economic, social and cultural solutions to address the sustainability challenge.

UGN is a research network focused on sustainable urban governance in China. The network includes four Nordic Universities and two Chinese Universities. The network aims to promote contact and collaboration between researchers in the field of urban sustainable governance in China. In addition, the network aims to develop connections with civil society and entrepreneurs.

4.2.2 Project Participants

Uppsala University – project leader
Mattias Burell and Oscar Almén, Assistant Professors, Dept. of Government. In a research project terminating in 2015, Almén and Burell have used the concept of social accountability in order to examine how social actors (via informal mechanisms) attempt to hold local authorities accountable in Hangzhou. Several of the cases are related to environmental protests.

Copenhagen University
Jørgen Delman, Professor, Dept. of Cross-Cultural and Regional Studies at Copenhagen University. Delman leads a three-year project focusing on climate-change governance with Hangzhou as a case study. The project uses climate-change politics to explore contemporary processes of city-level political change in China, by asking what climate change does to the Chinese party-state's mode of government.

University of Turku
Outi Luova, Adjunct Professor, Centre for East Asian Studies. Luova is carrying out a project on low-carbon policies in Chinese cities, and particularly the emergence of Chinese ecological governance for nurturing environmental awareness and inducing changes in civil servants' and residents' behaviour in environmental matters. Dr. Sampo Ruoppila, Director, Urban Studies Program, is an affiliated member of this university node.

Lund University
Marina Svensson, Professor, Centre for East and South-Asian Studies, is currently working on a number of issues related to how citizen groups in China understand urban space and participate in local affairs, e.g., cultural-heritage issues, migrant workers' struggles for social and legal inclusion, and the use of Internet and mobile technologies among environmental groups. In addition, at the Centre Dr. Stefan Brehm works on the role of strategic interaction and spatial spill-over effects for regulatory outcomes of environmental policies. Current research projects deal with spatial dependence of environmental law enforcement, as well as mechanisms for the diffusion of best-practice. Dr. Jesper Schlæger, a postdoctoral fellow at the Centre, is currently doing research on the impact of information and

communication technology in environmental governance in China. The focus is on how new technologies enhance the state's ability to implement environmental policy, and how a broader range of actors become part of the policy process.

Fudan University
Professor Yuan Ren, School of Social Development and Public Policy. As the China-side coordinator, Ren cooperates with team members at Fudan Nordic Centre in order to support and coordinate our network activities in China, including workshops and the Ph.D course at the Nordic Centre, Fudan University.

Zhejiang University
Professor Lang Youxing, College of Public Administration, collaborates in the research project with Almén/Burell. Several other scholars have been involved in the workshops and in the planned publication.

4.2.3 Long-term effects

One of the long-term effects will be in the form of a book. The final Copenhagen workshop in 2015 is focusing on the book project and a planned publication is set for 2016/2017. The tentative title of the book is: "Sustainable City Governance in China: Challenges and Practices".

Another long-term effect is that we are striving to continue to uphold the network and to include more network members. Many new connections between researchers as well as between other actors have come about as a result of the network. In the future, we also aim to extend more connections to civil society and private sector actors.

4.2.4 Project aim

The purpose of this project is to generate and share new insights into the fundamental transformation of urban society, and how the need for sustainability is addressed and leads to governance innovations. This is done through:

Research: the project facilitates contact between Nordic and Chinese research projects with similar research foci. For example, both Delman and Almén/Burell conduct research on state-society relations in Hangzhou,

while Ren Yuan works with citizen behaviour in relation to sustainability in the greater Shanghai region. The aim of the workshops is to connect Chinese and Nordic research groups with similar research foci, with an eye on exposing research to critical scrutiny and opening up for collaboration. A concrete aim of the final workshop is to produce an edited book. Mobility opens up for scholars and Ph.D. students to visit our respective universities and to further strengthen these forms of cooperation. A key aim of these network activities is to encourage future collaborative research.

Education: Ph.D. training. The multidisciplinary course *Sustainable City Development: Theories, methods, challenges, and experiences in China and the Nordic countries* aimed at Ph.D. students was organized at Fudan University in October 2014. Both Chinese and Nordic students participated. The course aimed to encourage an exchange between Chinese and Nordic experiences, and to expose our Ph.D. candidates to diverse disciplinary perspectives, concepts, and approaches. This helped them to integrate knowledge and theories from several fields in order to find solutions for sustainable urban change. Collaboration with non-academic partners also challenged the Ph.D. students to approach their research questions "outside the box", bringing a new type of dynamism to doctoral training in social sciences.

Innovation: The program also aims to establish a short-list of Chinese city-level policy innovations, "models", and "best practices" relating to sustainable development. We can see this as a form of "benchmarking" for sustainable city governance. These results will be shared with relevant external shareholders during the project, including municipal governments in the Nordic countries and various companies, NGOs, and environmental organizations.

4.2.5 Activities

Research Workshops

The first workshop entitled *Urban sustainable governance and citizen perception and action* took place in Hangzhou, October 24–25. The workshop was organized in collaboration with Zhejiang University and Fudan University. There were 24 paper presenters, equally divided between Nordic and Chinese scholars, and a large number of students and researchers that

participated as listeners. The workshop was a success in terms of the research debate and many interesting papers were presented.

This was followed up by a second research workshop at Fudan University, October 2014, entitled *Sustainable City Development: Theories, methods, challenges, and experiences in China and the Nordic countries*. In connection to the workshop, a Ph.D. course was also held. Several new papers were presented, and in some cases, new versions of the papers were presented in Hangzhou 2013.

In March 2015, a workshop entitled "Towards a Green China? Government Policies and Citizen Engagement" was organized by the Centre for East and South-East Asian Studies, Lund University, at which scholars active in UGN, other scholars at Lund University, and a scholar from Fudan University, presented their research on environmental issues (for the program see http://www.ace.lu.se/node/468). In addition, a documentary film on environmental issues was screened and discussed. The workshop was open to the public and gathered some 50 participants. The strong interest among staff and students at Lund University has led to the establishment of a university-based network, and plans for further activities.

The workshop for 2015 is planned to take place in Copenhagen in October/November. The main focus of that workshop is on the book project and a planned publication is set for 2016/2017. The tentative title of the book is: "Sustainable City Governance in China: Challenges and Practices".

A two-day Ph.D. course was arranged in conjunction with the workshop *Sustainable City Development: Theories, methods, challenges, and experiences in China and the Nordic countries.* The workshop included two keynote lectures that focused on theories, and in all eight Ph.D. candidates from the Nordic countries and the Shanghai region presented papers. In addition to fellow Ph.D. candidates, five senior researchers commented on the papers. The Ph.D. projects of the participants benefited greatly from both the workshop and the course.

4.2.6 Project Management and Contact Information

Uppsala University

- Mattias Burell, Assistant Professor, Email: mattias.burell@statsvet.uu.se
- Oscar Almén, Assistant Professor, Email: oscar.almen@statsvet.uu.se

Professor Bao Cunkuan provides comments in the research workshop, 2014

Photo Credit: Chen Dan.

Listening to the introduction of Mahota Eco-Farm, 2014

Photo Credit: Outi Luova.

Professor Bao Cunkuan provides comments in the research workshop 2014

Photo Credit: Chen Dan.

Participants of the research workshop in 2014

Photo Credit: Cen Dan.

Doctoral training course starting at the Mahota Eco-Farm, Chongming Island, Shanghai, 2014

Photo Credit: Outi Luova.

Professor Su Yunsheng presenting at Aalto Design Factory, 2014

Photo Credit: Outi Luova.

4.3 Sino-Nordic Welfare Research Network (SNOW)

4.3.1 Background

The Sino-Nordic Welfare Research Network (SNoW) was established in 2011 and received funding from NordForsk for the years 2011–2013. NordForsk is an organisation under the Nordic Council of Ministers that provides funding for Nordic research cooperation as well as advice and input on Nordic research policy. For the period 2013–2015, SNoW-activities are financed by the Nordic Council of Ministers (NCM) as one of six thematically different research networks funded by NCM to strengthen Sino-Nordic research collaboration and the Nordic Centre at Fudan University.

The background for the establishment of SNoW was the Nordic Centre of Excellence, The Nordic Welfare State – Historical Foundations and Future Challenges, NordWel: (http://blogs.hel-sinki.fi/nord-wel/), financed by NordForsk for the period 2007 until 2013, and directed by Pauli Kettunen, University of Helsinki. Based on Nordic and Chinese networking, collaboration was initiated to compile the book *The Nordic Welfare State*, edited by Stein Kuhnle (University of Bergen), Chen Yinzhang (Fudan University), Klaus Petersen (University of Southern Denmark) and Pauli Kettunen, and published by Fudan University Press in Chinese in 2010. A Japanese version of this book will be published in the autumn of 2015.

The Chinese edition was launched at the Nordic Centre, Fudan University, in May 2010, and it was then decided to develop the Sino-Nordic collaboration in welfare research, and to approach NordForsk for starting up joint activities, primarily funding of two seminars: at Fudan University in 2011 and University of Helsinki in 2012. On the basis of the two seminars and thanks to the grant from the Nordic Council of Ministers (2013–2015), another book was compiled, and published in English and (extended) Chinese versions in June 2014.

4.3.2 Project Participants

Core Steering Group

- Project leader: Stein Kuhnle, University of Bergen (stein.kuhnle@isp.uib.no).
- Pauli Kettunen, University of Helsinki (pauli.kettunen@helsinki.fi).
- Åsa Lundqvist, Lund University (asa.lundqvist@soc.lu.se).
- Klaus Petersen, University of Southern Denmark (klaus.petersen@hist.sdu.dk).

Editors, SNoW Newsletter

- Stein Kuhnle, University of Bergen (stein.kuhnle@isp.uib.no).
- Ren Yuan, Fudan University (yren@fudan.edu.cn).
- Editorial assistant: Regina Wang, Nordic Centre, Fudan University (regina@nordiccentre.net).

Extended Steering Group

- Anneli Anttonen, University of Tampere (anneli.anttonen@uta.fi).
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- Rolf Rønning, Lillehammer University College (rolf.ronning@hil.no).
- Wang Zhikai, Zhejiang University (zhikai@hzcnc.com).
- Xiong Yuegen, Peking University (yxiong@pku.edu.cn).

4.3.3 Project Aims

The aims of SNoW, financed by the Nordic Council of Ministers for the period 2013–2015, are:

- Strengthen Sino-Nordic collaboration in welfare research and higher education.
- Strengthen networking through publication of an electronic newsletter.
- Strengthen competence building and joint research interests through organization of Ph.D. courses and seminars/conferences.
- Strengthen networking through mutual exchange of scholars for shorter periods.
- Strengthen the Nordic Centre at Fudan University, which serves as the organizational and administrative hub for all activities in China.
- Increase the visibility of the Nordic welfare state experience in China.

4.3.4 Activities

Ph.D. Course: The project organized a Sino-Nordic Ph.D. Course on "Analyzing Welfare Institutions, Policies and Politics in China and the Nordic Countries" for 20 participants from Denmark, Finland, Norway, Sweden, China, South Korea, India, and Pakistan at the Nordic Centre, Fudan University, Shanghai, in October 2013.

Participants and lecturers at the SNoW Ph.D. Course 2013

Photo Credit: Nordic Centre, Fudan University.

A second Ph.D. course, will be organized at the Nordic Centre, Fudan University, in November 2015.

Conferences: A one-day Sino-Nordic Workshop on social policy, with five keynote speakers, was organized at the Nordic Centre, Fudan University, in October 2013, with 25 participants. A two-days conference on "Between Universality and Conditionality: Migration, Mobility, and Welfare Rights", was organized at the Nordic Centre, Fudan University, in November 2014, with 22 participants presenting keynote speeches or research papers. SNoW co-organizes with the Chinese Academy of Social Sciences a conference on "Ageing Welfare and Social Policy" in Beijing, June 2015.

Book launch: The Chinese-language book, published by Fudan University Press, edited by Pauli Kettunen, Stein Kuhnle and Yuan Ren on Reshaping Welfare Institutions in China and the Nordic countries was launched within a seminar at the Nordic Centre, Fudan University, on 6th June 2014. An English version of the book, published and presented simultaneously, has been published by NordWel at the University of Helsinki. The Chinese version includes a few more chapters than the English version. Both are based on two SNoW-seminars, the first in Shanghai in October 2011, the second in Helsinki in June 2012. The books are contributions to the topical debate of mutual policy learning and proper political responses to major socio-economic challenges for social policy develop-

ments in the mature Nordic welfare states and the emerging Chinese welfare state or "harmonious society".

Book launch 6th June 2014, Nordic Centre, Fudan University

Photo: Gao Mingtang, Nordic Centre, Fudan University.

SNoW Newsletter: A quarterly newsletter has been published and sent out from the Nordic Centre, Fudan University, since early 2013. It is sent out to network participants and to whoever is interested. It can also be found on the SNoW homepage: http://www.uib.no/en/snow

4.3.5 Contact

SNoW Homepage: http://www.uib.no/en/snow

- Project leader: Stein Kuhnle, Professor, Department of Comparative Politics, University of Bergen, Norway; Email: stein.kuhnle@isp.uib.no
- Secretariat: Regina Wang, Programme Officer, Nordic Centre, Fudan University, Email: regina@nordiccentre.net; Homepage: www.nordiccentre.net

5. Case Studies from Participants

5.1 Model for the Establishment of an Online Network (NIW) with Participants from all over Scandinavia

5.1.1 Synopsis

This case study describes the background, model and findings from the NIW project (Nordic Innovation Network for Welfare Technology) carried out in the period from May 2011 until May 2014 led by the National Board of Social Services in Denmark.

Firstly, an online platform was developed which offered a structure for interaction, coordination and knowledge sharing across the Nordic countries. And secondly, a Nordic organization consisting of a Nordic Coordination group on a high level, a secretariat (placed firstly at the Danish Centre for Assistive Technology – which during the project merged into the National Board of Social Services in Denmark), and a group of theme caretakers from different Nordic Countries, was established.

Three themes were established in the NIW project, each with a Nordic theme for whom an expert is responsible within the professional field of the theme, and who also acts as a moderator:

- Cognitive Support Using New Technology, Theme leader: Gunnar Michelsen, Norway.
- Safety at Home, Theme leader: Raymond Dahlberg, Sweden.
- Empowerment and Technology for People with Chronic Conditions, Theme leader: Helen Houmøller Rasmussen, Denmark.

5.1.2 Issues and findings

After the NIW project had been running for one year, one theme was established, and a total of 670 persons had joined the NIW network on the online Tangora CMS platform, with a majority coming from the public sector in Denmark, Iceland and Norway. Furthermore, the following was found:

- It was challenging to get companies to join the NIW network.
- Some language challenges were faced especially regarding potential Finish participants as they preferred marketing material in Finnish, in addition to the English and Danish/Swedish versions.
- Major organizational changes in the Nordic countries in the centre of Assistive Technology (Welfare Technology) had an influence in the organizational focus and stable allocation of resources, which made e.g. the marketing effort difficult to execute.
- On the CMS online platform there was limited activity in the themes (exchanging knowledge, presenting own projects & papers etc.). People joined the network, but were more interested in achieving knowledge rather than sharing own knowledge.
- A barrier for participants was that they needed to learn how to use the templates for adding knowledge on the online platform. Especially as many now were using mobile devices for networking, and were using social media for sharing knowledge on the go.

In order to strengthen the themes it was decided to reconstruct the organisation so the Coordination Group was closed down, and the three Nordic theme leaders took over the task as Nordic coordinators in a "theme leader network" together with the secretariat. Thereby the new network activities was directly influencing and improving the themes. In this online and physical network of theme leaders, the secretariat facilitated the sharing of experience, learning and ideas for improving the themes, and recruiting and activating the participants.

As a consequence of the stagnating activity among the fairly many participants, a decision was made by the National Board of Social Services in Denmark, that the secretariat could not be supported after the NIW project

period. A proposal and plan for moving to another more modern and easily transferable platform was initiated in the middle of the project period.

Networking and knowledge sharing was fast moving to mobile social platforms and all the theme leaders supported LinkedIn groups as the best solution among the presented options.

In the Spring/Summer of 2013 the themes on the Tangora CMS online platform – was replaced by LinkedIn groups. NIW was established as a main group on LinkedIn at http://www.linkedin.com/groups/Nordic-Innovation-Network-Welfare-Technology-4917865/about and the three themes were added as sub-groups.

By March 2014, a total number of 900 persons have joined one or more groups in the NIW network at LinkedIn, and each day new relevant members request for participation to join the network. In addition, the activity has increased significantly, and there is new activity every week.

The preliminary conclusions of the project are that it is possible to establish large relevant and important welfare technology networks of professionals within the Nordic countries, but the required time for establishing a theme is much longer than first anticipated.

5.1.3 Background

Nordic countries face common challenges (demographic trends, increased demand for public services, etc.) when it comes to ensuring the welfare of the elderly and people with disabilities. A challenge that is widely agreed is best addressed through innovative AAL solutions.

The innovative environment in the Nordic countries has grown substantially in recent years, and the development of new products and services is done in many different contexts. The opportunities to coordinate these development environments and influence their development are more difficult than ever. There is no overview of current projects and other new initiatives in the area of the stakeholder community, which limits the possibilities for cooperation and exchange of experience. It also increases the risk that you "invent the wheel" over and over again, or that companies "do the best they can" without benefit of the knowledge and competence available.

A database of initiatives and projects in the area will not be able to solve the need for an overview. The welfare technology area is too broad and innovation requires more focus on the actors and their interests and needs. Therefore, there is a big potential in establishing a meeting place for exchanging knowledge, challenges and ideas.

5.1.4 Objectives of the Online Network

The aim of NIW is to enhance increased visibility, interaction, co-ordination and sharing of knowledge between Nordic players in the field of welfare technology. National experiences from one Nordic country will hereby form the fundament of successful testing and implementation of similar solutions in other Nordic countries. The network focuses on selected themes within the field of welfare technology. The primary users of NIW are companies, public authorities & institutions and circles of education and development.

Specifically, the objectives of the online network are to:

- create synergies between the Nordic research and innovation communities, businesses and the practice field
- create a thematic overview of national and Nordic initiatives and new welfare technology solutions
- increase opportunities for joint Nordic innovation and development environments and projects
- provide a framework for strategic joint Nordic innovation initiatives and projects
- raise the profile and positioning of Nordic innovation on welfare technology in Europe and abroad.

Thus, an online platform will offer a Nordic platform and structure for interaction, coordination and knowledge sharing, which is unprecedented. You can call it a technology "incubator" which focuses on highlighting the innovation and development environments that facilitate collaboration and new initiatives.

5.1.5 The Setup

First, the organization around the online network NIW was established and described. The Secretariat and the Nordic Coordination Group was established, and the selection of team leaders was carefully described and carried out in close collaboration with NVC – Nordic Welfare Centre and the Nordic Coordination Group consisting of leading experts in the field of welfare technology.

Secondly, the online platform was developed – also in close collaboration with NVC and the Nordic Coordination Group. The idea of the NIW platform came from five Danish national online networks that are still running in Denmark, and which facilitate information exchange among the 98 municipalities in Denmark. The basic idea behind the online network is that experiences learned in one municipality can easily be made available to all the other municipalities.

The first theme established was *Cognitive Support Using New Technology*. This theme puts focus on the use of new technology to help structuring everyday life and to support memory for users diagnosed with ADHD, DCD, Asperger's Syndrome, Tourette's Syndrome, dementia, acquired brain damage, mental disorders etc.

Gunnar Michelsen is the theme leader. Michelsen is an experienced professional within the field of cognitive assistive technology. He is cand. polit. from the Norwegian University of Science and Technology and works as a senior adviser for The Norwegian Labour and Welfare Service (NAV), National Center for Assistive Technology and Vocational Rehabilitation, Nonite.

The second theme *Safety at Home* focuses on technologies and methodologies that can increase the feeling of safety. The main target group is people older than 65 who live in their own homes. But also people with disabilities are included in the theme's target group. Theme leader Raymond Dahlberg works as a research and development coordinator at the Swedish Institute of Assistive Technology (SIAT). Raymond is an Occupational Therapist and has a Ph.D. in Medical Science.

The third theme *Empowerment and Technology for People with Chronic Conditions* focuses on the application and development of technology solutions to and for people with chronic conditions. Solutions which may support the individual in achieving a better quality of life and becoming better

at handling his or her illness – regardless of time and place. Theme leader Helen Houmøller Rasmussen is working as a consultant and project manager at the North Denmark Region, Office of Health and Consistency, covering health agreements, chronic conditions, public health and welfare technology. Helen holds a Master of Science (MSc) in Social Science and Communication.

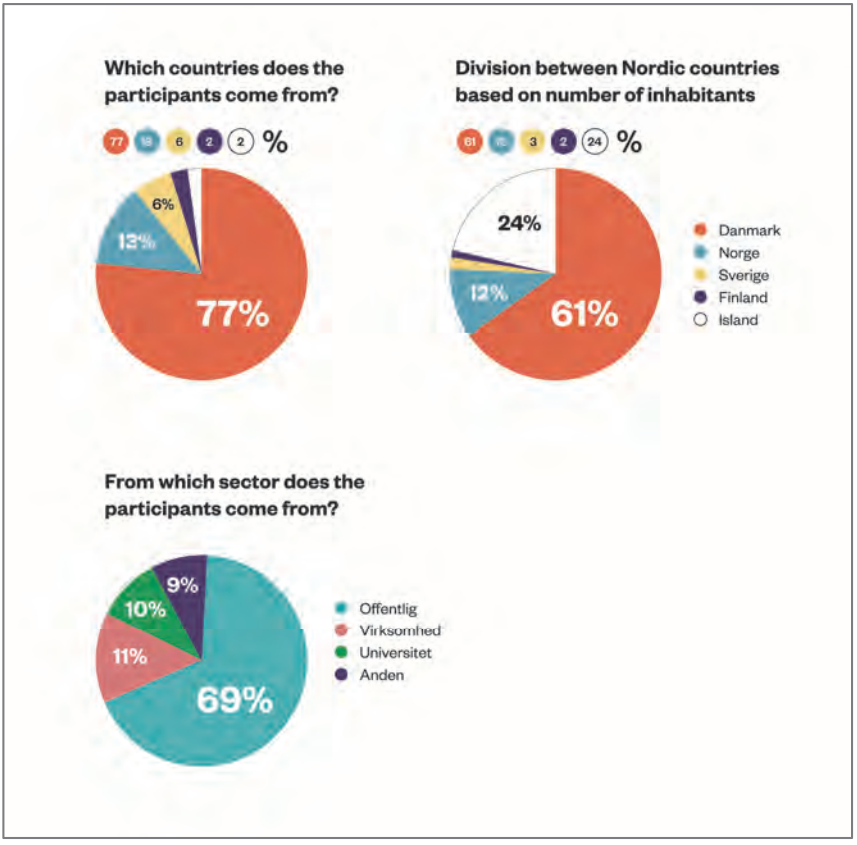
5.1.6 Marketing the NIW Network

The three themes were marketed separately in the Nordic countries by means of newsletters by mail, pamphlets in both English and a Nordic language and at a number of Conferences. The idea was to market the network through existing channels at the difference Nordic Centres for Assistive Technology. However, during the project period two of the Nordic Centres were merged into the national Social Ministries and in Finland and Norway, the area of assistive technology was organized into other Centres. Therefore, the marketing effort was challenging.

5.1.7 Results & Feedback

The first theme "Cognitive Support Using New Technology" went online December 2011, and was marketed actively in June 2012. In December 2012, the following participant statistics were carried out:

Platforms Change of the NIW Online Networks



Based on the findings within the first half of the project it was decided to move the online platform from an in-house configured and administered CMS platform called Tangora, to LinkedIn Groups.

The decision was based on the following findings:

- Limited activity in the themes – exchanging knowledge, presenting project findings to each other etc. A lot of people joined the network, but were more interested in achieving knowledge rather than sharing their own knowledge. It was not easy to activate them.
- A barrier for the participant was that they had to learn how to use the templates for posting knowledge on the online platform.
- Stagnating number of new participants.

Many professionals moved from the use of PC based Internet, to the use of mobile devices for networking, and there was a strong trend towards using social media for sharing knowledge, especially on-the-go through mobile devices such as smart phones and tablets. The feature of supporting mobile devices was not available on the CMS platform when we started and configured the NIW network, and it was expensive to update the platform for responsive design which supports a variety of mobile platforms.

Migration of the networks on the CMS platform to the other secretariat after the project period ended would be difficult and expensive. The NIW networks are able to continue on LinkedIn after the project finishes. This involves no license fee and no expenses when moving responsibility to other owners and managers, as well as no direct expenses and work when updates are necessary.

A LinkedIn group construction was chosen. The secretariat was owner and manager of the main group NIW, and owner of the sub-groups containing the themes, where the theme leaders are group managers and moderators. The secretariat handles all participants in all NIW groups, all activity on the main group, and support of the participants and activities in the sub-groups.

5.1.8 To what degree have the objectives of the project been fulfilled?

In general, the lesson is that it requires a longer time to establish and spread an online network than anticipated; especially when it is across national borders with language barriers, and where the context, understanding, terminology and national strategies are somewhat different in regards to the concept of Welfare Technology.

Initially, it was the intention to start up one to three themes per year but within the time frame it was only possible to establish one theme per year. Finding the right theme leader, get the organisation behind to support, and agree on the specific theme content and title, required much more time and work than anticipated. Hence, it requires a full year to get one Nordic theme started up, and it took a lot of hard work and focus to recruit and activate participants. In addition, it was difficult to utilize and integrate a coordination group of high profile and experienced generalists and experts.

Also, the requirement of voluntary commitment and participation from the various organisations supporting the network with resources for moderators is a challenging task which should be addressed in similar projects going forward.

Naturally, in a network with such a wide geographical coverage as all the Nordic countries, it is not easy to get people meeting with each other as the financing and time required is not available in the project. So from the initiation of the project it was not planned to have physical meetings between the participants of a theme. It is a barrier for networks if people do not meet, which can be one of the reasons why the start has been slow. However, as time goes by, this requirement may be less important, and we can see in the final year of the project, that participants are more familiar with sharing information online without having met in real life initially.

The user interface was originally planned to be Nordic, but we experienced early that this was not viable if we wanted to get participants from all Nordic countries involved. So, we changed to English and allowed for everyone to write in English instead of their own Nordic language, using the automatic Google browser translate plug-in to translate into a native language when required. When moving to LinkedIn groups, the user interface is following the participant's own LinkedIn settings. In LinkedIn, par-

ticipants are still encouraged to post their news, reports, events, ideas and concerns in both English and Nordic languages, and there have been no complaints about this approach. On the marketing side, all folders and other material have been made available in both English and a Nordic language (language depending on the theme leader's preferred language).

In the following, please read to what extend the objectives of the NIW project have been fulfilled:

- To create synergies between the Nordic research and innovation communities, businesses and the practice field.
  Outcome: Some synergies have been created across the Nordic countries on the three established themes. However, it is mainly participants from the practice field that have joined the themes. It has been a challenge to reach the knowledge environments in two of the Nordic countries and in general it has been a challenge to get companies on board from the beginning, even though there is a potential for building up business based on the connections and activities in the themes. As we understand some companies we have talked with, they are reasonably small size companies that are not yet using social media like LinkedIn groups for business development. But this is expected to evolve and thereby change within the next couple of years.
- To create a thematic overview of national and Nordic initiatives and new welfare technology solutions.
  Outcome: By changing the platform, it was accepted that the documented overview is going to be limited compared to the outcome using the previous CMS system, because the facilities of collecting knowledge in a structured form do not exist yet in LinkedIn groups. However, we expect the final theme reports from the theme leaders at the end of the project period to give knowledge on the field of the theme and list examples of important initiatives.
- To increase opportunities for joint Nordic innovation and development environments and projects.
  Outcome: Established groups with specific themes of welfare technology containing participants from all Nordic countries and the target groups, is a foundation where the participants can find other relevant project- and business partners. In addition, the most active participants are very

visible to the rest of the group, increasing their own network of relevant connections within the field of the theme. We believe that e.g. the much used sharing of knowledge like project reports and conference papers, both nationally and especially across the Nordic borders, have a positive influence on the knowledge foundation among the participants, where the high number of people from the public sector achieve knowledge to base their own new projects on, preventing or reducing the risks with the already know experiences from other projects.

- To provide a framework for strategic joint Nordic innovation initiatives and projects.
  Outcome: In the setup with LinkedIn groups, it is up to the participants to use the network for identifying relevant stakeholders for future innovation strategy and projects. The moderators can be catalysts in the process, but LinkedIn does not provide facilities for sub-sub-groups or other constellations within the same theme group. So, most likely, initiatives will be invisible to the group or in another communication forum, between participants who find each other through the groups.
- To raise the profile and positioning Nordic innovation on welfare technology in Europe and abroad.
  Outcome: In the long run, the significant group within these widely known specific fields of welfare technology are visible and an important source of information and sharing of important results, which is already being seen outside the Nordic countries.

Moving from a dedicated CMS online platform to LinkedIn groups was a key to the success of the NIW network themes, and it should be carefully considered for similar networks in the future as familiarity of a platform is important for the user experience, and is more encouraging for activity as the environment is safer for the participant.

There are no comparable constellations with both a common welfare technology network and various theme networks covering specific topics. This new solution was initiated as an experiment to meet an increasing demand for sharing knowledge and finding peers within these important themes across the Nordic borders. There are many experiences, experts and a lot of research which are hard to find and which could improve the success of local projects and products.

During the project period, it became clear that in the Nordic countries there was a growing interest in both the common understanding of the term welfare technology and in the national initiatives, both economically and politically. Even though it has been a hard and long "birth" of the NIW, the theme networks and the general network have shown that there is a strong demand and need within at least the Nordic countries to connect and share news, ideas and knowledge of welfare technology. The project finished at the end of May 2014 and had more than 900 participants in NIW, whereof approximately 500 are in the first established theme: *Cognitive Support Using New Technology*, which indicates that it is possible to get a significant part of the Nordic experts working within such a relatively narrow field of knowledge to connect and share knowledge. New participants are joining NIW every day, and there are activities every week.

5.2 The University College of Northern Denmark

University of Northern Denmark is the leading and coordinating institution for the NordRoad Project. UCN and the following partners: University of Tromsø, University of Umeå, University of Turku and NIW (Nordic Innovation on Welfare Technology) have all shared the work and participated in research and work seminars under the NordRoad Project.

In this chapter, we present a model to evaluate welfare technology on the basis of Nordic overall value.

5.2.1 Background of the Project

The development and use of welfare technology for the health sector have been increasing in recent years in the Nordic countries. This is partly due to society challenges in relation to health, where especially larger populations of elderly people and increase in citizens with chronic illnesses are major challenges, in combination with a shortage of resources.

Technology offers several opportunities to counteract and support these challenges, and currently several experiments with such technologies – which are called welfare technology in Nordic Countries – are carried out.

The current situation can be described as a state of flux, with various experiments and rapid technological advances. Several different types of technologies are being explored under the headline of "welfare technology" ranging from artificial limbs to cleaning robots, computer training applications, communication tools, home monitoring technology (cf. reports).

The rapid development of new technology and the need for the Nordic countries to support health professionals in their work creates a challenge for proper and knowledge based implementation. It is difficult to get an overview of technological possibilities, and especially difficult to follow and understand advantages and disadvantages of the various technologies.

This makes it difficult for decision makers to understand and decide what technologies to support and implement. For educational institutions training health care professionals such as nurses, physiotherapists, occupational therapists, midwives etc., it can be difficult to understand and decide what technologies to include in training programmes and curricula, and to pinpoint exact core competences for future health care professionals.

For this reason, four Nordic educational institutions have gathered in a project, with the ambition to take stock of the current status of Nordic welfare technology. Our shared task is to identify current practices and point out directions for future adaptation and use of welfare technology in the Nordic health sectors. Nordic cultures differ and people's preferences differ – our ambition is to define a roadmap that describes user-driven solutions in the field.

5.2.2 Setup for the Evaluation Model

One aim of the NordRoad project was to develop a model for evaluation of welfare technology from a Nordic user – and relational perspective. The model was to support the analysis of the scenarios produced in the project and facilitate drafting of the roadmap. However, in our discussions on the model several questions were raised, and the development of a new model appeared to be more difficult than first thought. We experienced the complexity of welfare technology. Before we could develop the model further we had to establish a common ground of knowledge and understanding of the phenomenon.

This report is a description of our initial thoughts on the model and of some aspects of the common ground of knowledge and understanding of welfare technology. We also suggest areas of future research and education.

The structure of the report is as follows: first we describe the questions raised in our discussions on the model. Then, we present some aspects of current Nordic welfare policy and the functions of welfare technology within this. Thereafter, we present some dimensions we believe would be of importance in a model for evaluating welfare technology from a Nordic user- and relational perspective. In the last chapter we describe areas of future research.

5.2.3 Three Questions on Welfare Technology

What is the difference between welfare technology, telemedicine, telecare and e-health? Is welfare technology a new phenomenon or a particular version of e-health?

This was the first question we encountered in our discussions on the model. We found no principal differences in the political justification of these technologies. Governments in the Nordic countries are facing rising demands and pressures for cost containment (Nordic Centre for Welfare and Social Issues, 2010). Low cost and routine ICTs promise more efficient use of resources and improved quality of services (Halford *et al*., 2010). These technologies may be used to develop "telemedicine" services offering remote access to specialist services (May & Ellis, 2001); information systems enabling faster communication, independent of location, and large, flexible databases (Hartswood *et al*., 2003); "telecare" where monitoring devices allow remote supervision of vulnerable people in their own "smart" homes (Barlow *et al*., 2007) and/or welfare technologies that supports individuals to master their own lives and health better, based on their own terms (Nordic Centre for Welfare and Social Issues, 2010). In short, the term welfare technology is relatively new, but it joins the ranks of other terms with slightly different orientations such as telemedicine, telecare and e-health. They all describe technological solutions that individuals can use in order to increase self-management, social participation and quality of life. A "next of kin" perspective and a service dimension are included in the descriptions (The Norwegian Directory of Health, 2012).

The second question we asked was *what the model of evaluation should be used for. Should it be used to guide implementation of new welfare technologies or to measure the effects of those already implemented?*

Experiences from telemedicine, telecare and e-health suggest that both implementation and measurement have proven difficult. The technologies have considerable policy appeal, but delivering the promise has not been easy (Aanestad & Olaussen, 2010; Pesola, 2013) and the history of healthcare information systems reveals far more failures than successes (Greenhalgh *et al*., 2009). Various explanations are put forward, but it is widely accepted that particular outcomes depend on the interplay between technologies and users and are made in the everyday conduct of healthcare work and organization (Halford *et al*., 2010). Introducing ICT initiatives into healthcare may "disrupt" established organizational arrangements, professional work and patterns of work organization which may create resistances toward the technologies in the field. However, lessons are learned from experience. In policy documents on welfare technology, it is emphasized that organizational issues need to be taken into consideration in implementation processes: "Implementation of welfare technology assumes a corresponding focus on service innovation" (The Norwegian Directory of Health, 2012; 11). In the research literature there has been a growing interest for assessment of ICT in healthcare (Petter *et al*., 2008). Models have been developed for understanding the workability and integration of complex interventions in healthcare such as The Normalization Process Theory (May and Finch, 2009) and for more narrow evaluations of the clinical or economic effectiveness of the new services (Tunis & Turkelson, 2012).

The third question discussed was: *Who are the users of welfare technology*?

Welfare technology may ensure that individuals in need of healthcare services can stay at home longer and thus postpone moving to a nursing home for a short or long term. The technologies may be used to improve quality of existing services, contribute to a better working environment or the creation for new ways of cooperation between the healthcare sector, communities, families, voluntary, non-profit companies, academia and industry (The Norwegian Directory of Health, 2012; 11). This makes the

term "user" problematic. A user of welfare technology may be the client, clinician, a family member or a healthcare provider.

That the "user" should not only be associated with the end users – those who use the software to perform work tasks and other everyday practices – is recognized within current research on advanced information systems too. Information systems have matured and attention is directed toward continuous maintenance processes of the systems (Johannessen, 2012): including, for instance, end users' role in shaping patterns of use. This research makes two key points. First, while earlier research has suggested that the end users of the systems should be allowed to modify them to own local practices (cf. Berg, 2001), seeing this as a precondition for successful integration of the systems, current research suggests that this may disrupt collaborative work practices, information flows across the organisations, planned organisational changes, and data security policies (Johannessen, 2012). A consequence of this is that organisations that are dependent on their systems must introduce stricter controls with end user use of the system. It is this control aspect that makes managers, system tailors and others involved in the everyday maintenance of the systems key to using these systems.

5.2.4 The Nordic Welfare Models and the Multiple Functions of Welfare Technology

The Nordic countries are characterized by their small populations and a high degree of cultural homogeneity in terms of language and religion. The countries are recognized by their social and economic models that include support for comprehensive social security systems, institutionalized social rights, solidarity, and a competitive economy. The goals are to promote individual autonomy, social mobility and equality, flexible and adaptable markets through high level of taxation and labour force participation, gender equality, extensive benefit levels, and dialogue between labour market parties. The governments play a dominant role in the formation of these social and economic models, and in the development of an extensive public sector for the implementation of the social and economic policies (Kautto *et al*., 2001; Hole *et al*., 2006).

However, the global economy, European integration, demographic change and international migration, change in class structure, ideological and political change have put pressure on core values of the Nordic countries and welfare societies. In order to compete in the global economy and maintain social cohesion, the models have to be refined (Hole *et al*., 2006; Alestalo *et al*., 2010). A strategic action to meet the current economic, social and cultural conditions surrounding the Nordic countries is welfare technology (Nordic Centre of Welfare and Social Issues, 2010). The expectation is that if the technology is well integrated into work practices and/or the everyday life of clients, the quality of public services will be maintained or increase while public expenditure is reduced. With support from welfare technology, people will be able to manage on their own, human resources will be used more efficiently and the physical workload for healthcare professionals will be reduced. Despite the large demographic changes, care for elderly people will be guaranteed. In the near future, the number of senior citizens will increase at the same time as the working generation decreases. Last, but not least, welfare technology may also open the way for major industrial development.

5.2.5 Nordic Model for Evaluating Welfare Technology

Welfare technology is one solution to current challenges which governments face in delivering public services. The challenges and the solutions are described in general terms. In order to measure its effects, make informed decisions on investment in welfare technology products, and motivate clients to install them in their houses, the terms have to be operationalised. The model for evaluating welfare technology from a Nordic user and relational perspective is one way of doing this. The model represents a practical approach to evaluate welfare technology that is used in the Nordic region or when to consider if it should be implemented.

The Nordic welfare model is characterised by universalism, emphasising a high degree of labour force participation, gender equality, egalitarian and extensive benefit levels and wealth redistribution, and liberal use of expansionary fiscal policy. The welfare model aims to enhance individual autonomy, promoting social mobility, and ensuring the universal provision of human rights, as well as for stabilising the economy (Esping-

Andersen, 1990). These characteristics mirror general cultural specifics of the Nordic culture (Hofstede, 2001). Nordic people are generally individualistic combined with predominantly female value sets, thus generating a caring and welfare-oriented society. Power distance is relatively low in tune with the very flat structures in companies and organisations, and uncertainty avoidance is similarly at a low/medium level, meaning that populations like variation and do not try to control the future and have less anxiety.

To ensure that the basic values of the Nordic welfare state and culture is represented in the new services made possible by welfare technology, the evaluation model should be sensitive to these values. The model should disclose how elements of Nordic culture and welfare models interact with the welfare technologies in use or available on the market. In our initial discussions we found four dimensions that connect with these values and that might be key measures in our model: Human Value Added, Cost Efficiency, Connectivity and Ease of Use.

Human Value Added

With human value added we mean the product's ability to increase a user's life satisfaction. It could for example be how the product influences personal pride of the user and what effect the product has on individuality and independence. Human value added can also concern the influence of relationships and other aspects of more physical wellbeing.

Cost Efficiency

Cost efficiency refers to the product's ability to increase profitability over time and to reduce cost per user and/or service event. The product could for example affect labour saving procedures, institutional investment, energy consumption, maintenance costs or have consequences for contact and care hours.

Ease of Use

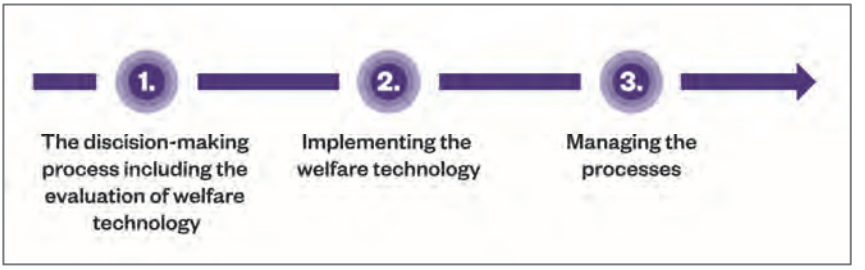
Ease of use is the product's level of usability to different end users. It could for example represent how easy it is to use for residents at a care centre as well as for care staff and relatives. Ease of use can also encompass other decision makers as for example local system tailors and how easy it is to replace the equipment when needed.

Connectivity

Connectivity refers to the products capability to produce an interactive and meaningful connection between the user and care personnel or other significant people. For example, improvement of resident/staff communication, resident/family communication, resident/friends communication, resident/authority communication, or even resident/media communication.

Welfare Technology –"Handle With Care"

Design, implementation and use of welfare technology are comprehensive tasks. Components of the complex processes involving welfare technology are illustrated by the figure:



The term welfare technology joins the ranks of several others that have been promoted by governments in the Nordic countries to solve challenges related to efficiency and quality in delivering public services. Much has been written about earlier initiatives, and a Nordic Model of evaluation should be positioned within this. In order to get an overview of the existing research literature we suggest a literature review to be conducted of existing models of ICT evaluations. We also suggest empirical studies of welfare technologies in use to be carried out. The literature review and the empirical studies contribute to building blocks in a common knowledge base in welfare technology. Further development of a model must run parallel with the development of a knowledge base that is also valuable for developing curricula and teaching modules in welfare technologies for students at Bachelor, Master's and PhD programs in the Nordic countries.

The Nordic Centre for Welfare and Social Issues recommends collaboration between the Nordic countries on welfare technology (The Nordic Centre for Welfare and social issues, 2010; 4). According to the Centre, the

Nordic countries are at different levels as regards to both attitudes to technology and the will to provide funding to test it out. The Centre sees potential for learning from each other and setting up stronger Nordic cooperation in this area than currently exists. Knowledge and competence are needed to exploit the technology that already exists. Knowledge and experience sharing are areas that would be useful and suitable for Nordic cooperation in the future.

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5.3 SLU Holding – SWEDEN

5.3.1 Students as an Active Support Resource in the Commercialization Process – Students Desktop Researchers

Innovative student – TTO (Tech Transfer Office) collaboration creates win-win situations in technology transfer.

Executive Summary

At SLU Holding AB (Inc.), the venture arm and technology transfer office at the Swedish University of Agricultural Sciences, students are employed to be engaged in collecting data and the preparation of investment cases. Through desktop research students collect information supporting our evaluation and decision-making process. Under guidance of our Senior Business Advisors the students perform initial market surveys, competitor analysis, investigate new trends and other tasks.

Using this concept, SLU Holding AB (Inc.) can allocate its resources in a much more efficient way. At the same time the students gain insight on relevant market players and dynamics and consequently future entrepreneurial and employment opportunities. Additionally, besides an hourly wage the students learn about e.g. project management, quantitative and qualitative desktop research as well as "entrepreneurial thinking".

The students are part of our overall innovation support team and become ambassadors of innovation and entrepreneurship spreading the word to their student colleagues as well as teachers. The university becomes more attractive as it adds a valuable element besides education to its current offers to students.

Background

Like most TTOs, SLU Holding has limited resources and has to develop ways and processes of efficient resource allocation. The concept Student Desktop Researcher (SDR) is a practical and cost efficient solution to integrate students' creativity, energy and brainpower in general tech transfer processes.

The first thoughts on the SDR concept arose when we realized that there is always a need of initial market research in the early stages of commercialization where "good enough" is sufficient in order to get a first

overview of the market situation. In 2010, SLU Holding started a program where students get the opportunity to work with web-based market research and other information gathering as a sideline to their studies, so called Student Desktop Researchers (SDR). As the name implies, the work tasks are primarily performed by gathering information online, but also by using other resources available, like a university library.

Since 2010 the SDR concept has developed in size and scope and more than 45 individual projects have now been completed, from market- and product specific surveys to investigations of current phenomena or developments in the tech transfer realm. Currently there are more than 10 students enrolled in the pool of SDR co-workers. They represent a dynamic group with various academic backgrounds including food agronomists, garden engineers, an animal agronomist, business students, at both undergraduate and master's level. Students get paid like any other extra job and get relevant work experience as well as an opportunity to put their academic knowledge into practice.

The Setup

The students are employed by the hour and are part of the team at SLU Holding with its senior staff guiding the students in their work. A work pool of students has been established in order to provide flexibility and efficiency – competence matching as well as reliable delivery of results when the commercialization project requires quick action. Students from different schools and departments are recruited using recruitment procedures with an emphasis on personality, attitude and the person's ability to integrate in the team.

It is important to point out that studies still remain the first priority and, as a result, the SDRs work a few hours per week. The SDRs are supervised by the senior business advisors at SLU Holding, who formulate and define the research scope and questions and provide suitable templates for structuring and presenting their work.

Examples

One of the first SDR cases was done by a agronomist student helping a company called Nature Assisted Health Care (Inc.), founded by SLU researchers and one of SLU Holding's portfolio companies. NAHC has developed a research based rehabilitation method for individuals suffering from a number

of stress related diseases. Nature assisted therapy is defined as interventions that aim to treat, hasten recovery, and/or rehabilitate patients with a disease or a condition of ill health, based on the fundamental principle that the therapy involves plants, natural materials, and/or the outdoor environment. The company was looking for partners for collaborations, and the SDR task was to find suitable candidates. The outcome was a list of European companies which has served as a basis for NAHC in deciding which companies to approach for commercial partnerships.

Examples of other SDR projects include initial market research for new business ideas supported by SLU Holding, e.g. competitor analyses, identifying market barriers, literature searches or writing summaries of political reports etc.

Results and Feedback from Students

> "This work leads to interesting insights into the world outside the university, and provides inspiration for my studies."
>
> (Maria Kjellander, SDR at SLU Holding).

The response from the students involved has thus far been positive. Many feel that the opportunity to think and work independently is a great complement to the more fixed academic courses. However, the most positive long-term impact is that the SDR program makes the students more aware of the possibilities, opportunities and aspects of starting and running a business. The SDRs are a part of SLU Holding's long-term strategy of creating a positive entrepreneurial culture at the University. SLU Holding's initiative has attracted great interest and response from teachers as well as from University management since it promotes the interaction between education, research and innovation. Furthermore, SLU Holding's concept for student collaboration is currently implemented at its counter-part at Uppsala University, UU Innovation.

One student, who was hired as an SDR in 2010, is now a full-time employee. The SDRs are also working for the university on broader tasks and are currently helping the Senior Collaboration Lecturers in their community engagement activities.

5.3.2 TRAMPOLIN – Entrepreneur Development Program and Teaching Developing Methods

Background

SLU Holding works actively to promote a positive attitude within academia towards innovation and entrepreneurship. In 2010 and 2011, SLUH was granted money from Tillväxtverket (Swedish Agency for Economic and Regional Growth) and their program Promoting Women's Entrepreneurship to run two projects: one focusing on female newly dissertated doctors, PhD- and undergraduate students showing alternative career paths, and one focusing on implementing the knowledge triangle and the understanding of entrepreneurship and entrepreneurial learning within academia.

The Setup

Since the start in 2010 two entrepreneur development programs have been completed. Female students, research students and newly dissertated doctors from all parts of the university have been invited to the program free of charge. The first year, the program was very compact, whereas the second program was able to adjust to the actual learning process, with more individual tasks and time for reflection. Nevertheless, the students were exposed to the same basic ingredients: IPR, business development, financing and economy, law, leadership, board of directors – work and duties, etc. The education form has been seminars, workshops and coaching. The students have been working individually or in groups with business ideas of their own supported by the innovation office and external partners in developing the ideas. Six workshops have been carried out to support the students in the development of themselves as entrepreneurs and their business idea. The themes of the workshops have been: Introduction (From Idea to Business Idea, Business Model Canvas, Professor's Privilege and IPR); Business Ideas and IPR (NABC, IPR); Commercialization – Business Plan; Financing; Customer Focus (Market Research, Sales and Marketing); Economy and Law.

To influence academia and current curricula regarding the implementation of the knowledge triangle is a delicate task. Making changes in the direction of academia regarding curricula takes a long time and a strategically wise approach is necessary. Therefore efforts to suggest changes must come from other directions. In 2013, SLU Holding has arranged a

course in entrepreneurial learning targeting teachers interested in developing their pedagogic skills. The course was arranged together with an external consultant named Me University that has several years of experience of training teachers to teach in a novel way.

Entrepreneurial learning is a process-oriented pedagogic form to structure the education around the students as individuals or in groups. The purpose is to stimulate the student's attitudes and inner abilities to liberate their potential. The purpose of the course has not been about how to start a company but how to help other people (students) to see their inner abilities and strengths and to actively translate these into practice. It is all about, as The Swedish National Agency for Education says, "[…]developing curiosity, self-reliance, creativity and the courage to take risks." It also means to "seize chances and changes and to develop and create value – personal, cultural, social or economic."

The setup of the course has been to be very interactive and focused on giving participating teachers actual tools customized to the individual teacher's individual teaching situation. Through workshops, the teachers together with a process leader have discussed different situations, sharing experiences that will help the pedagogic take steps towards entrepreneurial learning. During spring 2014, the plan was to offer participating teachers one-on-one coaching to further help them to apply the ideas of entrepreneurial learning in their own educational habitat. After a period of individual practicing of the method in live situations the teachers meet up together with the process leader to collectively share experiences and to get guidance from each other. The purpose of this is to create a positive pay-it-forward culture at the university. Representatives from the Centre for Educational Development (UPC) at SLU has also taken part in the workshops, as a way to see if the course could be part of the regular program for competence development for employees.

Results and Feedback

SLU Holding's approach to make a difference regarding attitudes towards entrepreneurship at the university is to broaden the perspective of what an entrepreneur is and what general abilities can be identified, and to let teachers develop their pedagogic skills in the subject instead of trying to go around teachers to make changes in curricula. Regardless of where the students end up after university, private or public sector, society will al-

ways benefit from people – entrepreneurs or intrapreneurs – using their abilities positively and creating values.

Our two entrepreneur development programs had a remarkable difference in size of groups. Our first program was a small group and they founded their internal network very quickly which led to a high rate of attendance as well as active participation. In our second program the group was much larger and rather quickly we could notice a smaller group network forming within the big group, which had a remarkably higher attendance rate and engagement in both their own journey as well as in inspiring other group members.

Our second program was also going on for a longer period of time, which we thought would make the learning better and the network stronger. In a dialog with the participants we came to the conclusion that the theoretical approach was appropriate but that it failed in practice due to external factors in the lives of the participants. Finding a balanced mix of inspiration, realistic role models, basic knowledge and platforms for group discussions are essential parts of an entrepreneur development program.

The biggest benefit of the course for teachers was that the participating teachers, most of them already strongly positive to innovation and entrepreneurship within academia, found other like-minded people and a platform for developing their thoughts and putting it into both words and action. The course centred somewhat around theory and for the roundup of the course the focus was changed even more strongly to focus on action and examples of concrete tools and methods for the students. The teachers expressed a high interest of developing these themselves but were also concerned that they would not find the time to do so.

5.3.3 Akreuts AB (Inc.) – Market Pull for Student Competences

Business Idea

Akretus is a student consulting company which provides services based on the competences of SLU's students to the private sector. With a large pool of motivated and highly qualified students, Akretus can deliver a broad spectrum of high-value, yet cost-effective services. The pool of consultants include:

- Landscape architects.
- Veterinary students.
- Business students.
- Agronomists, etc.

Customers range from small- to medium sized companies in the green sector, to private house owners and housing cooperatives.

Background

Akretus stands as a great example of a venture opportunity derived from a market pull of knowledge and resources. Akretus was founded by SLU Holding AB (Inc.) as a wholly owned subsidiary. SLU Holding has identified a market opportunity through a well-defined process including market analysis and involving key players such as teachers, students and regional companies.

Akretus started in the segment of landscape architecture, providing services, e.g. garden design, to home owners and housing cooperatives in Uppsala and Stockholm. The operations later evolved to include business students and veterinary students who delivered market research reports to external companies, as well as expansion to Campus Alnarp. The vision of Akretus is to have operations in all of SLU's four campus regions and to include the majority of the study programs.

Setup

Akretus is set up like a traditional consulting firm, with the competitive advantage that services offered are wider in scope than many other firms and also that Akretus can take on projects that are smaller in scale. Interested students register their resumes at Akretus webpage and, after a selection process, get appointed to a specific project based on their competence and time available. For larger projects, students work in teams to deliver on time.

Akretus provides an opportunity, exclusively for SLU students, to get valuable and relevant work experience during Bachelor or Master's programs. Akretus is also a great starting point for building a network, since students get in contact with several clients.

Furthermore, many of SLU's students will work as consultants when they have graduated. For them, Akretus provides hands-on training in project management and a platform for developing their entrepreneurial skills. Moreover, the job also allows for valuable insights into the challenges of selling and delivering services.

For the University, Akretus is an additional channel for spreading academic knowledge to a broader public and indirectly helps marketing of SLU programs.

Examples

- *Landscape Architecture*
  A large company in property rentals contacted Akretus to get help with redesigning the entrance area for a commercial building. Within two days, Akretus consultants met with the company manager and visited the place, where the consultants identified many technical aspects and difficulties never thought of by the client.
  The consultants are currently working on a plan which will improve the attractiveness of the building's customer entrance with design and suitable plants as well as solving accessibility issues and previous problems with rain water.
- *Business administration and finance*
  A small R&D based company needed temporary and complementary business support. Akretus' consultant had a video conference with the project manager at the company who explained their situation. The

small company had been approached by several interested customers but did not have the time or resources to catch up with the financial calculations needed. Akretus helped the company in collecting all information needed and also designed a template to be used when writing and calculating offers. In that way Akretus helped the company in securing its first customer by providing solid financial calculations for its operations.

- *Veterinary Medicine*
  A veterinary practitioner and entrepreneur turned to Akretus for help on a new service. The entrepreneur needed qualitative and quantitative data on the need and demand for the new service. The Akretus consultant, a veterinary student, helped the project in formulating a survey, the dissemination plan as well as collecting and structuring the answers. The survey generated 500 answers from pet owners and 80 from clinics, an impressive response rate of 80 and 60% respectively. Akretus' cost effective services were of essential value to the entrepreneur in the validation and service development process.

Results and feedback

Statements from students and customers:

> "The jobs I've had have been very diverse and exceptionally fun to work with. The customers have been very interested and kind. It's been very valuable for me that it is possible to work and study at the same time. There's always some job I can take on so I consider this a unique opportunity."
>
> (Nejra, Master's Student, Landscape Architecture).

> "Working at Akretus can be summarized into three points: a flexible job which can be combined with studies, secondly it is a perfect way to use the theoretical knowledge from the university in practice and, last but not least, you will get a network for the future."
>
> (Erik, Master's Student in Business administration).

"I had a meeting with one of the consultant where we told her about our wishes for our garden. When we later got the design proposal, she had captured our thoughts completely and presented them in a way that was far beyond our expectations. It was very well invested money."

(Magnus, costumer and house owner).

5.4 Nordtek Network of Welfare Technologies

The societal challenge induced by the demographic change over the next decades has gradually become common knowledge, but it also holds new opportunities for innovation and entrepreneurship – the core concepts of the knowledge triangle, which defines the basis for the Nordtek Network of Welfare technologies. A challenge that impacts all levels of our society – from education to businesses. The old-age dependency ratio is a single and very descriptive key factor that pinpoints the challenge. In particular for the Nordic countries the challenge is even larger than the EU average, as public spending on care systems is proportionally higher, due to our welfare systems and social support.

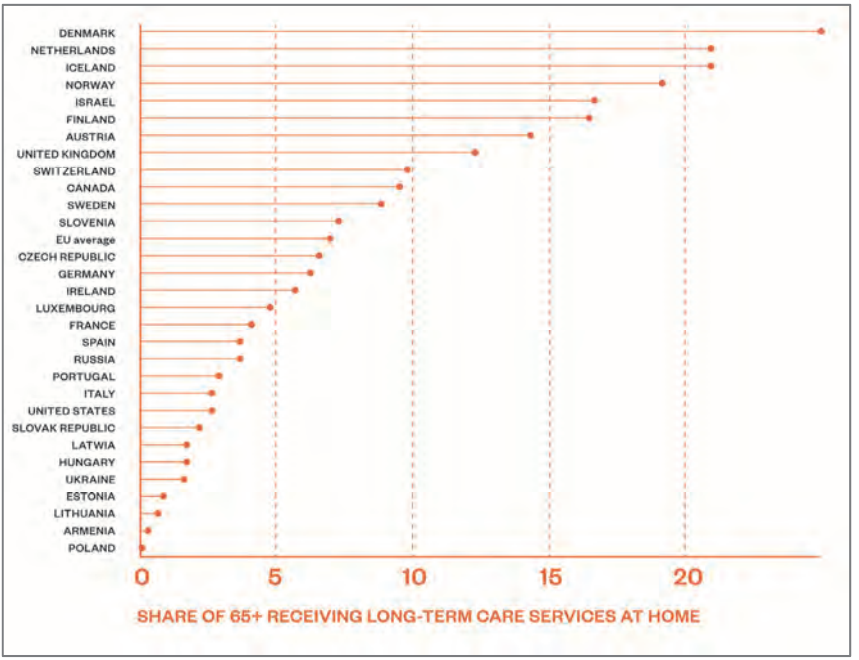

Photo Credit: Nordtek Network of Welfare Technologies.

SEQ Figure \ *ARABIC 2: Eurostat (AEGON Global Pensions)

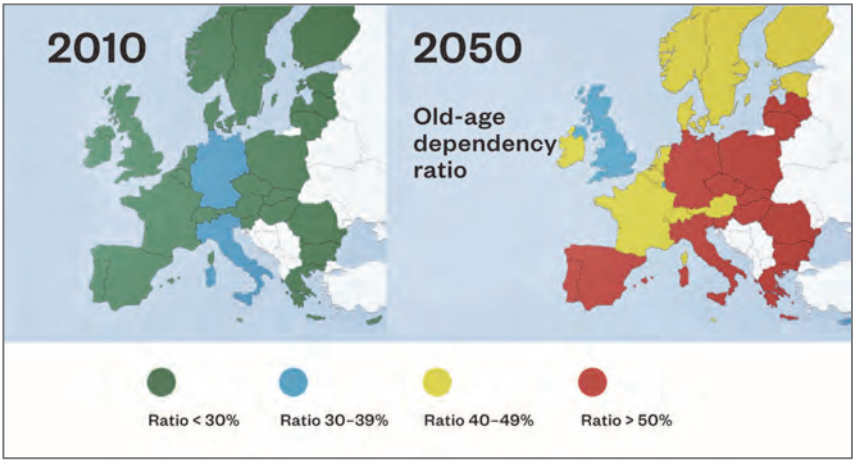

Photo Credit: Nordtek Network of Welfare Technologies.

The challenge is the motivation for the network that aims to strengthen the collaboration among members of the Nordtek network. To maintain and prolong collaboration after network funding and a secondary objective is to build Nordic platforms for the Horizon 2020 and other research programs. However, as the Nordtek network is built on educational pillars, student activities and involving students in network activities are given high priority.

5.4.1 Steering group

The network is managed by a steering committee chaired by Kasper Hallenborg (Denmark) and holds members from each of the Nordic countries: Arne Krokan (Norway), Matti Linnavuo (Finland), Rúnar Unnþórsson (Island), and Gerd Johansson (Sweden). Communication between the annual workshops is done by email, and all planning and coordination of network activities is coordinated with Peter Göranson – representing the Nordtek network.

5.4.2 Kick-off Workshop

The Nordtek Network of Welfare Technologies was launched with a kick-off workshop on 2nd November 2012 at the Danish Technical University (DTU) hosted by Jose Solér & Lars Dittmann. 10 persons from Denmark, Norway, Finland and Iceland participated in the workshop. Participants from Denmark included representatives from both public organizations and the second largest municipality of Denmark.

The workshop focused on a discussion about the concepts of the knowledge triangle and how it is applied in the Nordic countries within the domain of welfare technologies.

Furthermore, general discussion on scope of the network took place, and it was decided to focus on two tracks for the network – one track supporting entrepreneurship and collaboration among students, and one track researching and road-mapping the different approaches to build ICT infrastructure for care support and telemedicine.

5.4.3 Second Workshop

The second workshop, which would focus on barriers for entrepreneurship in the healthcare and care sectors for both innovative students and SMEs, was planned as a side-event to the AAL Forum in Norrköping, Sweden, September 27th 2013. The network applied to the conference committee and was approved as a side-event to be co-located with the large AAL Forum conference (approx. 750 participants). It could have provided unique opportunities to widen the network, and the AAL community (Ambient Assisted Living) is the target group of the network.

However, the AAL Forum decided to place the side events on the day after the conference finished, and the marketing of the side-events being collocated was very weak. As a consequence no participants attended any of the 4 side-events that were planned – and the workshop had to be cancelled in the last minute. Even though announcements were posted in relevant forums, such as Linked-In groups, etc., the boost effect of being part of a large conference was not revealed due to the timeslot provided.

The program for the workshop was planned to be initiated by invited talks – one from a SME that has experienced the barriers of entrepreneurship in this domain, and a talk of how entrepreneurship is being taught in one of the member organizations. The talks are followed by open questions that address the barriers and how to turn them into opportunities.

5.4.4 Online forum

As decided at the kick-off workshop, online tools to support networking activities, and collaborative work between students and others, should be established. A forum with web tools for rich communication and collaboration among its members that allows them not only to describe and profile themselves, but also present ideas for welfare technologies that they want to share or seek partners for further developing the idea.

The forum is built on the Mahara platform, which includes these special tools for collaboration. The platform has been launched and was announced to students and others to attract the critical number of users, which is required for such a platform to be interesting and utilized.

5.4.5 Ongoing and Future Activities

As mentioned above the kick-off workshop defined two tracks for the network to focus on, which are further described below. Each of them focusing on the objectives of the network – strengthen entrepreneurship and outlook for research collaboration in European funding programs (by road-mapping opportunities).

Along with the online forum different instruments are being investigated, which can be used to strengthen the links to students or education within the knowledge triangle, e.g. thematic summer schools, online seminars, etc.

Specific workshops are arranged to address the focus of track two. Survey and research activities to do the deeper road-mapping are done and initiated by the Maersk Institute at SDU. Part of the work is also to define a metric to compare or assess the different care systems. The different approaches within the national (health)care systems has a significant impact on the level of ICT support and infrastructure. Use of international standards is one of the focus areas for the road-mapping.

5.4.6 Track One – Supporting Student Entrepreneurship Opportunities

This track shares experiences and look into different Nordic approaches to teach and support entrepreneurship at the technical universities of the Nordtek network. The online network forum has tools to directly attract students and make it possible for them to present their ideas, and get in contact with the right persons or organizations to support further development of their idea.

The network gives rise to the exchange of students between different members of Nordtek, so presentations of educational initiatives within the area of welfare technologies and entrepreneurship from the institutions are of high importance to the network.

5.4.7 Track Two – Road-mapping ICT infrastructures for Health and Care

A global problem, not only in healthcare but for systems in general, is the development of siloed system solutions, which have serious lack of integration possibilities. On the national level of each country there are initiatives to standardize data structures and the ICT infrastructure, but there is no general approach. Even though very large international standards exist for storing healthcare data, e.g. HL7, and also infrastructural guidelines, like Continua Health Alliance and IHE, they are rarely used.

This track surveys the ICT structures and approaches used in the different Nordic countries, and share experiences to demonstrate potential improvements for better integrations of the healthcare and care systems.

Specific workshops are arranged for discussions of these national ICT infrastructures and standards used. It also roadmaps to some extent the different approaches to care in the Nordic countries. E.g. the sectoral division of the countries might be very different and it will have a huge influence on the possibilities for integration of systems across the sectors.

5.5 Nordtek Design Network

The Nordtek Design Network has been active since September 2012 and was initiated to support the creation of knowledge triangles in the area of design (widely defined as industrial design and product design engineering). The activities of the network have focused on annual seminars and the creation of special interest groups (SIGs) which have had separate activities. These are described in the following.

5.5.1 Network Management

The network is managed through a steering group consisting of five members, one from each Nordic country; Anders Warell (Lund U), André Liem (NTNU) Torben Lenau (DTU), Magnus Thor Jonson (Iceland U), and Oscar Person (Aalto U). During the first year, the steering group had three meetings, conducted on site in Lund, Copenhagen and on Skype.

5.5.2 Web Forum

An interactive web forum was set up to facilitate communication within the network. The forum, http://nordtekdesignnetwork.ni-ng.com, uses Ning as a platform. Interested people are free to become members and take part in the forum and activities of the network.

5.5.3 Network Support for Initiatives

The network supports ongoing initiatives in the following ways:

- Support by the network steering group.
- Practical organizational support for workshops or events.
- Online network social community.
- Project/SIG workshop funding.
- Mobility scholarships: Background and motivation for applying should be a focal point in the application process. Initiatives have to be planned and budgeted in terms of activities, partners, outcomes, and resources. Criteria for applying for the scholarships will be developed.

5.5.4 Annual Network Seminars

Two annual seminars have been held; the kick-off seminar for the network held at Lund University in September 2012, and the 2nd seminar held at NTNU in Trondheim in September 2013.

5.5.5 Network Kick-off Seminar, Lund University

The workshop held on 11–12 September was hosted by Industrial Design, Department of Design Sciences at Lund University. The purpose of the workshop was to build an inclusive network based on members' interests, organized in order to support the creation of projects based on the concept of knowledge triangles, involving industry, academia and the public sector to achieve collaboration between innovation, research and education. Our aim was to use a "funnel model" approach, starting with a diver-

gent explorative phase, which through collaborative activities converged into a limited number of defined initiatives.

During two days, we explored opportunities, developed a joint understanding of the purpose and activities of the network, identified projects and planned for future activities. From an open and inclusive starting point we began discussing opportunities and challenges of networking, identified areas of interest, formulated themes and finally agreed on a number of initiatives, including:

- Organizational tasks.
- Project initiatives.
- Interest groups.

18 participants attended the seminar which lays the foundation for the work of the network to come.

5.5.6 2nd Annual Network Seminar, NTNU

The 2013 Nordtek Workshop was conducted in Trondheim between the 17th and 18th of September. Around 30 academics and students from various European countries participated. The workshop was co-organized with the annual Nordcode seminar which took place 18–20 September.

After the welcome and opening remarks, the three workshop leaders, Torben Lenau from DTU, Elin Olander from Lund University, and Jeanette Løining from the Norwegian chair manufacturer Varier, introduced their tracks. The first session track lasted for 1.5 hours, dominated mainly by discussions. During the first round of presentations, each track presented the outcome of their discussions. In the 2nd session, participants of Torben's and Elin's track actively started to make sketches. The Varier track which was led by Jeanette continued with more in depth discussions around "Active Sitting". In the second round of presentations sketches and drawings were shown and presented.

Although participants and workshop leaders were encouraged to extend their 2-D visualisations into 3-D representations, they continued in the 3rd session to discuss and generate ideas using sketches and drawings. At the start of the 3rd session, the Varier group had difficulties in

consolidating their discussions. However, the following morning, they managed to give a structured presentation. The broad discussions on "Active Sitting" has made Varier more interested in becoming a partner in a research funding application on "Prospective Ergonomics". The 1st day of the workshop ended with a dinner at Credo Bistro. Some Nordcode participants also joined in.

At the beginning of the second day of the workshop, each track was given the opportunity to consolidate their work and prepare for the final presentation. During the final presentation, early Nordcode arrivals also attended the presentations. The keynote speech followed directly. In his presentation Toni-Matti Karjalainen of Aalto University, shared how IDBM students with multidisciplinary backgrounds collaborated with a wide selection of Finnish companies. The Nordtek event ended with a buffet lunch. At the same time, the closure of this event marked the beginning of the Nordcode seminar, where several of the Nordtek participants also attended.

5.5.7 Special Interest Groups (SIGs)

SIG: Bio-Inspired Design

- SIG Leader: Torben Lenau, DTU.

The Bio-Inspired Design SIG is organized by Torben Lenau at DTU. Two events of this SIG were held during 2013, as follows:

Biomimetics SIG workshop

On 21st February 2013 there was a meeting in the Nordtek special interest group on biomimetics (SIG-BID). At the beginning of the day a keynote lecture was held by Ingrid de Pauw, an eco-design researcher from TU Delft who also work with biomimetics, who was specially invited to this event. About 40 people attended this lecture. For the remaining part of the SIG-BID event there were 23 participants from academia and industry that first worked together in a workshop experimenting with biomimetic concept generation. The participants came from Denmark, Sweden, Germany and the Netherlands. After lunch a more general discussion was held on research and application challenges in biomimetics. Discussed challenges

included differences in culture and terminology, facilities for search and training in abstract thinking and visual communication of found results.

2nd Nordtek Seminar Workshop

At the Nordtek seminar in Trondheim in September, 8 people (from Norway, Denmark, Mexico, the Netherlands and Iceland) participated in a biomimetic workshop that lasted 3 x 1.5 hours. It was a hands-on workshop where the participants in four groups exercised four activities: clarification of the design problem using visual aids, search for biological analogies that could solve the problem, communication of the found design principles using biocards and finally concept generation. Everyone produced very good results and got a detailed understanding of how to use the biomimetic method for idea generation. Furthermore, the layout of the workshop was planned so that the results could be used for an investigation on the efficiency of the method, which currently is carried out in a joint Indian-Danish collaboration.

SIG: Methods in Industry

- SIG Leader: Anders Warell, LU.

As part of the intentions of this SIG, network members applied for research funding through the Vinnova programme "Innovativ Produktframtagning" during 2012. The requested funding was awarded for a project which studied the spread and implementation of methods in product development industry and involves researchers from Lund University and Chalmers. In total, approximately 40 respondents at 30 different industries, businesses and organisations were interviewed in the study, which yielded insights on the use, spread and implementation of methods and ways of working.

An innovation project initiative was launched in collaboration with the Swedish manufacturer of car seats Läreda Mekan. An industrial design student from Lund University carried out a concept generation project on new car seat systems under the supervision of Andreas Larson, Innovation Engineering, and Anders Warell, Industrial Design. The results were presented in June and will, in collaboration with Läreda MEkan, be submitted for patenting and further development. Candidates were sought through

the network of Nordtek universities throughout Sweden to source students for this project.

SIG: Creative Environments

- SIG Leader: Elin Olander, Lund University.

This SIG has had one event, a workshop held during the 2nd annual seminar. The workshop focused on exploring how our physical environments affect our creative performance, as professionals, students or in private life. Social networks, problem solving methods/processes or our cognitive ability to be creative contribute to our creative performance. However, these aspects were not emphasized during this workshop. Rather, we explored the components of physical spaces of everyday life: we reflected, discussed and created/visualized our earlier experiences but also our dreams and wishes of how our physical environment support and hinder us to be creative.

In total 5 persons plus the moderator took part in the workshop which was structured in three different sessions within one day. All participants had universities as their working environment, as either students or teachers. Each session took 1.5–2 hours and focused on analysis, synthesis, and implementation, respectively.

In the first session, the participants described themselves in terms of profession, years of working experience, size of organisation and whether they have their own or a shared working space. They also described the most creative, as well as the least creative environments where they have worked or spent time. In session two, the participants visualized their dream place for creative work. They focused on physical elements they believe they need for being creative. This exercise resulted in individual drawings and illustrations of environmental elements which enhance creativity. In the last session, the participants were exposed to a movie marketing Air New Zeeland. Afterwards they were asked to come up with additional ideas for a dream place for being creative based on connecting our common wish list from the first session and the inspiration they got from the movie. The workshop resulted in numerous insights on people's experiences of creative environments which can be explored through future activities.

Apart from this workshop, an explorative study has been initiated which maps the characteristics of student design studios at universities. Aalborg University and the Department of Product Design studios at NTNU have been visited.

SIG: Design Competences and Identity

- SIG Leaders: Torbjörn Andersson, LiTH; Charlotte Sörensen, MAH.

The purpose of this SIG is to discuss the implications and character of the variety of design educations and professional identities which arise as new design disciplines enter the professional arena. This discussion is particularly relevant for the technical universities, where programmes in Industrial Design Engineering have been introduced during the last two decades, and which reposition design in relation to established professions such as Industrial Design. A network event is planned to initiate the activities of this SIG.

SIG: Master of Design Methods

- SIG Leader: Magnus Thor Jonsson, Iceland University.

The idea is to create an executive programme for industry managers and leaders of the MBA type, which would serve to support industry leaders to successfully employ design thinking in their organisations. Discussions have commenced, partly due to the call for Nordic Master Programmes by the Nordic Council of Ministers, which regularly supports the initiation of Master's programmes.

5.6 How Does Welfare Technology Add Value to Health Care

5.6.1 Methodology

To support the identification of current situations and visions we use scenarios as a method to organize and present knowledge from current situations and create visions for the future. Scenarios are stories about people

and their activities (Carrol, 1999). Consequently, scenarios can collect and connect information about technology use in a way which supports both analysis and dissemination. Moreover, scenarios can tell stories about current practices and future visions.

In accordance with Carrol (1999) we organize analysis and creation of scenarios within the themes:

- Setting: what is the setting of the technology use? If several settings, we choose a central setting for analysis and presentation in the scenario.
- Actors: who are the actors in the scenario? If several actors, the scenario focuses on core actors central for analysis. In the health sector this means typically patients and healthcare professionals.
- Goals: what are the goals or objectives of the actors? What changes do the actors wish to achieve in the situation presented in the scenario? Caroll writes: Every scenario involves at least one agent and at least one goal. When more than one agent or goal is involved, they may be differentially prominent in the scenario. Often one goal is the defining goal of a scenario, the answer to the question "why did this story happen?" Similarly, one agent might be the principal actor, the answer to the question "who is this story about?"
- Actions: what is the plot of the scenario? What is the sequence of actions? This will include actions that actors do. Things that happen to the actors. Sometimes actions change the goals for the actors in the scenario.

5.6.2 Case Material

The area of welfare technology is overwhelming with blurred boundaries and different cultures, and a primary challenge has been to find a starting point for analysis. We build our analysis on existing cases. In order to choose cases suitable for analysis we have chosen to collect best practice examples for analysis. Eight best practice examples were studied and analyzed and shared for collective analysis among the Nordic partners via scenarios.

We shall define and find best practice examples of welfare technology by searching for technology that has been implemented or is close to implementation. We assume that technology which is (close to being) im-

plemented has been tested and evaluated positively and consequently can be regarded as a best practice example of welfare technology.

To illustrate the scenario method we will present a case example that has been analyzed through the scenario methodology.

5.6.3 Scenario – TeleHomeCare 2012

The following extracts from the literature has formed the basis for the 2012 scenarios.

Settings

The settings are the homes of the patients who have chronic obstructive pulmonary disease (COPD). These patients are representatives of a patient group with a serious health problem in Denmark. The COPD is a chronic disease and patients from this group with severe and very severe COPD have a readmission rate of 63% during a mean follow-up of 1.1 years (Dinesen 2011). In the region of Northern Jutland, Dinesen and colleagues have developed a tele-rehabilitation program for Danish COPD patients. In the study they defined tele-rehabilitation as rehabilitation between the patient's home and healthcare professionals with the support of communication and information technology. The positive result of the study has led to an increased effort for the COPD patient's rehabilitation using Tele-HomeCare technology.

The technology will be distributed in the whole region of North Jutland to patients with serious COPD. The tele-rehabilitation program involves the COPD patients, their relatives and health care professionals such as nurses, general practitioners and doctors from a health care center or hospital. Se figure 1 below.

Figure 1. The Tele-rehabilitation program (Dinesen 2011)

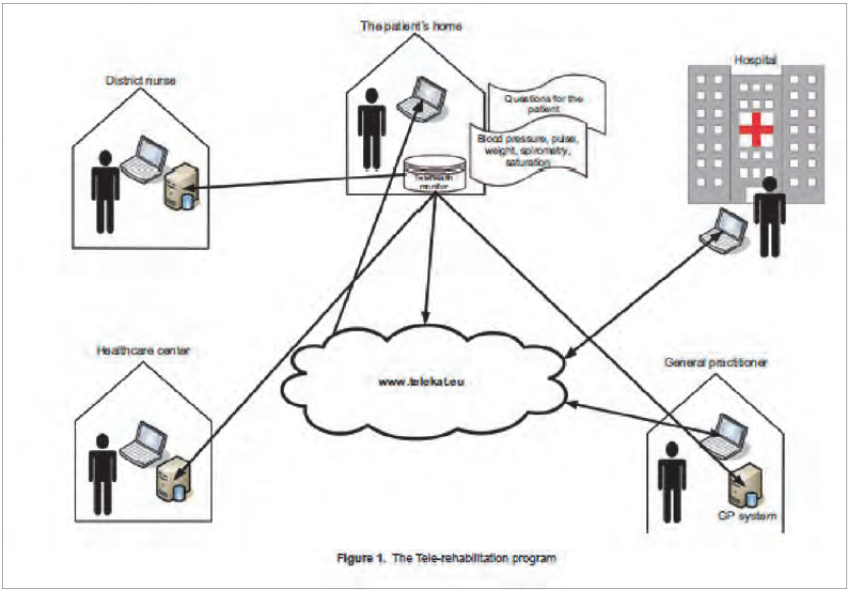

Photo Credit: Nordtek Design Network.

A telehealth monitor box is installed in the home of the patients. The box uses wireless technology to monitor and share data such as: blood pressure, pulse, weight, oxygen level, lung function etc. The data are sent via the internet network to a web-based portal or directly into the patient's electronic health care record, where trained health care professionals are able to evaluate their data. The health care professionals can then advise the patient about their daily training program which they have to carry out at home and give advice about their medication. This should prevent readmission to the hospital for most of the COPD patients. The tele-rehabilitation team will meet virtually and discuss each patient's individual rehabilitation program.

Actors

- Patients with COPD.
- Relatives to patients with COPD.
- Nurses at the health care center.
- General practitioners.
- Doctors from hospital.
- Administration municipality.

Goals

The goal for the patients with COPD is to move rehabilitation activities to their homes. They want to learn more about their own disease and how to monitor their symptoms when carrying out their daily routines at home. Furthermore, they still want the possibility to be in contact with healthcare professionals during their rehabilitation activities and daily routines.

The goal for the relatives to the COPD patients is to obtain a better understanding of how to handle life with a relative living with a chronic disease. Furthermore, they want to learn more about the symptoms of COPD to be able to provide better support for their relative.

The goals for the nurses are to be able to empower COPD patients in managing their own disease, and to avoid the patient's readmission to the hospital. Furthermore, they want to share the data from the patient monitoring with both the patients and other health care persons for the benefit of the patient. Another goal is to improve the patient's physical and mental condition.

The goal for the general practitioners and the doctors from the hospital is to prevent the patient's readmission to the hospital.

The goals for the administration municipality and the health care system are to prevent readmission to hospitals and save human and economic resources.

Actions

The actions are focused on communication between actors, especially between the nurse and the patient. Actions are based on data send back and forward between nurse and patient primarily. The dynamic of this online feedback is the positive part of the scenarios below. The information load of this data transfer is the negative part of the scenarios below.

5.6.4 2012 Telehealth Positive Scenario

Tom, who suffers from COPD, received the telehealth monitor box two weeks ago. He is now almost familiar with the technology, and he is able to measure his blood pressure, pulse, oxygen level and weight. He has received the first instructions of rehabilitation which includes encouragement to walk 10 minutes twice a day, and to make some easy exercise at home. He is instructed to monitor his pulse and oxygen level before and after he has made the exercise. He is told that he can evaluate his condition and be empowered to take care of his daily life.

The monitor box stands on a table and he has decided that he must accept this box in his living room. His wife doesn't like it so when closed she puts a nice cloth over it. But it has to be switched on to function, so they may quarrel a little about it.

Today Tom feels tired and he doesn't want to do anything but sit in his chair. He decides to contact his contact nurse via the telehome monitor box. With this technology it is possible to contact and see the nurse when talking with her via the monitor box. He tells her that he is breathless and tired and he wants her to do something that can make him feel better. His wife is at home, but he doesn't want her to help him right now. The nurse asks him to measure his oxygen level, lung function and pulse. These measurements are sent by the internet to the nurse, the patient's record at the hospital and to a record at his general practitioner.

The nurse can read his data on her PC a few seconds after he has sent them. The nurse asks if he has remembered to take his medication yesterday night and this morning. Yesterday he took his medication but this morning he forgot to take his medication because he wasn't hungry and he doesn't like to take all of his pills without food. The nurse tells him that his measurements are almost ok, but if he can eat and take his medication she will be back in 2 hours and hear how he is feeling. He takes his pills and when the nurse is back on the monitor box he can tell her that he is feeling better. She tells him that at 3 o'clock a physiotherapist will contact him with some exercises that fit his condition. She encourages him to do his own evaluation of his blood pressure, pulse, oxygen level and lung function after the exercises to learn how his biological data fits his own feeling of his health. The physiotherapist talks with him via the monitor box and guides him through the easy exercises and he can ask how to do the things

he doesn't understand. After the exercises he makes his own evaluation and he detects that he feels better and is less breathless after the exercises. He can see that after exercises his oxygen level improves and he feels better and is less tired – or at least tired in another way.

5.6.5 2012 Telehealth Negative Scenario

Today Tom is feeling good but he forgets to take his morning medication. His wife has her usual half yearly appointment for her diabetes check at the hospital. She feels comfortable about leaving Tom as he is in a good condition. She decides to go shopping after the appointment and tells Tom that she will be back in the afternoon. She leaves the home without realizing that she has forgotten her cell phone.

At lunch time Tom is feeling breathless and tired and he tries to call his wife, but a voice says "no contact with the cell phone". He becomes more nervous and this results in even more breathless condition, and he feels his heart beat very quickly. He remembers that it is important to measure his pulse, lung function and blood pressure, so he does it and writes it on a slip of paper. Now he wants to talk with a nurse via the monitor box as he has had a good experience with this before. He takes the monitor box from the table under the table cloth, but the box is switched off and normally it is his wife who starts the box. Anyway, he opens the monitor box and switches it on. But he can't remember how to call the nurse and he gets even more breathless. He tries the different possibilities and at last he sends a message to the nurse that he is having trouble to breathe. She is not by her computer so she writes back from her cell phone to the monitor box and asks him to send his data to her and she will be back at the office in half an hour. He can't remember to enter his new data in the box, so unfortunately he is sending his last good data to the nurse. The nurse evaluates the data as fine, and sends a message back that he is fine and encourages him to do his exercise. He can't understand the answer and gets even more breathless and nervous, now he wants to talk with the nurse but he is so breathless and sick that he can't remember to press the right button (Lillibridge & Hanna, 2008). He feels helpless and is very afraid that nobody will come and help him. He decides to call 112 and the alarm central sends an ambulance to the house and brings him to hospital.

After he is stabilized he is taken back to his home, he tells them that he doesn't want such a monitor box ever again as he thinks that the box caused all the failure and trouble with the result that he had to stay one week at the hospital. He is very negative about Telehome Care and tells everybody that this is a really useless piece of equipment.

The nurse who got the wrong information must acknowledge that it is important always to communicate with the patients via the face to face connection to prevent these situations.

5.6.6 Scenario: TeleHealthCare 2020

It is the year 2020, and healthcare has changed considerably because of new technologies.

Setting

- The case setting: homes of COPD patients.

It is well known that COPD patients with cognitive dysfunction are a significant clinical problem since patients have an increased need for help to the most basic activities in daily life. It is also known that they have lower compliance in the medical treatment because they often forget to take their medication or administer it in the wrong way [www.virtuellehospital.dk]. COPD patients are admitted virtually in their own home because numerous studies have shown that their cognitive functions improve considerably in case of virtual admission compared to ordinary hospitalization.

Actors and Stakeholders

- Patients with COPD.
- Relatives to patients with COPD.
- Nurses at the health care center.
- General practitioners.
- Doctors from the hospital.
- Administrative staff from the municipality.

Goals

The new technologies for COPD patients are focused on the individual's wellbeing in healthy surroundings. Innovative technologies analyze the body's level of health to secure that the disease or the aggravations of the disease are detected at an early stage. This early detection is detected due to implants that monitor the development. By using intelligent medication and using avatar technology it is possible to keep focus on the patients' health.

The goal for the COPD patients is to be more responsible for their own treatment on a daily basis – supported by new intelligent healthcare applications.

Action

- 2020 TeleHealthCare positive scenario – Denmark.

Tom was diagnosed with COPD 4 years ago. He has been admitted to the TeleHealthCare system for the last 1½ years. The TeleHealthCare system is an interactive platform which collects all relevant data concerning Tom, and it is also the platform which is used for virtual contact with health professionals. One of the important features in the system is a technology called RFID – Radio Frequency IDentification [http://ipaper.ipa-percms.dk/IDA/Politik/sundhed2020/].

RFID makes it possible to take care of the quality of the services delivered to Tom because it identifies all measurements, interventions and treatments automatically by a little chip in Tom's leg which can be read by the RFID reader. RFID tags structure the data and link them together by keeping track of the medication, the patient, the equipment, and the staff which can all help increase the patient's safety.

Overall, Tom's life has become easier because of the technology provided by the TeleHealthCare system because it allows him to focus on the things that he finds important – being with his wife, his family and close friends, and to focus on rest and activity.

Every day Tom goes for a walk with his wife if the weather is good or else he plays golf on his Wii. The Wii gives Tom the possibility to train and exercise whenever he has the energy for it and not whenever the physiotherapist has the time to come by. All data from Tom's interactive Wii training are transmitted directly to the doctor together with other daily tests. This way the doctor can assess data to see his condition and change

the treatment if needed. That part of the data with information about the actual execution of the activity is also transmitted to the physiotherapist who through the videoconference module can be in touch a couple of times during the week to guide and motivate Tom in his exercise.

A couple of months ago Tom was tired of playing golf and at the same time the weather was cold and damp outside which did not encourage him for a daily walk with his wife. The physiotherapist tried virtually to encourage Tom to play other Wii games so that he could get his daily exercise but Tom was not interested in other games. The RFID collected all data about Tom's inactivity and sent a message to his doctor to pay attention to changes. The doctor invited the couple to a videoconference where he showed an avatar [http://vhil.stanford.edu/] of Tom. The avatar was an identical copy of Tom which showed the negative progression in his situation from being active walking around and part of social life to being in bedridden 24-7 and depending on the help of others if he failed to do his daily workout. This simulation gave the couple a lot to think about and shortly after Tom began his training again accompanied by his wife who wanted to support Tom in any way she could.

During the period Tom has had the TeleHealthCare system he has only been really sick once. That was when he caught a cold which developed to pneumonia. The RFID received data from pressure sensors in the walls and floors and from a chip in Tom about his changed movements. The RFID compared these changed movements and with all the other data and informed his doctor. The doctor assessed the situation as serious and saw why a quick response was necessary. Tom needed some blood tests which the robot assistant in the TeleHealthCare system managed. The robot assistant takes blood tests using camera sensors that can reveal even the smallest veins and in addition it can also analyze the blood tests. When all the data was registered in the RFID the doctor could access all the current information about Tom. The doctor contacted Tom and his wife virtually and started the medical treatment. Due to the rapid response Tom avoided acceleration in his condition.

When Tom is very ill he gets cognitively affected and has trouble remembering when to take his medication. In the past he always got it too late – when he actually was respiratory depressed. Now Tom gets intelligent medication to avoid this – that means that he only has to take a pill

once a month and it delivers target doses to the parts of Tom's body that need it. This happens by the help of the drug delivery technology [http://inano.au.dk/da/outreach/nanovidensbank/nanomedicine/fremtidens-maalrettede-kraeftmedicin/], which uses molecular transporters and Nano particles which deliver directly to a specific part of his organs. Tom's experience with the intelligent medication is that he is feeling better. Before he had important side effects (such as shaky/shivering hands) due to his acute medications, but that is now history because the intelligent medication targets doses on a daily basis and thereby decrease his need of acute medication. The RFID automatically reads the medication dose and activation in Tom's body and the information becomes available for the health professionals.

Before Tom was assigned the TeleHealthCare platform he was always admitted to the hospital whenever his condition worsened. In those situations his respiration rapidly deteriorated because of all the stressors around him, for example being picked up by the ambulance, the ride to the hospital, moving from stretcher to bed, temperature fluctuations and responding to all the health professionals' questions etc.

In general, with the TeleHealthCare system, he now experiences a much more satisfactory condition and personal wellbeing. The technology opens up for distance diagnosis by using the technology – video, pictures, sounds, measurements, and involves the health professionals in the diagnostics and treatments in an early state in his home. At the same time he gets the right amount of medication his body needs at the right time. This way Tom does not need to get admitted to the hospital whenever his situation worsens. It means a lot to Tom that he can stay in his home environment nearby his loving wife.

2020 TeleHealthCare Negative Scenario

For 2 months Tom has been admitted to the TeleHealthCare program and he is not quite happy about it. First of all it does not make him feel safe and he does not like the feeling about being monitored all the time. All the sensors in the house and the little chip in his leg register everything down to his smallest movements. That is difficult to ignore even though he knows it is there to help him. Second of all, he recently discovered that the system worked inappropriately. After a lovely weekend together with his family filled with wellbeing and togetherness and different physical activi-

ties he decided to lie in bed a little longer than usual because he needed the sleep and to recover. During his sleep he was contacted first by the physiotherapists and after that by the doctor. They contacted Tom because the RFID system automatically informed them about him being in bed longer than usual. They both started a big lecture about how important physical activities is for Tom and the doctor even showed a simulation of the evolution of his situation using avatars if he did not get out of bed. Tom felt this was entirely inappropriate and had no connection to the reality which he was trying to describe to them. After this experience Tom gets the feeling that the system is there for the sake of the system and not for his sake. His experience is that the physical and personal contact to the health providers is replaced by technological solutions not adapted to his needs**.** That makes him feel lonely and isolated with his illness compared to earlier, where the doctor, nurse and physiotherapist came round to visit him on a weekly basis. In the old days Tom had the feeling that they really understood who Tom was and how he lived, and they even showed real interest in Tom as a person by asking him different questions about his life. Now they only contact him when measurements are worrying.

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5.7 China in Turbulence: Paths Forward for Nordic Business?

5.7.1 Background

The growing social, economic and political turbulence in the world increasingly challenges business executives to search for research-based analytical ideas, suggestions and intelligence that provide tools for anticipating the future. This is also the case at Nordic firms doing business in China.

Although the analysis of historical development paths of various business models and strategies is fruitful for gaining an understanding of the current state of the art in the global economy, it is timely to enrich such analysis with insightful ideas and "wise analytical guesses" about the potential paths for the future. Such analysis is beneficial to all partners of the knowledge triangle: the business community, academia, and supporting organizations. Furthermore, new forms of interaction and knowledge networks are needed.

This project builds a future-oriented knowledge creation network, which boosts Nordic firms' competitiveness in China through two di-

mensions: research and education. The network uses the Nordic Centre at Fudan University as the platform for collaboration and hence strengthens the Nordic Centre's role as a bridge between academia and the business community.

5.7.2 The Setup

Boosting Sino-Nordic Businesses by Research-Centered Networking

The research dimension of the knowledge creation network builds on the research carried out during the project. Here, the idea is to keep the relationship between research and the business community active and lively throughout the project.

This entails active cooperation with business supporting organizations and firms throughout the research project; first in organizing a survey among members of business associations, and later when selecting firms to be interviewed for qualitative analysis. Interaction is also kept active when carrying out the data gathering in the form of thematic semi-structured interviews where exchange of ideas is included.

Traditionally, project-based academic business research puts the main emphasis on the delivery of the end results. This means that the business community receives only the final, fully analyzed research report, often combined with a seminar. However, in the current global turmoil characterized by a range of socio-economic and political uncertainties, the time span between empirical field work and the final research report can be too long as regards to the applicability of the findings.

The idea of "timely" results is challenging, when firms would need analytical guidelines from academia without delay. Instead, the interaction between business and academia needs to be continuous, and take place in various rounds of interactive data gathering and panel-type symposiums and brainstorming events. These events summon together representatives from Nordic firms, academia and the public sector to jointly discuss future prospects of Nordic businesses in China, with the purpose of drafting guidelines for further research, and developing other ideas for knowledge exchange. The Nordic Centre at Fudan University provides an excellent basis for organizing such events.

Boosting Sino-Nordic Businesses by Education-Centered Networking

At the heart of the education-centered knowledge network are various concrete collaboration platforms, where the future supply and need for business skills are brought together. These include boosting internships in Nordic firms in China by organizing networking events between firms and students in the Nordic Centre, where Nordic managers tell about their own career paths, present job and internship opportunities and discuss how the need of skills and knowledge seems to develop in the future thus guiding students in their studies.

In addition to the concrete networking meetings, the Nordic Centre can become a facilitator by keeping an updated listing of internships available in the Shanghai area, to both Nordic and Chinese applicants. In building such a network, it is essential to establish institutionalized forms of cooperation between medium-level actors, such as various Sino-Nordic chambers of commerce.

5.8 UGN Case Study – Outi Luova

5.8.1 Sino-Nordic Doctoral Training Workshop "Sustainable City Development: Theories, Methods, Challenges, and Experiences in China and the Nordic Countries"

Since 2008, half of the world's population lives in cities, and the proportion is expected to reach 70% by 2050. To solve the complex challenges that urbanization creates, new types of approaches are needed. None of the central issues can be understood from the sole perspective of traditional disciplines. A cross-disciplinary and collaborative approach is required to train experts who can rigorously examine the interactions between urbanization, the environment and welfare to find new pathways to sustainable cities – in environmental issues as well as in the fields of governance, economy, society and culture.

A cross-disciplinary and collaborative approach is required to train experts who can rigorously examine the interactions between urbaniza-

tion, environment and welfare to find new pathways to sustainable cities. The development of sustainable urban governance is to a great extent a future-oriented topic and for that reason it's essential to get young promising researchers engaged in projects that deal with sustainable cities. So from the early planning stage onward, it was self-evident that the network "Sino-Nordic Urban Governance for Sustainable Cities" (UGN) would include a PhD course in its activities. The multidisciplinary course was aimed at PhD candidates whose thesis deals with urban sustainability in China or in the Nordic countries. The aim was to encourage an exchange between Chinese and Nordic experiences, and to expose PhD candidates to diverse disciplinary perspectives, concepts, and approaches. This would help them to integrate knowledge and theories from several fields in order to find solutions for sustainable urban change. Furthermore, collaboration with non-academic partners was expected to challenge the PhD candidates to approach their research questions "outside the box", bringing a new type of dynamism to doctoral training.

The PhD course was linked with the second research workshop of the UGN, and it took place in October 2014 at the Fudan University in connection with the research workshop "Sustainable City Development: Theories, Methods, Challenges and Experiences in China and the Nordic countries".

The PhD course consisted of both the research workshop and the two-day PhD training workshop. In all 11 persons were accepted to the course, but unfortunately two had to cancel their participation. Four of the participants were from the Shanghai region (Fudan University and Zhejiang University), five were from Nordic countries and one participant was a Chinese from Germany. Their disciplinary background varied from architecture to political science.

The training workshop was organized with:

- *Keynote lectures on theories of urban studies*
  Dr Dorthe Hedensted Lund from Copenhagen University opened the workshop with an introduction to governance models in the Nordic context and how they conflict and Dr Shen Jie of Fudan University concluded the workshop with a summary of significance of China for theory building in urban studies.

- *Seminars in which PhD candidates presented their papers*
  Each PhD candidate had 15 minutes for their own presentation, after which one pre-selected fellow student and senior researcher acted as a discussant. Four of the organizers (Almen, Delman, Ren and Luova) as well as Lise Herslund of Copenhagen University acted as senior discussants.
- Problem-based workshop with non-academic partners
  The initial aim was to visit Nordic Innovation Centers and discuss their work in relation to sustainable city development and also to visit relevant Shanghai City authorities to change ideas about their sustainable city solutions in Shanghai. However, these plans could not be realized because of busy schedules. Instead, the workshop participants visited the Aalto Design Factory at the Tongji University in which Prof. Su Yunsheng, a Chinese "Leonardo da Vinci" of urban planning and design introduced his recent projects, and in particular a university town in the Guandong province. The project and also Prof. Su's engagement in civil servant training generated a lively discussion during the workshop. The director of the Design Factory, Mr. Matti Hämäläinen also made an introduction to the very active and in many ways innovative Centre. This was followed by a visit to the Oriental Tower from which it was possible to marvel at the expansion and variety of urban Shanghai, and to learn about Shanghai's urban history in the historical museum at the foot of the Tower. In addition, the last workshop day was arranged at the Mahota Eco-farm which introduced to the PhD candidates an unexpected side of the Shanghai metropolis.
  Before the course, a Moodle-online site was created in order to facilitate the flow of information and to create a sense of community already before the course started. Obligatory reading materials and other relevant texts and links were shared through the Moodle site. Furthermore, the PhD candidates shared their papers there and also made self-introductions to get to know each other before the onset of the course.
  The full participation in the research workshop and the PhD training workshop corresponded to a workload of 4 ECTS that was granted by the University of Turku.After the course, the organizers collected feedback from the participants. According to the feedback, the PhD candidates appreciated most the experience of presenting their own

papers, acting as discussants and participating in the discussions. Furthermore, they regarded highly the multidisciplinary nature of the course and the opportunity to learn to approach issues from many different angles. Also engagement with various stakeholders was valued. Two NGOs participated in the research workshop, but some of the participants would have liked to see more of them at the event. All in all, the doctoral training workshop was very successful. It contributed in several ways to the networking of young researchers with established scholars, NGOs and various research institutes, and also promoted their professional development towards a more flexible, innovative and multidisciplinary direction. The workshop was also a useful learning experience for the organizers, who could benchmark good doctoral training practices.

5.9 Applying the Knowledge Triangle to Food and Nutritional Care at Hospitals – Case-Insights from the Sino Nordic Food4Growth Network Program, Bengt Egberg Mikkelsen, Aalborg University

5.9.1 *Introduction*

Malnutrition in hospitals is a major problem that causes decreased quality of live, poor treatment outcomes and increased cost due to increased length of stay. Prolonged admissions are very costly for the hospitals and measures that can be used in bringing down the average number of admission days is the focus of much research and development in both Nordic countries and in China. Studies have found that 1/3 of the patients that are admitted to hospitals are, or will become malnourished during their stay at the hospital. This is critical to the patients' ability to recover and their well-being. As a result, individual nutritional risk screening and a follow-up process are being implemented in many hospitals as part of the nutritional care services at hospitals. Traditional screening using paper and pen which are carried out by nurses and assistants who manually monitor the dietary intake of patients in the hospital is time consuming

and troublesome and as a consequence often neglected in hospital wards. As a consequence there is considerable interest in many countries to develop routines, procedures and technologies that can improve food nutritional care services at hospitals. This is the background for the Food4Growth project that was initiated in 2013 and is bringing China and Nordic researchers and practitioners together.

It is estimated that nurse or assistant dieticians will spend approximately 20 minutes on every patient to be able to give an estimate of amounts of food that the patient has eaten. This amount of time could be spent on other activities adding value for the patients. The aim of the Food4Growth project is to contribute to better health outcomes for patients at hospitals. One of the important activities has been to explore new means and ways to improve the nutritional risk screening and follow-up procedures for patients. This paper takes the knowledge triangle as its point of departure and looks at how this has been applied to food and nutritional care services at hospitals, and how the Sino-Nordic Food4Growth network program has contributed to the advancement of this important area of public and clinical nutrition.

5.9.2 Network Activities

The Food4Growth network joins research groups from Aalborg University Copenhagen (AAU-CPH), Center for Nutrition and Intestinal (CET) from Aalborg University Hospital, JAMK University of Applied Sciences, University of Tromsø and Shanghai Fudan University and the Huadong Fudan University Hoøpital as well as the Zhongshan Fudan Hospital. The activities in the network have revolved around network meetings hosted by the Food4Growth partners.

Food4Growth opened its activities with a kick-off meeting that was held in Copenhagen, 28th October – 1st November 2013. The program from the week is published on the internet. As one of the first activities the project group carried out an assessment of strengths and weaknesses as well as opportunities and threats for future joint undertakings. The idea was to identify partners' expectations and capture untapped potential in the planned cooperation. Discussions on development of protocols for joint research projects were started and plans for visibility, communica-

tion and dissemination were adopted. The program included a focus on novel methods for dietary assessment and the potentials of using intelligent devices for dietary intake monitoring. An open seminar on these potentials was held in Aalborg featuring leading intelligent device scientist Prof Mingui Sun from Pittsburgh University. The 2nd network meeting included excursions to best practice cases in Aalborg and Copenhagen and an open conference. The program and a protocol for preparation of a 2nd workshop were developed. The protocol includes a template for mapping of best practices and educational programs in the countries.

The 2nd Food4Growth workshop week was held in the spring of 2014 at Shanghai Fudan University. The workshop included visits to local hospitals to get an understanding of the Chinese healthcare system and the way that food and nutritional care is dealt with. Part of the program was on methods for dietary assessment and the potentials of using intelligent devices such as the Dietary Intake Monitoring System – DIMS (Ofei *et al*. 2014). The meetings also included discussions on F4G's contribution to the conference "Health Services in Transition" that was planned to be held at Fudan University in the fall of that year. The meetings also included the planning of the summer school in 2015.

The 3rd Food4Growth Workshop was held in the early fall of 2014 (28 September – 3rd October) at the JAMK University of Applied Sciences in Jyveskyla in Finland. This workshop picked up on the results/conclusions from the previous workshops and the work that has been carried out since the Shanghai meeting. The meeting included discussion on how to carry out a comparative study where routines of food and nutritional care services in the participating countries could be mapped. The idea was to develop a better foundation for the technology development activities of the project.

The last workshop of the Network is held between 24th and 28th August 2015 and is a joint undertaking between University of Aalborg and the University of Tromsø. The meeting activities include activities in Copenhagen and Oslo. The week includes a training school and an open seminar and technology and devices is the overall theme for the week.

5.9.3 Research

The research activities have mainly evolved around the carrying out of a comparative study of routines of food and nutritional care services at hospitals. This line of research takes as a point of departure a survey carried out in the Nordic countries on the level of nutritional knowledge among different groups of health care workers that is involved in carrying out nutritional care services at hospitals (Move *et al*., 2007). The survey has been translated into Chinese and will now be carried out among a representative sample of nurses, doctors and dieticians at 2 universities in Shanghai.

In addition, the network has developed concepts around the idea of New Public Health. The idea is that food and nutritional care services at hospitals as an integral part must involve activities of prevention and health promotion in the adjacent communities that the hospital is a part of. This part of the activities was presented at the Health Services in Transition International Conference on Chinese and Nordic developments that was held 20th–21st October 2014 at the Nordic Fudan Centre, Shanghai. The paper on *New public health and the role of food and nutritional care hospitals – case insights from Denmark and China* (Mikkelsen *et al*., 2015) was presented on the subtheme "Empowering the patient".

5.9.4 Innovation

The network has resulted in a range of different activities all related to improving the quality of food and nutritional care services at hospitals. One of the important activities has been the exploration of how technology can be used to assist the nutritional care process. One of the main efforts has been around testing and the evaluation of the dietary intake monitoring system (DIMS) – an ICT assisted method to monitor patient intake and convert it into an estimate of nutrient level. The DIMS technology (Ofei *et al*., 2015) is an example of hardware and software that can be combined to further facilitate and simplify the nutritional care process. The application has been developed in cooperation between research, enterprise and education – three important components of the knowledge triangle. The Dietary Intake Monitoring System (DIMS) is a device for capturing accurate data on a patient's meal both before and after consump-

tion in a foodservice setting and is used for assessment of food intake and plate waste (Ofei *et al*., 2014; Ofei *et al*., 2015).

The DIMS was originally developed within the framework of the Food-ServInSPIRe project with Aalborg University, SyscoreAps as lead partners and with the AAU FoodScapeLab and with Aalborg University Hospital as the test site. The DIMS1.0 is able to estimate the type and amount of food on a plate using an integrated technology based on imaging, weighing scale, IR thermometer and ID technology. The DIMS is used in a sequential mode: first the plated meal is recorded and second the returned plate is recorded. The 2 recordings then return the intake and the plate waste. The results so far indicate a substantial innovation potential since it will be able to lead to a new achievement on three levels: a commercially available welfare technology, new commercially available and easy2use food-waste monitoring and a new scientific breakthrough in the field of ICT assisted automated dietary assessment technology.

5.9.5 Education

The educational level as a part of the knowledge triangle has played a strong role in the technology development part of the network. The first prototype of the DIMS was developed by students from the Integrated Food Studies (Mikkelsen *et al*., 2015). The graduate program is offered at Aalborg University in its Copenhagen campus. It is 120 ECTS and lasts 2 year as a full time study. The curriculum builds on a trans-disciplinary approach resting on three pillars. These are Public Health Nutrition & Meals Science, Gastronomy & Design and Policy & Innovation. The teaching is based on the Problem based learning approach (PBL) and the conceptual foundation originates from foodscape studies. The students work the last semester on a Master's thesis. A number of the projects have been developing prototypes for technologies to assist dietary intake estimation and they have been evolving around food related laboratory experiments in the Foodscapelab (www.foodscapelab.aau.dk).

Besides the graduate level, the doctoral level has also been involved. At the PhD level the Food4Growth network has functioned well. The technology part has been strongly rooted among PhD students at Aalborg University Doctoral School, but also PhD students from Fudan University have

been involved. A group of the students will attend the August 2015 training school. For the PhD students the network activities have functioned as an effective training in how to run international scientific networks.

Besides the educational component of the triangle, the commercial part has played an important role in the technology part of the network activities. The company is Syscore and has been the technology and ICT provider in the different prototypes for measuring food and nutrition behavior that have been developed with the Foodscapelab as the greenhouse. As part of the further development of the DIMS 2, graduate students from the Royal Architectural and Design School have been involved in developing a robust 2nd generation of the DIMS. The version 1.1 was taken to a first field test and showcased at the ICCAS conference in June 2015 at Montclair State University and subsequently to a technology workshop at Pittsburgh University on new ICT assisted methods for dietary intake data collection.

Besides the 4 major network meetings, activities have been related to maintaining the Food4Growth website and exploring funding opportunities for joint research and education: The F4G network has been promoted in educational programs at the involved university partners and has resulted in a number of Master's projects related to F4G. These projects will inform the upscaling of protocols for joint research to be carried out at "all 4 countries' level".

5.9.6 Discussion

Research, innovation and education – all important cornerstones in the knowledge triangle are increasingly getting internationalized. Students expand their world view and are getting involved in international exchange, research is, to a far larger extent than earlier, organized in and dependent on cross-national consortia configurations, and innovation is more and more taking place in cross disciplinary teams. The proceedings from the Sino-Nordic Food4Growth network program is a good demonstration of these dynamics. The network has increased the insight into how the knowledge triangle can be applied to food and nutritional care at hospitals.

The cooperation however has also pointed to some of the challenges related to international cooperation in multidisciplinary environments

and to the involvement of multiple educational levels. Working across borders is one important challenge. Differences in organisational cultures make leadership an important task. In the case of Food4Growth, the activities have been a mixture of formal meetings, seminars with scheduled presentations, excursions to on-location places as well as open outreach conferences. This mixture has been well suited for attracting different types of stakeholders involved in the network activities including students from both graduate and doctoral levels, entrepreneurs, researchers and practitioners across cultures and across borders between the entities in the knowledge triangle.

The importance of leadership and a strong project plan seem to have been decisive and a learning lesson from the project. In the case of the innovation part, an important experience has been that it is important to involve university resources with expertise in taking prototypes and experimental versions of technology to further necessary steps. To involve small entrepreneurs into more firm types of relations at university opens up for new informal types of exchange of ideas between the commercial side and the students. Involving entrepreneurs as lecturers at campus has been further beneficial for both parties and in this case also for the network. In general, research that involves the concrete development of devices, applications and technology will be able to benefit from engaging expertise at an early stage on intellectual properties rights issues, proof of concept thinking and eventually also the scouting for venture capital that can take the ideas into commercial applications with a market potential.

5.9.7 Acknowledgements

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6. Models and Methods of Knowledge Triangulation

6.1 Culture KICK: Methods of Triangulation of Creative Industries, Research and Cultural Institutes

Culture KICK brings together 8 core partners from Norway, Sweden, Denmark and Finland which share a common interest in practice-based and collaborative research with creative industry partners as well as heritage institutions. By working with external partners from the Nordic countries, the network blends in complementary skills and expands its reach to cultural heritage institutions and the ICT industry.
The project started as an initiative between the University of Oslo and the Interactive Institute Swedish ICT Stockholm / NODEM (Nordic Digital Excellence in Museums), and was financially supported by the Nordic Council of Ministers (NORDEN). The Interactive Institute Swedish ICT/NODEM was responsible for activities related to knowledge transfer from network activities, while University of Oslo was in charge of managing the research network.

This initiative of exchanging knowledge has been taken by universities and culture heritage professionals from the Nordic countries to address issues of fragmentation in the digital heritage sector and facilitate the development of coherent cultural heritage technologies. Focused workshop presentations have been set up to examine the challenges of R&D based collaborations, and to solve the problems of sustainable knowledge transfer by using a participatory approach based on existing Nordic research projects that triangulates the creative industries, research and cultural heritage institutions.

The Culture KICK network aims to facilitate the exchange of existing Nordic research and know-how on design methods and conceptual frameworks relevant for both practical and theoretical approaches to innovation with ICT in the cultural heritage field.

The Culture KICK Network

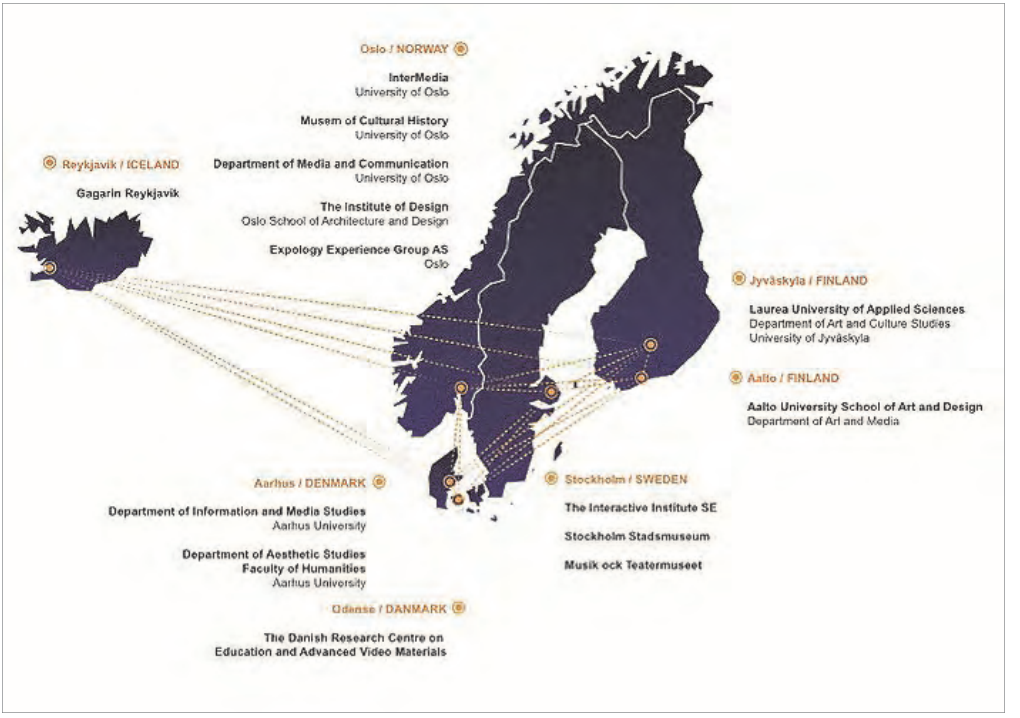

Photo Credit: University of Oslo.

6.1.1 Interdisciplinary Workshops

Consolidate the Network – 2012, Oslo

The first workshop aimed at consolidating the Culture Kick network, familiarize participants with the ways of working in practice based and collaborative projects crossing disciplinary boundaries of media studies, interaction design, informal learning and museum professionals from exhibition design and curation.

Each research network partner presented projects that triangulate research, museum innovation and education. Partners from the creative industry defined needs and topics where research and the creative industry could collaborate.

- *Research and Innovation of Digital Technologies for Learning and Communication in a Context of Museums and Science Centers*, Oluf Danielsen, lector, ph.d & dr.phil, Institut for Kommunikation, Journalistik og Datalogi, Roskilde Universitetscenter.
- *Museums as Knowledge Arenas – Tools for the Future*, Kari Gjetrang, CEO Expology AS, Norway.
- *Participatory Design in Cultural Heritage Institutions*, prof. Ole Sejer Iversen, Centre for Advanced Visualization and Interaction (CAVI), University of Aarhus.
- *Designs for Participation in Urban Spaces*, prof. Andrew Morrison, Centre for Design Research, Institute of Design, Oslo School of Architecture and Design (AHO).
- *User Evaluation of a Situated Simulation Reconstructing a Viking Hall at Borre*, prof. Gunnar Liestøl, Department of Media and Communication, University of Oslo.
- *Involving Teacher Students in Museum Innovations*, Dr. Dagny Stuedahl, University of Oslo; Ellen Marie Næss, museum pedagogue, Museum of Cultural History, University of Oslo; Dr. Bård Ketil Engen, Faculty of Education and Int'l Studies, Oslo University College.
- *Designing Engagement for Art – Exploring Interfaces and Interpretive Content of Digital Heritage Artifacts in Museum Environments*, Dr. Halina Gottlieb, The Interactive Institute Swedish ICT, Stockholm.
- *Curation and Learning in the New Museum (proposed title)*, Associate Professor Ane Hejlskov Larsen, Centre for Museology, Department of Aesthetic Studies, Faculty of Humanities, Aarhus University, DK.

The consolidation meeting also communicated the need for community building platforms, and the different requirements from research, museum innovation and the creative industry for such platforms. As a consequence, different solutions for a digital repository was discussed as an initiative to archive best practices and make a resource for both research publications and a community platform for professionals and researchers in the cultural heritage field.

Collaboration, Partnership and Participation – 2013, Oslo

The research based on applied research projects participating in Culture KICK ranges from collaborations with the creative industry, with schools, or with national policy based development programs. The research projects are based on research collaborations, user engagement, co-design and other forms of partnerships at some level. The network can present multiple approaches and methods to museum and heritage design anchored in diverging disciplines and approaches to applied research.

Culture KICK aimed at collecting good case studies and practical experiences with planning, scaffolding, rolling out, performing and analyzing these new approaches to user engagement in research and development. The workshop and its following publication gave valuable case examples as well as theoretical and methodological contribution from the digital humanities, media literacy studies as well as interaction design on innovation in the cultural sector and heritage institutions. In this workshop, participants of the Culture KICK network presented and discussed concrete examples of different forms of research collaborations related to digital cultural heritage and design which were related to discussions of knowledge triangulation to the field of design and culture.

- Mariana Salgado, Laurea University of Applied Sciences & Sanna Martilla, Aalto University: *Discussions on Openness in Finland: the Open GLAM.*
- Rachel Charlotte Smith and Ole Sejer Iversen Centre for Participatory IT (PIT), Aarhus University, Denmark: *Emerging Spaces for Participant Innovation in Museums.*
- Peter Bjerregård, postdoc, Museum of Cultural History, University of Oslo: *Death, Materiality and the Origin if Time: Bringing Research Back to the Museum.*
- Magdalena Laine-Zamojska, Department of Art and Culture Studies, University of Jyväskyla, Finland: *Doctoral Program for Society's Memory Functions. New modes of dissertations in the digital cultural heritage area? Promoting innovative research outcomes.*
- Dagny Stuedahl, & Ole Smørdal, InterMedia, University of Oslo: *Experimental zones as collaborative modes between museum and design-based research.*

- Nils Wiberg, Gagarin, Reykjavik: *Interactive exhibitions and interpretive planning.*
- Kari Gjetrang, Expology Experience Group AS: *R&D as a market positioning tool*.
- Invited speaker: Prof Ann Light, Northumbria Design, Northumbria University UK: *What happens when communities take their cultural heritage into their own hands?*

Curatorial Challenges – 2013, Stockholm, NODEM 2013 Conference

The workshop provided an opportunity for museum professionals, creative industry and researchers to explore some of the practical ways of innovating and opening museums.

The focus was on how to best use digital technology and interdisciplinary collaborations to enhance and support curatorial practices that are possible thanks to digital technology, as well as changing attitudes of culture professionals. Furthermore, it aimed to extend the discussion of how technology may be used, not only to serve visitors, but also as a curatorial tool in a variety of areas; for example, preparing and researching a collection for an upcoming exhibition, identifying and developing chronology and typology of a collection, curating of interpretation, exploring themes and storytelling, and communicating the pedagogical potential of a collection.

6.1.2 Knowledge Transfer Lab

Digital Repository Connected with the NODEM Portal

The repository provides an up-to-date and comprehensive archive of Nordic design-based and innovative projects in the cultural heritage field presented at the NODEM conferences. NODEM (Nordic Digital Excellence in Museums) enables discussions on applying and managing innovative design research and practical new technology. Local committees consisting of people from academia, the museum sector, memory institutions and the creative industry organize the NODEM conferences almost yearly. The aim is to connect research and practice in the field of design and digital cultural heritage in an international context.

The Digital Repository is a tool for the presentation of case studies and projects, and a source to reach Nordic academic and professional communities in the digital cultural heritage field. Within this connective platform, users can find relevant project descriptions and demos that document various approaches to designing digital heritage communication.

The Culture KICK platform aims to support those working in the digital cultural heritage field by providing avenues for professionals to connect and access the latest information and research. The NODEM Digital Repository aims to be a central online resource for the digital cultural heritage sector that pools knowledge and resources from the network and reduces duplication of effort.

Know-How Books – Knowledge Transfer from Research to Society

The books illustrate case studies and prototypes presented in the workshops, and aim to support and inspire professionals working at museums and cultural heritage sites.

The following two know-how books serve as models for researchers on how to promote themselves and their innovations to museum and creative industry professionals:

- *Research Supporting Innovation*, Senior Researcher: Halina Gottlieb: The booklet is a summary of projects from many years of research, studies and experiments, as well as many of the methods concerning digital media, and learning done at museums in the last decade.
    - Group Leaders:
        - Halina Gottlieb, Interactive Institute Swedish ICT.
        - Hans Öjmyr, The Stockholm City Museum, Sweden.
        - Working Team: Gabriela Alina Sauciuc, Arezzo Arinay, Matthias Andersson, Sally Pang, Emilia Alvarez Nordström, Silvia Istudor and Christoffer Gottlie.

- *Fly high! Collaborate*, Design Researcher: Mariana Salgado
  Based on three case studies, this booklet offers recommendations on engaging the museum community in technically mediated exhibitions. Mariana Salgado's research deals with cultural heritage materials and design, and her work in co-designing participation in museums through the use of interactive pieces.
    - Group Leaders:
        - Mariana Salgado, Aalto University
        - Working Team: Hans Öjmyr, Halina Gottlieb, Silvia Istudor and Christoffer Gottlieb

All the books in the series are available in hard copy and online on the NODEM Digital Repository at http://repo.nodem.org. Interactive Institute Sweden ICT acted as the coordinator, editor and publisher of the Know-How Book Series for Culture KICK.

A template for know-how books is available in the repository for researchers to create their own know-how books.

6.2 SLU Holding

6.2.1 Innovation Support at the Swedish University of Agricultural Sciences

The Swedish University of Agricultural Sciences (SLU) has a broad and unique scope of research areas within life sciences: from agriculture, forestry and veterinary medicine to landscape planning and environmental engineering, and much more. Some fields, like for example plant breeding and genetics, are often being rated as world leading. Education is a relatively small part of the university's operations in comparison to other Swedish universities. Roughly 70% of total turn-over goes to research and post-graduate studies. SLU is ranked 3rd in the national university ranking (Urank, 2013), which takes into consideration the quality of education provided.

SLU Holding is the venture arm and technology transfer and innovation office of SLU. SLU Holding facilitates the transfer of SLU's outstanding

research to the private and public sector for society's use and benefit. The mission is to create economic growth, social development and welfare through the commercialization of inventions and research results. Revenues that business activities generate are solely reinvested in future inventions and ventures. Currently SLU Holding is actively involved in its nine portfolio companies, investigates several new investments opportunities and handles over 50 innovation development projects. Since spring 2013, SLU Holding is also an innovation office which broadens the mission and scope of how to help researchers let their innovative research results have a positive societal impact.

SLU Holding operates in both academic and industry environments. However, the third leg of the knowledge triangle, i.e. students and education, is also part of our mission and there are several activities relating to the three poles of the triangle at SLU. The majority of them were initiated or run by the Innovation Office / SLU Holding, which has the responsibility to foster innovation and entrepreneurship locally and regionally at SLU's four main campuses.

Examples of activities that have been successful and which strongly relate to the philosophy of the knowledge triangle are the unique SDR concept and the early involvement of industry and end-users in innovation development. To develop and invest in innovations are part of SLU Holdings main mission. The involvement of different stakeholders, e.g. industry, is a natural part of business development and an absolute necessity if innovations are to succeed. Recently the definition of innovation has also widened, see e.g. the IAI project, where science's positive impact on society at large is an overriding goal instead of financial returns. Below are some examples of methods and activities relating directly to the knowledge triangle, many of which aim at creating a positive culture and attitude towards entrepreneurship as well as increasing the number of research based inventions reaching, and benefiting, society.

6.2.2 IAI – Intellectual Assets Inventory

Inventions often surface during the research process, rather than being the result at the end of the process. It may be an algorithm or software that has been created to be able to process data in a novel way, or it may be a database or a machine that is the result of wanting to pass around obstacles along the winding road. In short, it is all about problem solving to reach the end of the research process. Value is being created during the whole research process. There is often a tendency to be unaware of these discoveries due to the overwhelming focus on the end result.

The method *Intellectual Assets Inventory* (IAI) was created at Innovationskontor Väst to address this phenomenon. At SLU Holding a pilot study was initiated during 2013 at SLU's Skara Campus which also ran in 2014 on the three other main campuses (Alnarp, Umeå and Ultuna). The method is a structured way of helping the researchers to be aware of the values they create, whether they are of commercial, societal value or other value. The inventory is made by either the researcher himself/herself (self-valuation), in a group or together with an innovation advisor. Assets are sorted in six categories: *Model* (taxonomy for describing or analyzing), *Method* (structured working method), *Dataset*, *Invention*, *Software* or *Design*. The assets are registered in a matrix to give an overview and an inventory list of all values created, which may help the researcher in the communication when applying for financing of research or looking for partners. Innovationskontor Väst has divided the process in four consecutive steps: Preparation, Identification, Categorizing, and Prioritizing (according to R&I strategies) and Completion (inventory sum up).

The intellectual assets inventory helps the researcher/team to act more focused on possibilities and to better communicate the research to funders or partners. An important idea of the IAI is that the method should be a natural integrated part of the researcher's regular work. The inventory list is also of great help for TTOs or Innovation Offices in their strategic work understanding and mapping research being conducted within the university and in finding innovative projects at an early stage.

InnovationsKontor Väst

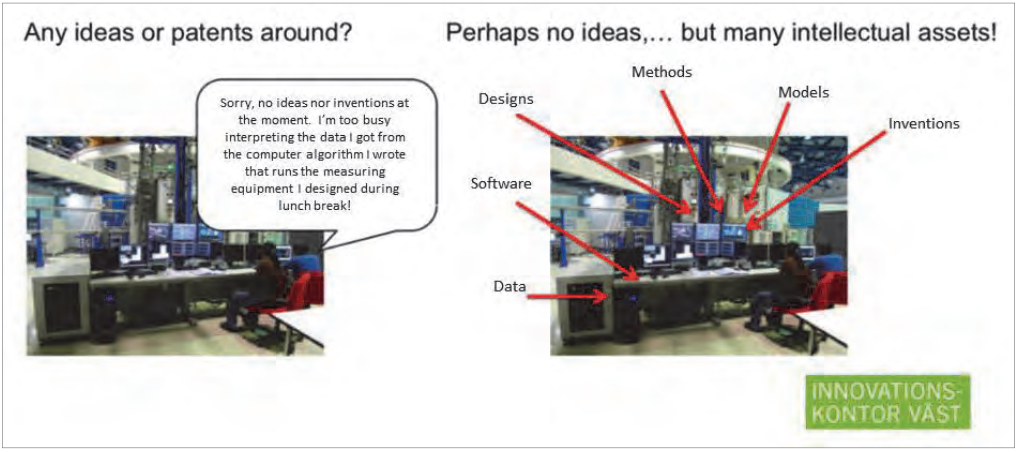

Photo Credit: SLU Holding.

6.2.3 The IDEA BANK

Most innovative ideas perish before they are being exposed to society. There is a shortage of entrepreneurs willing and capable of being the driving force refining the idea and taking it further. In Sweden, the Professor's privilege brings more responsibility to the innovator to take the lead in commercializing an innovation unless there is a designated driver, i.e. the entrepreneur. In the Idea Bank researchers give an ownership option to the invention to the Innovation Office for a period of time (normally PCT international phase minus 3 months) to verify and develop to a commercial proof of concept. The researcher is part of the project as a bearer of knowledge and speaking partner throughout the process. The Idea Bank services ease the burden for innovative researchers that wish to focus on research but also utilize its results.

Before signing the option and commercialization agreement, the Innovation Office has done initial market research and patentability evaluation to make sure that the idea has solid commercial potential. The agreement clarifies the mutual responsibilities between the two parties, innovation office and the researcher, the idea passes through a structured process where each step adds information to the decision making. The four fun-

damental pillars in the decision making process which the idea must meet to get either a "Go" or a "No-Go" are the following:

- a well-defined and quantifiable customer problem
- well-defined customers
- solution is a "painkiller"
- a sustainable business model is plausible and feasible.

The commercializing options for a project within the Idea Bank are:

- Evaluation agreement by a prospect interested party.
- Packaging – licensing of patent, know-how and service.
- Founding a start-up company.
- Selling of patent.

Besides the innovator and the TTO staff, students are also involved in the evaluation process. Individually or in teams of two, the students help the commercialization officer in collecting data on competitive technologies or getting statements from related industry on current challenges.

The Idea Bank process is inspired by the successful commercialization work at Uppsala University Innovation as well as the Five Disciplines of Innovation® developed by SRI International.

6.2.4 TIIGS – Involving Industry in Business Development

TIIGS is a workshop concept in three steps developed by SLU Holding to get early and valuable industry input on innovation projects. The workshop has a clear focus on helping a young start-up company with their go-to market plan by discussing strategic issues with a highly experienced panel. Relevant industry partners as well as business angels are also invited to these meetings. The workshop meetings have a focus on questions specific to the individual start-up or invention, e.g. market needs, information on potential market hurdles, different aspects of marketing, organization etc.

An executive summary together with the strategic topics for discussion are sent out beforehand to the invited participants. The results from the discussions are summarized in an action plan, i.e. appropriate next steps for the entrepreneur. During the meeting a moderator makes sure that the discussion stays focused, and is also responsible for taking notes and writing the draft for the action plan. Afterwards the panel are quarterly updated on progress of the project or start-up.

SLU Holding has successfully used this concept for developing both young start-ups and commercial projects. The TIIGS workshops have been very much appreciated by both the entrepreneurs and invited guests. For the business angels it is an opportunity to get to know the founders early on and to get an exclusive insight into high quality projects and potential investments. For industry it is an exclusive opportunity to get firsthand information on cutting edge research and future product opportunities.

6.2.5 Conclusion

SLU Holding has since its reorganization in 2007 build and established an effective and appropriate organisation for innovation and start-up support. Furthermore, there are several examples of successful international companies and license deals based on SLU research. However, the Innovation Office / SLU Holding is not in a position to instruct the university or vice versa, since the holding company is organized under a different Swedish ministry and company law. This means that even though there are many activities relating to the knowledge triangle the units' strategies are aligned, there is no direct responsibility assigned for, or primary goal to, implement the knowledge triangle at large.

Besides the more commercial aspects of being a innovation support function, SLU Holding works actively to promote a positive attitude within academia towards innovation and entrepreneurship and is involved in teaching of both undergraduate and PhD students which is done directly through guest lectures, but mainly through actively involving students in innovation development or as part-time employees at start-ups or at SLU Holding. More traditional ways of teaching entrepreneurship have thus far been done through projects like Trampolin. In addition SLU Holding arranged a course in entrepreneurial learning targeting teachers interested in

developing their pedagogic skills. However, SLU Holding wishes for a more long-term commitment and support from the University in this matter, and not only through time limited projects or sporadic point operations. Education of students is not part of the Innovation Office operational budget as is also the case with government funds for Innovation Support.

The potential and opportunities relating to innovation and entrepreneurship in the METIS project have been confirmed during the project period. The complementary resources, experiences and knowledge base increase understanding and widen perspectives. The METIS network could provide a stronger base for growth companies, e.g. through joint know-how or IP. But also better ventures through shared learning, knowledge sharing and joint venture development.

6.3 NMBU Technology Transfer – NORWAY

6.3.1 Innovation Support at the Norwegian University of Life Science

The University of Life Sciences (UMB) was established as the Higher Agricultural College at Ås in 1859 and existed as the Norwegian Agricultural College during the period from 1897 to 2005. The proposal to establish a Veterinary College in Norway was introduced in 1811, but the official opening of the Norwegian School of Veterinary Science at Adamstua did not take place until 1936.

On 1st January 2014, the two institutions with long and proud histories were merged to form a new university: The Norwegian University of Life Sciences (NMBU). The University's academic fields are concentrated into three faculties:

- Faculty of Veterinary Medicine and Biosciences.
- Faculty of Environmental Science and Technology.
- Faculty of Social Sciences.

The number of students is 5,200, of which over 800 students are from abroad. The University has 1,700 employees and 800 and a turnover of over NOK 1.5 billion.

The central goal for NMBU during the period from 2014 to 2018 is to establish the university as a preeminent academic institution in the field of environmental and life sciences.

This goal shall be reached through focusing on NMBU's interdisciplinary competence in bio production, veterinary medicine, environmental technology, land and natural resource management, economic and international development work, while at the same time preserving and further developing the uniqueness of the individual academic fields.

NMBU Technology transfer is organized as a section under the University administration and is responsible for

- idea scouting and commercialization of research based ideas
- building a culture for entrepreneurship at the university
- matchmaking function between researchers and external partners.

6.3.2 Commercialization

Our commercialization strategy has mainly been built on out-licensing and forming collaborations with industrial partners for further development of the technology. There are also examples of spin-offs which have been established based on our research.

Most ideas coming from research are premature and need to be developed for many years in order to verify the commercial potential. We support our researchers in the commercial development phase where proof of principle/proof of concept has to be shown. To build strong project teams with limited financial resources we involve students in our commercialization projects. We involve experienced persons from industry and private sector in the commercialization projects in order to identify development risks in an early phase and get valuable input on customer needs and how to reach out to the market.

6.3.3 Entrepreneurship – Building Culture

Entrepreneurship is about to become a prioritized area in higher education. NMBU wants to contribute to society's future development by facilitating a greater focus on entrepreneurial activities and training of entrepreneurial skills among students, researchers and staff. NMBU TTO has the responsibility to encourage entrepreneurship in collaboration with the academic environment at the university.

NMBU TTO wants to stimulate to innovation in the private- and public sector, collaborating on entrepreneurial activities using our students and researches as resources. The private- and public sector regard the university as an open innovation arena where they can collaborate, develop and recruit students.

6.3.4 Student Company – Educational Program

A successful study program implemented at the university is a credited course called, *Student Company*. Student Company is an educational program that gives students skills and knowledge of business creation through a year of start-up and operation of their own companies. The students gain knowledge and expertise in corporate establishment and management work, as well as knowledge of how business and working life works. During the year, the student companies participate in several regional and national competitions, where they have stands and present their ideas. The student companies from NMBU have won several prices, and some of these companies have established "real" companies after finishing their study course. Some examples of these companies are:

- WayaWaya: https://www.facebook.com/wayawayabags

6.3.5 Innovation Camps – Involving Students in Business Development

NMBU TTO is organizing several activities to create areas for open innovation. Together with *Young Entrepreneurship Norway (a part of JA-YE Europe and Junior Achievement Worldwide),* we are arranging 3–4 innovation camps per year.

Innovation camp is a concept which focuses on creativity and innovation. The students get a real challenge defined by a project owner which usually is a company. The students are then working with the challenge for several days before they present their solutions to a jury. The cooperation with the company is central to an innovation camp, and in some cases the company has implemented solutions identified at the innovation camps.

6.3.6 Conclusions

NMBU Technology Transfer focuses on the technology transfer process in a broader context than only licensing of IPR to established companies. We will be more active in visualizing for the society the value creation from NMBU research by telling the good stories where research from NMBU has been essential in the development of innovative products available in the market.

We will try to give society free access to some of our innovations/IPR that we are unable to develop ourselves. Joining the EasyAccessIP initiative could be one way to go. Under EasyAccessIP – companies can obtain a free license to IPR on inventions in return for investment in development and commercialization of the IP.

The establishments of spin-offs from university research based ideas are quite difficult. One of the reasons, that we have experienced, are the lack of an entrepreneur that is willing to build a company based on the research idea. Most researchers/inventors at the university want to continue their academic career rather than being an entrepreneur with all the risks that are involved. For our future spin-offs we will focus in an early phase to identify a person that can be the entrepreneur and to build a strong team with the inventors at the university. Working more closely with Master- and Ph.D students and involving them in NMBU Technology Transfer projects in an early phase, will be one way to identify potential entrepreneurs and to create interest among the students.

6.4 Københavns Universitet, F & I, TTO – Denmark

The University of Copenhagen is the largest and most research intensive university in Denmark. The University is ranked no 45 in the world on the latest QS ranking. The University has a well-functioning technology transfer organization and attracts many successful partnerships with both private and public players.

Innovation and collaboration with industry and society is the core mission of the University of Copenhagen with the aim of maximising value creation for the benefit of society. The Tech Transfer Office was inaugurated in 2003 and is responsible for handling all intellectual property rights (IPR) issues including commercialisation of IPR. Maximising value creation for the benefit of society guides the Tech Transfer Offices policies on IPR and commercialisation. To fulfill this mission, the University aims to be as flexible as possible when it comes to commercialisation of its intellectual property rights, thereby facilitating more collaboration with industry and society at large.

The commercialisation strategy has mainly been built on out-licensing and forming collaboration with industrial partners based on the key principle of controlling the exploitation of the IP and at the same time providing the best possible working conditions for industrial partners. The University of Copenhagen has been successful in fulfilling this mission having brokered half the licensing agreements entered between research institutions and industry in Denmark (based on patented inventions).

Handling the university's IPR includes most activities related to technology transfer: assessment of commercial potential of inventions, assessment of novelty and patentability, building and maintaining patent portfolios and marketing of technologies, negotiation of licenses and collaboration agreements with industrial partners.

All the technologies or almost all are early stage with the attendant uncertainties about readiness for production, resources needed to bring from lab bench to final product etc. Only a fraction of disclosed inventions will be out-licensed and many projects will be abandoned along the way. In many cases, the technologies turn out to be at such an early stage that potential industrial partners are not willing to take the risk of licensing and investing in the technologies. Traditionally, Tech Transfer Office ei-

ther abandon patent applications or hand back the IPR to the inventors as a consequence hereof.

However, shutting down projects or abandoning the IPR reflects loss of value or potential value. Therefore, in 2011 the University of Copenhagen joined the University of Glasgow and two other universities in the launch of EasyAccessIP. The University of Copenhagen was the first non-UK university to join this initiative and since then many international universities and research organisations have adopted the concept.

EasyAccessIP is a way to lower the barriers for industrial partners to collaborate with universities on projects that in the past would have been abandoned or shut down.

Under EasyAccessIP companies can obtain a free license to IPR on inventions in return for investment in development and commercialisation of the IP. To facilitate the process, an interested company or individual can download a simple license agreement only a few pages long with no financial terms attached from the EasyAccess web-site.

In addition to the signed license agreement, companies or individuals interested in licensing a specific project must provide a trustworthy development and exploitation plan and commit themselves to paying future patent costs to maintain the IPR.

EasyAccessIP supports the overall mission of both the Tech Transfer Office and the University of Copenhagen since its aim to ensure transfer of as much knowledge as possible. Furthermore, it represents an opportunity of commercialising IP that is difficult or impossible to commercialise through traditional channels.

Universities in Denmark abandoned the Professor's Privilege in 2000 and employees at public research institutions are under an obligation to assign the rights to their IP to research results in exchange for reasonable remuneration. Many universities, just like the University of Copenhagen, have adopted the one-third remuneration policy which means that the Inventor is entitled to one-third of the net profit.

EasyAccessIP requires that all inventors give up this right, but the upside for the inventors is the opportunity of entering into collaboration with the EasyAccess licensee. If new IP arises during such collaboration, the licensee can only exploit such IP under a traditional license agreement based on commercial terms.

The EasyAccessIP concept benefits all stakeholders. Companies get access to innovation and business opportunities on terms that reflect the uncertainties and development stage of the technology, the inventors are offered an opportunity for research and development collaboration and the universities contribute to more knowledge transfer, create new relationships with companies which do not yet collaborate with the universities and researchers. Companies gain access to some university IP without barriers through flexible and speedy license agreements under the EasyAccess concept. It is also the hope that this novel concept will encourage smaller companies with no prior experience with university collaboration to engage more with the world of research and thereby ensure a higher degree of innovation.

6.5 Sino-Nordic Welfare Research Network (SNoW)

Based on two SNoW research seminars a book with selected papers has been produced in an English and Chinese version, edited by Pauli Kettunen, Stein Kuhnle and Yuan Ren. The book is titled: *Reshaping Welfare Institutions in China and the Nordic Countries.* The English version, published by NordWel, University of Helsinki, contains 13 chapters, while the Chinese version, published by Fudan University Press, contains four more papers originally written in Chinese, but excludes two chapters only published in the English edition, and thus contains altogether 15 chapters.

Both books were published in May 2014, and were presented at a book launch at the Nordic Centre, Fudan University, on 6th June 2014. See SNoW Newsletter no. 2/2014 for an overview of all chapters in the two editions: http://www.uib.no/en/snow. Papers for the seminars, and those selected for the book, were presented within the following three topics, which all concern common or similar challenges in the Nordic countries and China:

- Norms and institutions.
- Labour markets, migration/immigration and social rights.
- Ageing populations as a challenge to social security systems.

History teaches us that there are different roads to welfare and well-being, and different perspectives across time, space and governments, as to what the scope of the welfare role or responsibility of the state should be. Since the early 1990s, there has been much research on different types of "models" of welfare states or regimes in the West. This field of research has subsequently given rise not only to comparisons of different types of Western welfare states, but also to comparisons of welfare and social security development in different parts of the world. Concepts of an "East Asian welfare model" or "Confucian welfare model" have been introduced by some researchers to emphasise embedded fundamental "cultural" norms and values which have given rise to different kinds of public policies and welfare and social security institutions. Perhaps several "welfare models" can be distinguished in East Asia, just as we can distinguish different welfare models in Europe.

We reprint below the three editors' introductory chapter to *Reshaping Welfare Institutions in China and the Nordic Countries* to give an idea of the background for the book project and a brief presentation of the contents of the book.

6.5.1 Pauli Kettunen, Stein Kuhnle and Ren Yuan: The Development and Diffusion of Welfare Systems and Policies in the Nordic countries and China[45]

In the world of extended and intensified transnational interdependencies, international comparisons between different societal models are not only a fashionable scholarly approach but also an integral part of political, economic and cultural action.

The so-called Nordic model is a hallmark and concept that has attracted international attention. At the same time, the ever more significant role of China in the globalised economy has increased international interest in the preconditions of China's economic growth and associated structural

[45] This is the introductory chapter by the three editors to the book *Reshaping Welfare Institutions in China and the Nordic Countries* (published in English by NordWel, University of Helsinki, and published in Chinese by Fudan University Press, both in 2014).

transformations. The social aspects and impacts of these transformations have for their part, in China as well as internationally, inspired discussion on various models and paths of welfare policies. Concepts such as "the East Asian welfare model" and "the Confucian welfare model" have been introduced by some researchers to emphasise that historically embedded, fundamental cultural norms and values give rise to different kinds of public policies and welfare and social security institutions. Indeed, in current debates, "models" may refer to persistent path dependencies or to transferable knowledge about best practices to be utilised in policy learning.

In this book, Nordic and Chinese researchers on welfare policies discuss normative and institutional characteristics of Nordic and Chinese societies. They go further, examining two major areas of current welfare policies both in China and the Nordic countries, namely the problems and solutions associated with migration and labour market mobility, and the ageing society. In order to initiate these analyses, this introductory chapter will briefly highlight three topics framing the Sino-Nordic scholarly cooperation in welfare policy research: (1) historical changes in the welfare state in the Nordic countries and future challenges and prospects for Nordic welfare states (Pauli Kettunen); (2) a Chinese perspective on implications of the Nordic experience and institutional characteristics for China's welfare reform (Yuan Ren); and (3) a Nordic perspective on features and changes in China's welfare system and possible future direction of development (Stein Kuhnle).

1. History and Future Challenges of the Nordic Model

In international comparisons, the five Nordic countries, Denmark, Finland, Iceland, Norway and Sweden, constantly appear among those offering the highest levels of social security and public health, care and education services. Nordic citizens are among those who are least at risk of poverty and have the highest life expectancy in Europe, and comparative studies indicate their high levels of human and social capital and happiness. The Nordic model is praised for combining economic competitiveness and growth with social and gender equality, solidarity, individual freedom and stable democracy.

Simultaneously with the increasing international interest in the Nordic model over the last decades, it has been widely recognised that the Nordic welfare state is being challenged by major transformations, including

globalisation, European integration, immigration, the ageing society and increased individualisation. The accounts of the role of the Nordic welfare state during these transformations are controversial. Some commentators have argued, either regretfully or hopefully, that the Nordic model, alongside other models of the national welfare state, are likely to disappear in the face of the imperatives of global competition. On the other hand, the Nordic pattern of social regulation is seen as a sustainable model to enable a consensual response to the new challenges by means of human and social capital. It is also valued as a set of ethical principles and social innovations to be applied not only on the national level, but also in European integration and global governance.

When discussing the global preconditions and impacts of the Nordic model, one should take into account that the Nordic countries are rather small, currently having a combined population of about 25 million inhabitants in the northernmost part of Europe. Furthermore, there are differences between the five countries and similarities with non-Nordic countries, in particular with other small Western European countries. The "Nordic model" is a model of a national society, and there is "one model with five exceptions" (Christiansen & Åmark 2006, 335). However, this in no way precludes the importance of a Nordic transnational regional context, in which national identities and institutions have been shaped, and of an inherent Nordic element within the national identities and institutions of Denmark, Finland, Iceland, Norway and Sweden.

In general, inter- and transnational processes were constitutive of the formation of the national welfare states (Kettunen & Petersen 2011). In the 19th century, the intertwined ideas of historical progress and transnational interdependence became crucial ingredients for the notion of modernising nation-state society in the Nordic countries. The elite groups that were active in nation-building processes consciously adopted the distinction between what came to be referred to as centre and periphery. According to this view, the educated elite of a peripheral country, and later the popular movements, especially labour movements, could and should define their political tasks on the basis of knowledge about more developed – or more "civilised" – countries. Problems should be anticipated and solutions should be planned by acquiring information on the experiences,

solutions and mistakes in what was conceived to be the centre of industrial modernisation.

The Nordic countries developed into small relatively open economies that were – each country in its specific way – highly dependent on exports and exposed to the cycles and crises of the world economy. This international dependence provided preconditions for the articulation of strong notions of national economy and national society and for the legitimacy of the active role of the nation-state in the processes of modernisation. As the German development researcher Dieter Senghaas (1985, 71–94) argues, "there is no automatic connection between growth and the lack or elimination of absolute poverty." What was required was the development of a combination of world market integration and internally consolidated national economy. The "Scandinavian development path" is his main example. A constitutive factor was a formation of national political, economic and cultural identity as well as "considerable political control over domestic and external economic processes, in order to prevent export growth from making society more oligarchic and producing a sort of rentier capitalism."

During the last couple of decades, many researchers have discussed the origin of the Nordic welfare state. They have tried to find it in the 19th century processes of modernisation or the structures of pre-industrial rural communities, in socialism or nationalism, in the rise of Social Democracy in the 1930s or the Reformation and the creation of the Lutheran state church in the 16th and 17th centuries. Instead of making a choice between these different proposals, it is reasonable to re-interpret the divergent "origins" as temporal layers in the Nordic welfare state. Mediated through mentalities, traditions, values, epistemic practices and social movements, these layers are present in the formal and informal rules and norms of the Nordic model (Kildal & Kuhnle 2005), and in the tensions and contradictions associated with these rules and norms.

Historical accounts of the Nordic welfare state tend to exaggerate the ethnic and cultural homogeneity of these countries. However, one can say that particular historical preconditions existed in the Nordic countries for utilising an ideal of cultural homogeneity in the construction of the nation-state and the welfare-state. One should not bypass the role of religion here. The Reformation, carried out in the spirit of Lutheran Protestantism

in the 16th and 17th centuries, was a process of making the centralised state. The state was inseparably intertwined with the Lutheran church and its lessons combining conformity and an individual relationship to God. Homogeneity and conformity have by no means implied an absence of class conflict and class consciousness. Rather, the development of the nation as an "imagined community" (Anderson 1983) offered moral criteria by means of which the socially subordinated groups could interpret their experiences of suppression and injustice and elaborate their individual and local experiences into political class consciousness and strong labour movements.

The class compromises of the 1930s, reflecting political conclusions from the Great Depression and the international threat of fascism, were important for the formation of the Nordic welfare model. They included the political coalitions of "workers and farmers", i.e. the Social Democrat and Agrarian Parties, and the consolidation of the practice of collective agreements in the industrial labour markets. A virtuous circle was supposed to connect the interests of worker-consumers and farmer-producers on the one hand, and of workers and employers on the other. However, this was not just an idea of a positive-sum game between different organised interests. The trust in a virtuous circle between increased social equality, economic growth and widening democracy came to widely colour the future horizon in the post-Second World War decades, the Social Democratic labour movement being the main carrier of this mode of thought and action. In the 1970s, national institutions, policies and future prospects indicated what are referred to in current debates as traditional characteristics of the Nordic model: the public sector is large and expensive; welfare benefits and services are financed primarily by taxes; the principle of universalism extends; the welfare state empowers women in the family, labour market and society; and the comprehensive organisation of an autonomous labour market works in a smooth relationship with the state.

Since the 1980s, crucial aspects of the notion of national society that were associated with the vision of the expanding welfare state and parity based negotiations and agreements in labour market have been severely challenged in the Nordic countries, as elsewhere. The transformations labelled as globalisation have meant increasing economic and social

asymmetries concerning the role of spatial ties. The increased mobility and the increased asymmetries between different actors in terms of their mobility have reinforced the role of economic competitiveness in the defining of national political agendas.

In the Nordic countries, changes have taken place within a considerable institutional continuity. According to a far from unsuccessful argument, the high levels of social security, comprehensive public social and educational services and agreement-based industrial relations are not only compatible with the objective of economic competitiveness but also provide crucial competitive advantages. In the shaping of the European Union's social policies, it has been easy for those coming from the Nordic countries to develop and support the principle of "social protection as a productive factor" that was adopted into the EU strategy in 2000. The principle implies an economisation of social policy in two different senses: as an argument for the recognition of the economic importance of social policy and also as an argument for reforming social policy in a way that could meet the demand of being a productive factor and providing "social investments". We can recognise an incremental discursive and institutional change, in which welfare-state institutions are modified to serve competition-state functions.

At the same time, the welfare state is very popular in the Nordic countries. No political party can expect to gain electoral success by declaring its opposition to the welfare state. The arguments for a radical deregulation that emerged in the 1980s have been pushed to the margin and everyone seems to be in favour of the welfare state. Rescuing the welfare state is one of the most widely shared arguments in the politics associated with the financial crisis that began in 2008 or with the long-term concerns about demographic structures and the so-called sustainability gap. Those concerned about economic competitiveness or advocating austerity politics motivate these concerns with the necessity of creating or rescuing resources for the welfare state. The welfare state is used as an argument for restrictive immigration policies as well as for the promotion of labour immigration. Those defending the welfare state against the pressures of globalised capitalism argue that the welfare state, through its security networks and risk sharing systems, actually generates competitive advantages. Rescuing the welfare state seems to be a goal that sanctifies

many different means, and a means that sanctifies many different goals, yet it is not clear how well the Nordic welfare state is withstanding the operations by which it is rescued.

2. A Chinese Perspective on Implications of the Nordic Welfare Model for China's Social Transition

In the context of the market economy, under the influence of labour unions' collective bargaining, through strengthening and enhancing legislation, Nordic countries have established a relatively developed and comprehensive social welfare system and social policy framework, which has now become an important pillar for their nations' development. The positive role of their social welfare system is to promote movement from the early capitalistic economic model, which is typically characterised by free competition and survival of the fittest, and to emphasise the role of the state in providing social security and in improving the welfare of workers and citizens.

The Nordic welfare state model originated in the late 19th century and has experienced rapid development during the post-war period. Most Nordic countries have already built social welfare systems and worked out the relevant public policies, covering education, public health, medical care, employment, elderly care, protection for the disabled, family, housing, etc. Such an integral social welfare system has become an important feature of the Nordic countries and provided them with great advantages. It has made great contributions to alleviating poverty and fostering social equality and justice. And this also plays an important role in promoting economic innovation and sustainable development.

At present, China is experiencing rapid economic growth as well as social transition. This transition is a move from the *danwei*-based welfare system under the planned economy towards a more market-orientated social welfare system; from a dualistic and segregated rural-urban system and unequal social welfare system towards a flexible and integrated rural-urban welfare system; from economy-driven development and reform towards an economy society coordinated and more holistic development.

During the process of transformation, China's social security and welfare system has lagged behind its economic growth. At the same time, terms of both rural and urban areas and different social groups, a series of problems have appeared, including the widening income gap, the poverty

problem in the cities, aggravated social stratification, the housing problem, discrimination against migrants regarding social rights and basic public services, weak protection for special vulnerable groups, etc. The increasingly serious social issues and social stratification have highlighted the shortcomings in our social security and welfare system and are making an urgent call for the system to be enhanced. Taking China's realistic conditions, the characteristics of the state system and its socialist features into consideration, Nordic countries' social welfare system, compared to that of the United States, which is relatively more market-orientated, can provide transitional China with more knowledge and lessons.

The comprehensiveness of the Nordic welfare system does not only lie in its wide coverage, from cradle to grave and including various social affairs, such as employment, living and personal development. It also lies in its elaborate design. For example, for elderly care, it even specifies the situations where the third generation should take responsibility for looking after their grandparents; for child care, it even stipulates the age under which the family has the responsibility to look after children and secure their life and development; in migrant welfare, it also has clear rules which provide the standard that international migrants should satisfy in order to enjoy the same social welfare and public service as citizens. Furthermore, the comprehensiveness can also be seen in a series of social welfare legislation to guarantee the welfare of the elderly and the disabled, poverty relief, etc. Through legal and institutional construction and improvement, the social welfare system has become an important part of the national economic and social system.

Transitional China will definitely face a challenge to speed up the construction and improvement of its social welfare system and a challenge to extend social security and support to satisfy the various demands of urban and rural residents. The insufficiency of the welfare and support for social affairs including maternity, childcare, pensions, employment and so on, in turn, increases the pressure on family life, increases the risk to the citizens in a transitional society and decreases their well-being. Meanwhile, the relevant legislation and institutional construction are still unsatisfactory. Legislation and administration on some social affairs are still stagnating in words but not appearing in the form of actions. For instance, some laws appeal for protection of the legitimate right of the elderly and encourage

children to go home often, but without any concrete provision for action. Moreover, the legitimate rights for different social groups must be defined more clearly, and specific guidelines for their implementation also need further refinement.

The typical feature of the Nordic model is the universality of its social welfare system. By providing social welfare to all members of society, the nations demonstrate their responsibility in building up the welfare system and also promoting social equality. However, some scholars claim that the Nordic welfare system is still not universal, or even conditional. For instance, there are differences in approving employment visas for international migrants and in providing housing benefits. However, the universality essentially lies in the universal access to various kinds of basic social security, in an attempt to minimise a situation where minorities fall into hardship because of inadequate security and being excluded from the welfare system; and in an effort to promote social integration and social equality as much as possible through the welfare system. Therefore, the universality of the Nordic welfare system, to a large extent, is that of basic livelihood security and that which values more highly social support for disadvantaged social groups. To provide basic and universal social service and target groups with special difficulties is also an important purpose for constructing the social security system.

In the transition period, the characteristic and weakness of China's welfare system lies in its inequality. Such inequality is even presented in the hierarchical distribution of welfare. The dual social security system for government administrative organs and enterprises, the lower social security coverage among migrant workers, the lower level of new agricultural insurance and NCMS (New Cooperative Medical System): all these indicate that social groups in the upper classes enjoy a higher level of social security and welfare while disadvantaged groups have a lower level of security or even cannot enjoy any security. Such a hierarchical distribution of welfare will not only damage the underlying social values of universality and equality, but also break the social security principle – to provide support for those who are most in need of risk aversion and social protection.

Therefore, transitional China should first strengthen the spirit of equality and the universality in building up its social security and welfare system. Through establishing a universal social welfare system, China can

support and enhance labour market mobility and social mobility in its structural transformation.

Considering the fact that the percentage of social welfare expenditure to GDP is often high in Nordic countries, it seems that comprehensiveness and universality have increased the burden on the government's budget. However, the European debt crisis since 2008 has not seriously affected the Nordic countries with higher level of social welfare but rather Greece, a southern European country with deeper marketization but a lower level of social welfare.

To rediscover the competitive advantages of the Nordic welfare model, firstly, the high–level welfare system can help to promote economic innovation. The Nordic countries are relatively more successful in innovation and have made remarkable achievements in information, design, environmental protection, new energy and creative industries, etc. To some extent, such success can be attributed to their relatively developed universal and lifelong education system. The huge investment in education, culture, art and public affairs of Nordic countries has exerted a positive effect on their economic innovation.

Secondly, the welfare state system can also help to reduce unemployment and cope with economic crisis. For instance, in the face of crisis, the Nordic countries, with their powerful labour unions and employment benefit system, have not experienced a serious increase in unemployment and aggravation of poverty problems. By retraining workers and promoting industrial transformation, these countries have taken the lead in crisis recovery.

Thirdly, the welfare state system itself is built upon the basis of the well-developed market economy and labour market. The reform of the welfare system in these Nordic countries also places emphasis on the close relationship between employment and welfare, on the demand for high-quality workers, and on the close relationship between welfare provision and labour market participation. In addition, reforms also aim at fostering a more active role of the labour market. Therefore, the development of the social welfare system and economic growth objectively establish a well-coordinated, well-reinforcing relationship. Those who have much concern about the weaknesses of the Nordic model and it excessive provision either hold the opinion that social welfare is unproductive ex-

penditure and will increase the pressure on the government budget, thus depressing the driving force of economic growth, or think that it will weaken the competitiveness of the labour market. With a higher level of welfare, workers may have weaker motivation to work and reduce their labour supply, thus causing the problem of "supporting the lazy". Based on the experience of the Nordic countries, we come to the conclusion that the two consequences of this concern will not transpire. On the contrary, building up the social security and welfare system itself is competitive and neglecting its construction and improvement will probably hinder the sustainable and coordinated development of economy and society.

In this social transformation period, China has to face an increasingly serious and urgent demand for social welfare and social security construction. We should note not only that the provision of social welfare has lagged behind the economic development but that the institutional construction of our social welfare system is also relatively inadequate. Fortunately, the Nordic countries have provided us with long-term and detailed experience in regard to institutional construction. Therefore, to reform and improve China's social security and welfare system, we should learn from the comprehensiveness, universality and competitiveness of the Nordic welfare model; from its countermeasures to cope with specific problems, such as housing, employment, education, etc.; and from the way in which the Nordic countries have considered changes in their welfare system and policy design.

3. A Nordic Perspective on Changes in China's Welfare System and Its Possible Future Direction

China has over the last three decades emerged as one of the leading economic powers and crucial political players in the world. It has quickly advanced to become the second largest economy after the USA, and will in all likelihood soon have regained its position as the world's leading economic power, a position which China has held during 18 of the last 20 centuries.

China's social, political and economic development is of more crucial importance than ever before for the rest of the world, in which interdependence between nations has grown markedly in recent decades. Not least, the latest global financial crisis since 2007 has demonstrated China's crucial role for the world economy. But although consistently record-high rates of economic growth since 1980 have lifted many hundred millions of

people out of poverty, Gross Domestic Product per capita is low, giving China a rank position between 80 and 90 among the world's nations. The gap between rich and poor people, between rich and poor regions, between the urban and rural population, has widened dramatically, and the lack of adequate social protection for large population groups, not least for the around 260 million migrants to cities and urban areas, represent major problems and challenges for the Chinese government and society.

What has happened to social policy development in China since the People's Republic was established in 1949? What are the current trends, and towards what kind of "welfare state" – or towards what kind and scope of state responsibility for welfare – is China moving? Is the idea and phenomenon of a "welfare state" globalising? Do the globalisation of social policy discourses and the possible "globalisation of the welfare state" make the Nordic welfare state experience more visible and relevant for China? These are some of the questions to be dealt with and discussed in the following. Given China's increased and increasing role in world politics, it matters for the rest of the world what kind of state welfare responsibility China develops.

Chinese social policy has undergone tremendous changes since the establishment of the PRC, from a highly centralised communist "iron-rice-bowl" regime into a socialist market economy. Briefly and schematically we can say that the PRC has gone through three phases of social policy development.

The first phase of social policy development after the foundation of the PRC can be labelled the "Maoist period", lasting until the beginning of the opening up and reforms initiated by Deng Xiaoping in 1979. Welfare in urban areas was guaranteed through the *danwei* (working unit) system in State Owned Enterprises (SOEs), providing cradle-to-grave social security, and government employees were covered by social insurance based on a law from 1951. The *danwei* system acted as a kind of mini-welfare state and played a key role in providing health services. The rural population obtained minimum security through the public ownership of land and the establishment of People's communes in 1958. The household registration system (*Hukou*) introduced under Mao in the late 1950s gave people social entitlements according to their place of birth. This law cemented the rural-urban differences which have persisted up until the present day.

The second phase of social policy development lasted from the initial steps of economic reform in 1979 up until the late 1990s or the early 2000s, and saw a far-reaching erosion of the previous welfare arrangements and emphasis on market-orientated flexibility, competitiveness and cost-containment that played down attention to social security and the role of the state in the responsibility for citizen welfare. Generally, the government adopted an approach characterised by a clear priority for economic growth. The *danwei* system was dismantled and urban health care, for example, was delegated to local authorities; through a management reform, hospitals were generally transformed into profit-orientated entities endowed with substantial autonomy. The overall trend was characterised by state withdrawal and increased out-of-pocket payments by workers for health services (Saich 2011). Rural areas experienced a similar process of health care deterioration, due to the collapse of the Cooperative Medical Schemes. Village collective funds virtually disappeared, leaving – in the 1980s – 900 million rural residents without health insurance coverage (Chan *et al*. 2008).The third phase, which China is currently experiencing, can be said to have started in the late 1990s, and more explicitly after Hu Jintao and Wen Jiabao became the new leaders of the party and government in 2003. Both political rhetoric and practice changed. Attention shifted from pure economic growth orientated policies towards a more balanced, sustainable and socially equitable approach to development. The vision and ambition was to move towards a "harmonious society" – *xiaokang shehui*.

In recent decades, the separation of welfare provision from SOEs and the rapidly growing numbers of migrants from rural to urban areas, many of them informal workers, have left many without basic and/or adequate social security or protection. The most severe source of income inequality in today's China lies in the striking urban-rural disparities. The Chinese authorities have acknowledged the destabilising potential of the highly unequal distribution of income and access to social security and health care. Government and party authorities have become increasingly aware not only of the tremendous beneficial effects of economic growth, but also of the significant social and political problems that the rapid development of the economy has created. Accordingly, a great number of social policy initiatives have been taken and many laws enacted during the last 15–

20 years, over a broad range of social policy and welfare. Let us briefly mention some of the major social policy reforms that have been passed:

- Basic medical insurance scheme for urban areas (1998).
- Minimum standard of living scheme: urban areas (1997), rural areas (2007).
- New rural cooperative medical scheme (2003).
- Pension scheme for all urban workers (2005).
- Decisions on new measures to provide social protection for migrant workers (2006).
- Labour contract law (2008).
- Free nine years compulsory education for all (2008).
- New health care reform (2009).
- First comprehensive social insurance law (2010).

From 2003 onwards, the social policy agenda has shifted towards the inclusion of larger proportions of the population and the most vulnerable groups, i.e. rural residents, the unemployed or migrant workers. We might say that the recent vision to establish a "harmonious society" with nationwide universal health care and pension systems by 2020 reflects a more people-centred development than was the case during the previous two decades of economic reform. Social justice, equality, sustainable development and making welfare a top priority have to a greater extent shaped the discourse over the last decade. Besides fulfilling these goals, the aim is also to preserve social stability, which in turn is considered the main precondition for continued and stable economic growth (Saich 2011). It remains to be seen to what extent visions and goal statements on paper can be transformed into successful implementation.

Is the Chinese social policy development following Western patterns of "welfare state" development? There are similarities in terms of widening the scope of state responsibility for welfare, although the underlying values and understanding of "welfare" may be different. The challenges of social inequality, new social divisions of welfare, population ageing, changing labour markets and family structures, migration and globalisa-

tion are common to both Western, including the Nordic, countries and China and other East Asian nations. Chinese social challenges may to some extent be unique, and are certainly on another scale. Also, problem perceptions and concrete social policy solutions may differ. Although modifications of elements of the Nordic welfare states have taken place, for example increased individual responsibility for pensions; less generous unemployment schemes; more co-payments in the health sector, overall public expenditure levels persist, in both relative and absolute terms.

Given a historically relatively successful interplay of market economies, the role of organisations in the labour market and their collaborative relations with the government, and the comparatively successful management of the recent global financial crisis, the experience of the Nordic countries may appear to be both more visible and relevant for other countries and regions of the world, including China. To some extent, one might say that recent reforms and agreed-upon plans in China point in a more "Nordic" direction, for example, universal coverage of health care and pensions; efforts to narrow social divisions; and increased public responsibility for the welfare of citizens. China's social policy choices can potentially have a significant impact regionally as well as globally as China takes a greater role in international political forums and social policy epistemic communities in which scholars and practitioners representing different "welfare model" traditions and experiences meet. Ideas and policy learning will diffuse globally more easily than before, and will likely have an impact upon social policy thinking and reform developments in both the Nordic countries and in China and East Asia.

The spread of the idea of "the welfare state" is one element in the ongoing process of the globalisation of economics and politics. Public responsibility for citizen welfare is increasing, as measured both by public expenditure data and scope of legislation, in emerging economies around the world (Castles *et al*. 2010). It will be a major task of scholars in the field of social policy and welfare research to comparatively analyse policy reforms and institutional changes as responses to the challenges mentioned, the norms, logic and mechanisms underlying processes of change, and the social and political outcomes of policies.

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6.6 China in Turbulence: Paths Forward for Nordic Business

The partners of the knowledge network have created a particular co-creation concept which aims to strengthen the Fudan University Nordic Centre's role as a platform where science and education meet with business and innovation. Although the model is developed in the project "China in Turbulence", it is applicable to any other topic of interest at the Nordic Centre and its key partners in academia and business.

The core of the co-creation concept is the development of joint knowledge by bringing all partners' specific capabilities and competencies together. The academic project partners contribute their multidisciplinary – rather than discipline-specific – analytical capabilities to the cooperation which are increasingly needed when analyzing phenomena that are socioeconomically and politically embedded. In the "China in Turbulence" project, the analytical viewpoints include international business and economic geography, embedded in socioeconomic and political contexts. The par-

ticipating Nordic universities include competence in both applied and basic research on China and can use their international academic networks to bring to the fore the best resources needed. In addition to being the source of empirical evidence, the Nordic business community brings to the cooperation its insight that is based on long-term experience of doing business in China. The Fudan University Nordic Centre provides the platform for delivering the results and for organizing brainstorming workshops between academia and the business community. The Nordic Centre also provides the framework for higher education programs that are tailored based on the cooperation, and for the organization of internship programs.

In the co-creation concept, knowledge is combined in all phases of research and delivery. The identification of fresh and relevant research topics is based on insights which are gained through frequent discussions in which partners inspire each other's thinking. It is vital that the preliminary research idea, which is often an outcome of desktop work, is used only as a starting point that can be refined during the rounds of discussions. When all partners commit to the cooperation, common understanding on the research topic grows exponentially. This kind of an approach demands that all partners are committed to generate new forms of cooperation. Results are being delivered and discussed throughout the research project and can take the form of informal discussions, memoranda, brain storming – rather than plain research reports.

The co-creation concept is a step towards better fulfillment of the third mission of universities, i.e. their vivid and pervasive engagement with society. The "real world" should be a driver for university research, guiding its research and education towards relevant and impactful themes. This is a win-win situation: better engagement opens doors to more and more authentic data for the use of basic research.

The Fudan University Nordic Centre based co-creation knowledge network

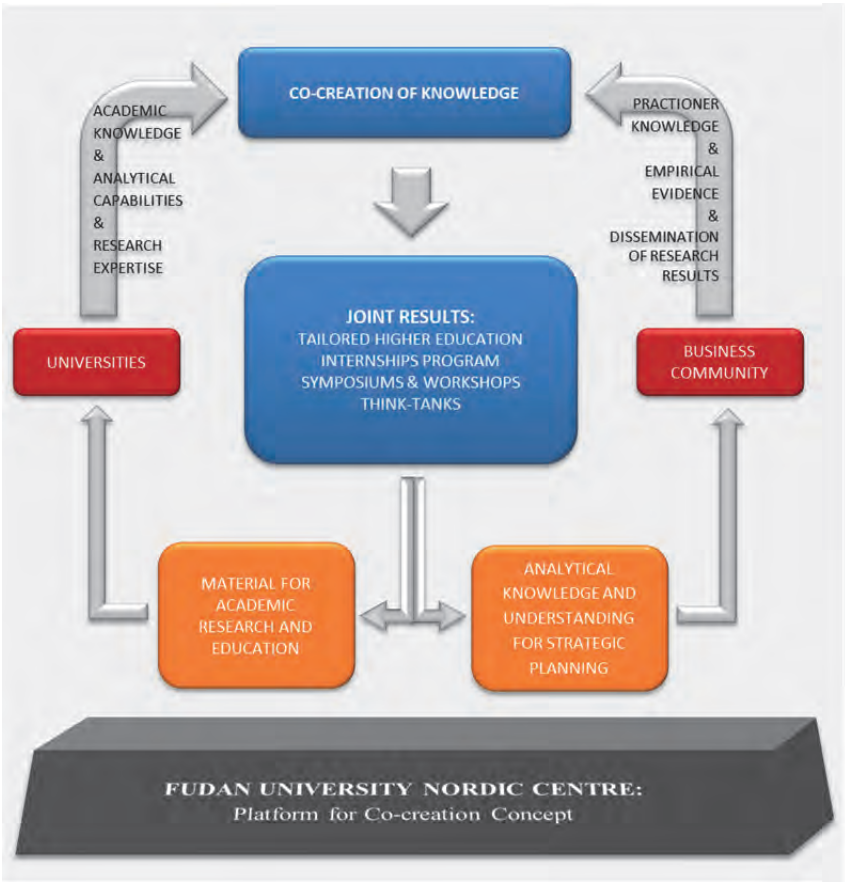

Photo credit: Riitta Kosonen.

6.7 UGN Methods and Models of Knowledge Triangulation, Outi Louva

Urban governments face today many serious problems. A cross-disciplinary and collaborative approach is required to find feasible and sustainable solutions to the complex and rapidly evolving problems. The challenge of the universities is to train experts who can rigorously examine the interactions between urbanization, environment and welfare to find new pathways to sustainable cities. These requirements are best reached by knowledge triangulation.

The research network "Sino-Nordic Urban Governance for Sustainable Cities" (UGN) aims to promote knowledge triangulation through three main methods. Firstly, the Network attempts to develop an innovative research culture by promoting an interdisciplinary approach, internationalization and co-operation with non-academic actors. Secondly, it encourages participating scholars to develop transferable knowledge. Thirdly, it aims to provide ideas for the improvement of teaching and doctoral training.

6.7.1 Promotion of Innovative Research Culture

International cooperation provides excellent conditions for the development of an innovative research culture, because it exposes scholars to a wide range of research and training practices. Cooperation enables participants to learn about other approaches and to improve their own practices. Furthermore, a cross-disciplinary approach brings researchers into contact with novel perspectives which pave the way for innovations. Also, collaboration with non-academic partners challenges scholars to approach their research questions from new angles, which brings a new type of dynamism to research.

These methods are imbedded in the Network's activities, and were in particular emphasized during the second workshop in 2014. That workshop brought together researchers from several countries and from different disciplines, NGO representatives and also professionals.

6.7.2 Development of Transferable Knowledge

The Network encourages researchers to develop transferable knowledge. The program will establish a shortlist of Chinese city-level policy innovations, "models", and "best practices" related to sustainable development. We can see this as a form of "benchmarking" for sustainable city governance.

These results will be shared with relevant external shareholders during the project, including municipal governments in the Nordic countries and various companies, NGOs, and environmental organizations. The activities arranged by the Network also contribute to the development of partnerships between research projects, business and other relevant stakeholders which facilitate the actual knowledge transfer.

6.7.3 Improvement of Teaching and Doctoral Training

The doctoral training course that was arranged by the Network aimed at creating a rich learning environment for professional development. This goal was pursued by establishing a multidisciplinary and international environment, inviting practitioners and NGOs to the workshop, and by arranging the sessions in different inspiring venues. The planning of the training workshop provided an opportunity for the organizers to develop best practices for doctoral training in sustainable urban governance and also for cooperation between Nordic countries and China.

The organizers collected feedback after the workshop in order to develop the practices. In particular, the participants were asked which activities promoted their learning most, and what could be done in order to further improve the advancement of their research project and career opportunities. The goal of the training course was also to establish strong networks between the PhD candidates, senior scholars, and institutions as well as public and private partners. This is expected to generate innovative future research projects of high international caliber.

Short-term projects cannot ensure that the new practices are institutionalized and become operationalized, but they provide ideas and incentives for the development of an environment that encourage the gradual embedment of knowledge triangulation in research and teaching.

7. Internationalization of the Knowledge Triangle Programme

7.1 Action 1: The 6th European Summit – Seminar for Enabling Know-How Exchange Globally

The sixth edition of the European Innovation Summit was hosted during 17–20th November 2014 by Knowledge4Innovation in the European Parliament in Brussels, Belgium. The theme of the summit emphasised the need to prioritise innovation in the new institutional cycle of the European Union and as a key facet of the 2020 strategy.

The program of the 6th European Innovation Summit (EIS) featured more than 25 conference sessions and discussions on important "horizontal" aspects of innovation such as framework conditions for innovation, TTIP, Horizon 2020, as well as parallel sessions for specific sectors for which innovation plays a key role in overcoming big challenges.

The summit brought together around 800 people from the EU's political, business, academic and scientific elite, as well as innovative organisations to discuss the importance of innovation and technological advances in addressing key global challenges.

Given the scale of the event and the opportunities for networking and sharing experience with other innovative organisations and EU policy makers, the Nordic Council of Ministers became a partner to the 6th EIS to organise a joint seminar that disseminated the final results of the Nordic Knowledge Triangle Programme, and opened discussions on opportunities to extend sustainably of the Nordic and Sino-Nordic networks. All 10 networks created, 4 Nordic and 6 Sino-Nordic networks were invited to present their results.

On 17 November, representatives from some of the networks participated at the seminar in the EU parliament in Brussels to share experiences and results of their work. The ultimate goal was to attract participants from beyond the Nordic countries and initiate collaborations for call of proposals within EU projects to further develop the networks that were built in the knowledge triangle framework.

During the four days of the event, the participants had also the opportunity to present concrete cases from their day-to-day experience and demonstrate their innovative and technological achievements and solutions at the special EIS Exhibition Space.

7.1.1 Agenda of the Seminar and Speakers

The seminar aimed to investigate efficient formulas that enabled access to a strong knowledge base and open innovation processes, augmenting the discussion of knowledge transfer actions from a humanistic perspective.

The agenda of the seminar included presentations of methods and tools for knowledge transfer and knowledge exchange among stakeholders from academia, business and research in areas such as design, culture, welfare, energy and entrepreneurship, as well as discussions on opportunities to open the Nordic networks to participants in the rest of the EU countries. The debate also focused on how to best facilitate the practice of transferring knowledge between research, education and the business sector, for the field of humanities and social sciences. While previous knowledge triangle projects have concentrated only on engineering and technology fields to overcome disparities that exist between universities, research intuitions and companies, the humanities, art and design have had more difficulty in identifying and promoting values and practical aspects to attract the interest of businesses and sponsors.

The seminar's program featured presentations of the following speakers:

The Speakers at the Seminar "Methods of Knowledge Triangle towards Innovation", 17th November 2014, Brussels

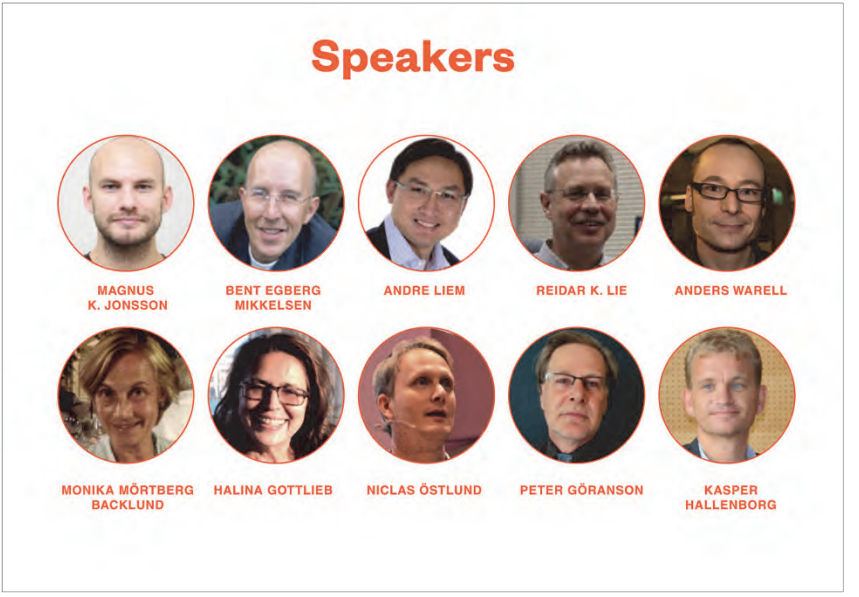

Photo Credit: Digital Heritage Center Sweden AB.

Host

- Monika Mörtberg Backlund,
  Senior Adviser, Education & Research, Nordic Council of Ministers

Speakers

- Halina Gottlieb,
  PhD, Knowledge Triangle Coordinator, Interactive Institute Swedish ICT, Sweden
- Reidar K Lie,
  Professor and Head of the Department of Philosophy, University of Bergen, Norway
- Anders Warell,
  Associate Professor, School of Industrial Design, Lund University, Sweden

- Andre Liem,
  Associate Professor, Department of Product Design, Norwegian University of Science and Technology, Norway
- Bent Egberg Mikkelsen,
  Professor, Aalborg University, Denmark
- Niclas Östlund,
  Innovation and Business Advisor, Innovation Financing at SLU Holding AB, Uppsala, Sweden
- Peter Göranson,
  General Secretary, NORDTEK
- Magnus K Jonsson,
  The Ministry of Enterprise, Energy and Communications, Division for Research, Innovation and Industry Development, Sweden
- Kasper Hallenborg,
  Associate Professor and Head of Department at the Maersk Mc-Kinney Moller Institute at the University of Southern Denmark

7.1.2 Ideas Discussed at the Seminar

Abstract: Culture KICK Network and Knowledge Transfer in Design and the Digital Heritage Field

Halina Gottlieb has been project manager for Culture KICK, one of the networks created and funded in the Nordic Knowledge Triangle Programme between 2011–2014, and has also been responsible of coordinating and facilitating collaboration between the Nordic networks.

Culture KICK is a university based network involving 8 partners from Norway, Sweden, Denmark, Finland and Island which all conduct practice-based and collaborative research with creative industry partners as well as heritage institutions.

The goal of the network has been to rejuvenate the Nordic cultural heritage in an effective way, by using results from design research and information and communication technology.

Since academic writing can be difficult to understand, Culture KICK has created different tools which make it easier for researchers to present their results in a way that is easy to understand and attractive to use for

museums and companies. In addition, the focus of the network has also been to promote and commercialise research results in the design and heritage field. Know-how books that came with specific examples to serve as models for researchers on how to promote themselves and their innovations to museum and creative industry professionals, a repository that provides an up-to-date and comprehensive archive of Nordic design-based and innovative projects in the cultural heritage field offering avenues for professionals to connect and access cutting edge information, and the NODEM conferences organized on digital media and heritage issues – all of them were measures the network undertook to enable collaboration in the cultural heritage field and to commercialise research results.

Abstract: The NORDTEK Design Network and Building Knowledge Triangles in the Design Field

The Nordtek Design Network was initiated in 2012 to support the creation of knowledge triangles in the area of design. The activities of the network focused on three main types of activities; annual seminars, special interest groups (SIGs), and PhD courses in related topics such as design methods, bio-inspired design, and practice driven research. Participants include researchers, teachers, students, and industry representatives. The network engaged participants in the Nordic countries including the Nordtek affiliated universities, but also attracted interest from an international audience.

The presentation prepared for the seminar in Brussels aimed to elucidate the Nordtek "Design" project's activities and propose a continuous development of innovative methods and practices for knowledge transfer between stakeholders in academia, research and companies as well as innovation and development of products and services.

As decided in the latest NORDTEK flagship seminar, which was organised in collaboration with Norddesign 2014, the network continues to focus on processes, methods and tools, which are relevant for building knowledge triangles among Nordic industries, practicing and research-active designers, including:

- *Methods for Form Development and Meaning Making,* focusing on how industry, managers and designers create knowledge and meaning relating to perception, experience and communication with the physical manifestation of the product and the principles for its

development, including emergent form evolvement and bio-inspired design. Issues of central importance relate to semiotics, engagement, narrative, identity and tangible branding.

- *Methods for Strategic Design, Human-Centred Design and Prospective Ergonomics,* focusing on stakeholder participation and interests as well as the wellbeing of people in the imagination and development of future products and services. Emergent processes are equally emphasised as deliberate ones, aiming for plural outcomes. Focal areas are (1) Workplace and workspace design, (2) Welfare and healthcare innovation, (3) Universal design, (4) ICT and Interaction Design, and (5) Service Design.

Abstract: The Role of The Maersk Mc-Kinney Moller Institute in NORDTEK Network of Welfare Technology

The Maersk Mc-Kinney Moller Institute at the University of Southern Denmark is a technology research center in welfare technology. Their research background in robotics, software engineering, artificial intelligence and electronics have been applied in a number of research and innovation projects within the domain of welfare technology and eHealth. All projects are built on strong partnerships with industry, the public sector and end users.

Their approach to engage end users is a mix between technology push, user-centered design, and a participatory design approach based on the project and the technology in focus. The institute has a strong collaboration with the university hospital and the local municipality to support innovation and new businesses aiming to care for patients at home rather than at the hospital, e.g. the very large project Patient@Home (http://www.en.patientathome.dk/).

The Maersk Institute has coordinated the Nordtek Network of Welfare Technology, and built on the experience with the knowledge triangle for other projects. In particular, the institute together with the hospital and other university partners are the core partners of a Danish node in a current application for a Knowledge and Innovation Community (KIC) on Healthy Living and Active Aging called by the EIT, which is built on the concept of the knowledge triangle.

Abstract: METIS Efforts towards Commercialization of Knowledge

METIS is a network based on interdisciplinary and trans-sectoral co-operation among universities in the fields of forestry, veterinary and agricultural sciences. The participants in the METIS network are the Tech-Transfer Office at the University of Copenhagen (DK), Kjeller Innovasjon (NO), NMBU TTO (NO), and SLU Holding (SE).

Cross-border collaboration between Innovation Support and Tech Transfer Offices is increasingly important to create start-ups and innovation ventures with long-term economical sustainability. In the Nordic countries a large percentage of the GDP is directed towards R&D in the higher education sector. In Sweden, Denmark and Norway this share is larger even in comparison with the US.

The impact of the research on innovation and on economic growth could be further increased by applying the research in society to a larger extent and to do so at a faster pace.

The purpose of the network is to strengthen, improve and streamline the commercialization processes at the participating parties/TTOs, by sharing experience, knowledge, best practices, and ideas for development of practices within the project. Another important topic is to identify and discuss national dissimilarities that could act as barriers or even obstructions. Such national dissimilarities give rise to different innovation strategies, tactics and different tools deployed by the practitioners which serves as a source of inspiration. The difference in ownership to intellectual property rights at public sector research intuitions could be mentioned as one major difference. Sweden, in contrast to Norway and Denmark, has kept the Professor's privilege system.

The project has focused its work on four common challenges: Deal Flow, From Market Evaluation to Tech Transfer, Supply of Funding (in a broad sense), and Cross-border Collaboration.

Abstract: NORDTEK and the Nordic Cross-Border Knowledge Triangles

NORDTEK was established in the 1930s as a network of the five Institutes of Technology in the Nordic countries. Today the network consists of 27 universities with education in advanced engineering up to a Master's level and PhD education in the technical/engineering research field. Its members represent more than 120,000 students, teachers and researchers.

Exchange of experience, collaboration and cooperation are the key elements of the network.

An important activity in the network is to initiate Nordic collaboration in new emerging areas of research and education, areas with common interest among their member universities. The result is new specialized networks and/or new research collaborations. Partners in this collaboration include academia (both research and education), industry and authorities.

From the knowledge triangle perspective, the network operates in a "three-dimensional" framework when adding a multilateral dimension in our projects. It has a cross-border perspective when establishing the projects, and it uses the member's national network to recruit participants. It also includes participants from industry and authorities.

NORDTEK has a bottom up tradition and most of the ideas and proposals are generated from discussions in connection to NORDTEK conferences and workshops which often provide effective meeting places for academia, industry, authorities and politics.

Abstract: Sino-Nordic Network in Ethics of Research and Public Health

The Sino-Nordic Network in Ethics of Research and Public Health is primarily a network of academics from the humanities and social sciences in China and the Nordic Countries. However, the network addresses ethical issues in product development in biomedicine. Such research is carried out by clinical research institutions often in collaboration with pharmaceutical companies. Such units are subject to rules administered by regulatory authorities, which often regulate controversial ethical issues.

In the topics addressed in this network there is an intimate relationship between innovation, regulatory systems, biomedical research, and ethics. The network is mainly composed of researchers with expertise in the last area.

The presentation for the seminar focused on how the network was organized in order to involve the other groups and how the development of the network will unfold.

Abstract: Food4Growth and Its Contribution to Public Health at Hospitals and in Communities in the Nordic Countries and China

The double burden of disease where chronic diet related sicknesses coexist with malnutrition and infectious diseases has serious implications in both developed and developing economies. Both are faced with the consequences of a modern sedentary lifestyle. Both in China and in the Nordic countries, societal actors, practitioners in the health care system as well as the scientific community increasingly address these challenges. For the health care system, this presents a double challenge. It needs not only to be able to treat the growing number of lifestyle related diseases, but also to reach out to communities to engage in preventive measures.

This is the background for the Food4Growth program which joins together research groups from Aalborg University Copenhagen (AAU-CPH) Center for Nutrition and Bowel Diseases from Aalborg University Hospital (CET), JAMK University of Applied Sciences, University of Tromsø, Shanghai Fudan University, Huadong Fudan University Hospital and Zhongshan Fudan Hospital.

The vision of the network is to make a contribution to the idea of new public health and to take food and nutritional care at hospitals and in the community as its point of departure. The network uses a three layered model as its conceptual foundation: the patient sphere, the hospital sphere and the community sphere.

The network aims at contributing to setting out an agenda for a Nordic-Chinese dialogue on the directions of the welfare system in relation to better food, healthier eating and nutritional care using a new public health approach. It aims at discussing what kind of dimensions of empowerment can be applied at the individual, as well as on the collective level in relation to food and nutritional care at the hospital and in the surrounding community.

Food4Growth looks in particular at ways in which patients, staff and citizens can be empowered to take responsibility for their own health. In addition to this, it understands the importance of social, cultural and environmental determinants in health, and values the potential of "intersectorality" in the promotion of good health.

The network has set up to publish a comparative case study on food and nutritional care at hospitals in Denmark and China. Moreover, it has

developed a program for a Nordic-Chinese summer school on new public health which is currently developing opportunities for researcher mobility. The network is in the process of exploring opportunities for developing and testing new intelligent ICT-assisted methods for dietary assessment including the exploration of commercial applications.

Its tangible outcome consists of a prototype of what they call a food monitoring system, DIMS, for hospitals. DIMS controls what the patients eat, and more importantly, what they do not eat. It keeps track of how varied the individual patient's food is and how often the patient eats. DIMS is also a tool that can be used to prevent food waste. While there is a great need for their product both in the Nordic countries and in China, the big challenge they are facing is to attract investors and add business value to it. In other words, it is about turning research into money. In order for this research achievement to move forward, experts in commercialisation, in marketing and intellectual property law are strongly needed. To become established in China, the network also needs experts in the cultural differences between China and the Nordic countries.

7.1.3 Conclusions from the Seminar

The Nordic countries have a history in supporting interactions between academia, research, private sector and society. Most universities in Sweden have holding companies performing their commercial activities, and there are national agencies (SISP), governmental companies (RISE) and non-profit organizations (SNITTS) in Sweden that promote the co-operation between academia, enterprise and society to create value, competiveness and economic growth.

There is a need to build sustainable infrastructures that bring together stakeholders from different sectors, countries and disciplines in order to ensure long-term knowledge transfer from research to the market and ultimately to society.

Stakeholders have leveraged the networks formed within the Knowledge Triangle Programme by initiating joint innovation projects which use different methods for knowledge transfer at micro (between individuals) and macro levels (between institutions, organizations or communities): entrepreneurial programmes at universities, tech-transfer

offices, hubs, collaborative publications, annual conferences, annual network seminars, mobility scholarships, workshops and online platforms.

The next step of the Knowledge Triangle programme is to find opportunities to bring the Knowledge Triangle programme outside the Nordic countries by building collaborations for a larger European project / Horizon 2020 project funding or for international projects.

7.1.4 Future Plans

The goal of the Nordic Council of Ministers is to establish networks between Nordic universities, research centres and companies with other partners worldwide, by increasing visibility of Nordic actions outside Scandinavia.

This joint seminar was the starting point to unlock more opportunities to extend sustainably the Nordic and Sino-Nordic networks. In 2015 and 2016, the Nordic Council of Ministers is committed to find ways to sustainably develop these networks which may have a large influence on educational programmes to target multi-disciplinary and entrepreneurial skills relevant to the business sector and enable the transition of research results into commercial products.

The plan is to carry out actions of promoting and pitching the idea to other related EU-based consortiums which share the values of the knowledge triangle principles. The expected result is to build collaborations with international partners to develop cross-border innovation networks.

The first step to achieve this plan is to raise awareness about the Knowledge Triangle programme across the world, so it attracts international participants willing to initiate collaborations for call for proposals within the EU's Europe 2020 Strategy or other funding programs.

Jerzy Buzek, Former President of the European Parliament, The 6th European Innovation Summit Opening Ceremony, Brussels, November 2014

Photo Credit: Knowledge4Innovation.

The Seminar "Methods of Knowledge Transfer towards Innovation", European Parliament, Brussels (from left to right: Niclas Östlund, Bent Egberg Mikkelsen, Reidar K. Lie, Henna Virkkunen, Monika Mörtberg Backlund, Halina Gottlieb)

Photo Credit: Knowledge4Innovation.

Monika Mörtberg Backlund, Senior Adviser, Education & Research, Nordic Council of Ministers, Interview at the 6th European Innovation Summit, European Parliament, Brussels, November 2014

Photo Credit: Knowledge4Innovation.

Henna Virkkunen, Member of the K4I Forum Governing Board, Seminar Methods of Knowledge Transfer towards Innovation, European Parliament, Brussels, November 2014

Photo Credit: Knowedge4Innovation.

The 6th European Innovation Summit Exhibition

Photo Credit: Knowledge4Innovation.

The Summit's Closing Ceremony (from left to right: Jerzy Buzek, Friedhelm Schmider, Lambert van Nistelrooij)

Photo Credit: Knowledge4Innovation.

Sammanfattning

Innovationsstrategi fastställd år 2004 av Sveriges regering betonar vikten av samarbete mellan utbildning, forskning och den privata sektorn. Denna strategi bygger på tanken att utbildnings- och kunskapssektorn spelar en central roll för samhällsutvecklingen. Detta formaliserades senare som en del av begreppet kunskapstriangeln under Sveriges ordförandeskap i Europeiska unionen 2009.

Nordiska ministerrådet initierade under 2011 nordiska kunskapstriangeln i syfte att bidra till ett förstärkt samspel mellan aktörer inom dessa sektorer. Programmet stödde befintliga övergripande nätverk och byggde nya konstellationer i Norden inom områdena design, kultur, välfärd och företagande. Fyra nätverk etablerades under den första fasen av projektet:

- METIS – Nordiskt nätverk vars huvudsakliga mål är att genom samarbete stärka, förbättra och effektivisera kommersialiseringsverksamheten vid universitet i Norden.
- NORDTEK – Det nordiska nätverket för de tekniska högskolorna. Dess syfte är att möjliggöra etablering för nordiska kunskapstrianglar . Fokusområden utgörs av industridesign och välfärdsteknologi.
- Culture KICK – nätverk vars syfte är att underlätta utbyte av nordisk forskning och kunskap inom området design med fokus på innovation inom kulturarvssektorn genom praktiska och teoretiska tillämpningar av informations- och kommunikationsteknik.
- NeRo – nätverk med fokus på välfärdsteknologi inom hälso- och sjukvårdssektorn i de nordiska länderna.

Under 2012 utökades programmet till att även omfatta Kina - ett land som numera betraktas som en viktig partner för nordiska universitet och företag med fokus på innovation. Sex sino-nordiska nätverk etablerades kring samhällsfrågorna folkhälsa, välfärd, grön energi och hållbara städer: Sino-Nordic Welfare Research Network (SNoW), Sino-Nordic Network in Ethics of Research and Public Health, Urban Governance for Sustainable Cities Network, Dynamics and Reliability of Renewable Energy Systems, China in Turbulence: Paths Forward for Nordic Business och Food4Growth.

Denna publikation har sammanställts i rapportform av nätverken som deltar i Kunskapstriangeln. Rapporten ger en översikt över nätverkens verksamhet och resultat under perioden 2011–2015.

TemaNord 2015:567

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The Knowledge Triangle Programme

The Knowledge Triangle Programme was initiated by the Nordic Council of Ministers in 2011 with the aim to stimulate interaction between research, education and innovation. This report is a collective work and provides an overview of the Nordic and Sino–Nordic networks between 2011–2015. Experiences and results from the work are described by the project leaders.

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