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How does the Finnish Innovation System respond to Global Challenges: FINNSIGHTS 2015

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Globalization is shaping our common future more than any other contemporary phenomen. At least it makes our global village more and more competitive, day by day. It offers great opportunities for those, who are competitive. For those, who are not, globalization poses great risks of further marginalization and even exclusion from the map of the world economy

When I refer to "those" who can or can not manage, I mean nation states, business corporations and, also citizens. Free movement of capital, business and goods mean that corporations are competing in a real global environment. People are moving as well in order to find the best possible environment, where they can exploit their potential, skills and knowledge. It is no wonder, that the nation states are fiercely competing with each other to create a conducive economic and business environment, which attracts investments and people. No country is any more sovereign in a sense, that it could build its nation in isolation of the developments in the rest of the world.

Globalization strenghtens those that are strong and weakens those that are weak. The biggest challenge in the global governace is to fight the exclusion of poor and vulnerable countries from the main streams of the world economy. The reasons for exclusion are many : conflicts, poor governace and corruption, lack of human resources and skills, weak infrastructure, poor economic management, absence of the rule of law etc. The list of problems we see in countries all over the world is long, and to turn all this the other way round means, that any country that wants to be a winner in the battle for investments, and people in the global village, has to be good in many things.

Information and communication technology, innovation capacity and education are key elements of a knowledge-based society. And building the knowledge-base of the society is perhaps the strongest element of competitiveness and success of any country today and in the future. Knowlwdge-based economy and society is not an option, it is a must.

Narrowing the global digital divide is one the biggest challenges of the international community. It is not only a question of "soft issues" like economic development, fighting poverty, and enhancing human rights. In the world of rapidly increasing inter-dependency among all the nations, a digital divide threatens also the broad-based security of all the nations. A growing gap in the wealth between countries and people, persistent absolute poverty, environmental degradation, migration pressures and other problems anywhere in the world are threating peace and security everywhere in the world.

My own country, Finland, has been ranked very high by institutions like Davos-based World Economic Forum when it comes to the competitiveness of our national economy and of our business environment. The same applies to Transparency International, which classifies Finland as one of the least corrupt countries in the world. Finland is also one of the leading knowledge-based societies

regardless of the criteria used. I am referring to these achievements in order to just create an impression that it looks like we should be confident about the future challenges. I think we are, but it does not mean that we should think that "Finland is now completed" and we can go on with the present model of running our country and doing business. No, we don't, because it is self-evident that in the world today the only permanent state of affairs is - change !

From this point of view we have produced for ourselves an analysis and strategy for the future, called FINNSIGHT 2015 and I am happy to share some of its major findings with this distinquished audience. Some of the issues are quite country-specific, dealing with the particular challenges of Finland but I think most of the points are universally relevant.

Before that, however, let me quickly describe where Finland comes from and what we have done so far. 1. We have invested for decades in our education system that is public and free for everyone, from kindergarten to doctoral degree. 2. Public sector has been given a push through technological and financing institutions to build the Finnish innovation system, but gradually the private sector has invested more and more in R & D. Today the private sector is financing almost 2/3 of total R & D investements. 3. There is a systemic approach to building collaboration between science and technology on one hand, and the Finnish innovation system on the other. 4. Finland has built a shared vision as a knowledge-based society - or information society - and as a global player in ICT, and 5. The information and communications environment was deregulated and opened for free competition at a very early stage, in order to make the ICT serve business, people and the country - and not the other way round !

Finland is by its population a small country - 5.2 million. Our economy was dominated by a strong pulp and paper industries, while the metal industry has gradually become the second largest sector. In the early 1990's Finland suffered a heavy economic recession, which was due to a number of simultaneous factors. First, the fall of Soviet Union - one of our biggest export countries for industrial products. Second, the economic recession in our other main export countries led to the fall of both export volumes of pulp and paper products, as well as their prices, and third, we had just liberalized our financial markets in a pretty care-free fashion which led to an overheated economy and then the bubble burst. Our credit-worthiness went down, a lot of companies went bankrupt, the unemployment rate was close to 19 %.

Finland really had to re-invent itself. We formulated new vision and national policies for the future. One of the big things was to build Finland, which is a knowledge-based society and a global player in ICTs.

It was not just the right analysis and right policies, we were lucky, too. At the same time Nokia, now the flagship of the Finnish ICTs, changed its multi-sectoral industrial structure like pulp and paper, consumer electronics, tires, rubber boots etc. into an ICT company. Nokia has since become a world leader in mobile phones and their applications, and is a major company in telecommunications networks with Siemens - Nokia Siemens Networks. Nokia cluster is today a key player in the Finnish economy and its exports are up to about 25 % of the country´s exports !

Next Steps

Science and technology have played an important role in Finland's recent development. But how do we face the new challenges posed by the global economy? Finland needs to formulate new approaches to our science and technology, and especially the innovation culture and policy in order to meet the challenges of the next 10 to 15 years.

The public sector and private sector have taken new initiatives to meet these challenges. One of them is **The Finnsight 2015** foresight project. It brought together top experts in science, technology, business, economy and social policy to consider how Finland can keep its position among the world leaders in creating new technologies and especially innovations. The work was carried out by Academy of Finland and Tekes, the Finnish Funding Agency for Technology and Innovation. Finnsight

2015 deals with trends in science, technology, business and society that have to be taken into account and utilized when building a common future for the entire society.

There is a shared understanding among all stake-holders that strengthening competitiveness and innovations is key to Finland's future development and success. It is also understood that the country needs a common vision to meet the future challenges of business and society as a whole. The objective of Finnsight 2015 is to identify focus areas and priorities in the fields of science, technology, industry and the society as a whole, in order to meet future challenges.

The foresight work also helped to define the Strategic Centres of Excellence in Science, Technology and Innovation. The Finnsight work was carried out by expert panels from industry and research and other walks of life.The foresight methodology integrates surveys of the future, expert's panels and policy analysis. The target is to identify challenges in the science, technology and innovation environment and to asses how to best respond to these challenges. The common vision for science and technology is that the country needs multi- and interdisciplinary cooperation in science and technology, new forms of collaboration and networking.

Some of the challenges of the science and innovation system in Finland were identified as:

1. Public research system needs renewal. In general there is need for multidisciplinary research and collaboration between universities. The division of labor between Academy of Finland (basic research) and Tekes (applied research) should be re-considered..

2. Companies have to invest even more in research and development (not only production)

3. Do the investments into knowledge and competence generate economic growth, employment and welfare in Finland? In other words, is it all relevant from the point of view of people !

4. What are the priority areas and how they will be funded?

The key tasks of the Finnsight 2015 are: 1. identify key driving forces that influence the business, industry and society in Finland, 2. identify key challenges and priority areas for research and innovation, that promote business and industry competitiveness and, hence the welfare of the society.

The Driving Forces

The driving forces to impact business and industry and the whole society are identified as the following ones:

1. Globalization Globalization will further increase mobility of goods, services, capital, people, ideas, cultures and values across borders. Inter-dependency between countries, economies and cultures will further increase. Finland will loose traditional and lower-level industrial jobs to other parts of the world, and the economic growth is further shifting to other parts of the world. Market success is no longer dependent on technological innovation only, but requires more information and knowledge on the behaviour of individuals and their lifestyles. People have more choices in their everyday life but they also become increasingly vulnerable while life in the globally inter-dependent world becomes more un-predictable, even unstable.

2. Change in the population structure. The aging population in Finland will influence labour markets, consumption and needs for services. Changes in the population structure change the economy and society as a whole.

3. ICTs are opening new opportunities as information and knowledge become accessible everywhere and anytime. This changes communication patterns, work methods and social interaction between individuals.

4. Sustainable development challenges us and requires long-term investments in environment. Climate change, changes in the world's ecosystems, water scarcity and problems, and waste management call for new solutions both in consumption and in production.

5. A competent workforce is crucial for success in any country. There is increasing competition for competent work force globally. In the future we have to invest in skills that integrate scientific and technological know-how with business, cultural, social and legal competencies. A good living and working environment for a competent workforce become increasingly important.

6. Open source becomes more relevant globally. Work becomes independent of time and location as organizations are global and managed through ICT networks. Therefore, Finland needs a more skilled and competent workforce in this changing, globally networked environment.

7. Multicultural equality becomes important. People are increasingly working in multicultural environments where multicultural equality is a must.

8. Global governance and managing changes requires more international co-operation, regulations, standards and agreements. Nation-states continue to be important players but they will need to work together.. Managing risks and security become increasingly important.

Priority areas for Finland in the Future in Science and Technology

The following areas of competence were identified crucial for Finland's future.

1. Learning and Learning Society
In today's environment continuous learning has become important when responding to the changes in our environment. Education and learning takes increasingly place outside formal education. ICTs have made learning independent of place and time. ICTs support new ways of learning. In labour forces knowledge-based work requires specific skills and there is global competition for these skills. Knowledge-based work is increasingly mobile and it challenges various organizations and their management to find new business structures and models.

2. Services and Service innovations
The service sector is growing and provides most new jobs - it is labour-intensive but it will use more and more new technologies in an innovative way in order to improve service business models. It is important to better understand consumer's needs and choices, to provide services in an innovative way. The new service innovations can focus on improving housing, service and work environments, which take into account people's needs. Finland needs to increase service exports.. These service areas can be ICT, environmental services, security technology, culture and specialized tourism services.

3. Well-being and health
The focus of public health systems is in aging populations and their needs, in mental illnesses and in children and youth. Advances in health technology can help solve issues of labour shortage in health services, as well as a lack of services in rural areas. These technologies can be preventive and emphasis is put on health services that are delivered at home. We move from treating illnesses to promoting health. The focus in the future research will be in biomedicine, in treatment of illnesses like cancer, and in brain and neuro research.

4. Environment and Energy.
The ecological expertise and competence in Finland will become more important in order to meet environmental challenges such as climate change. Advanced geoinformatics provide foundation for tracking environmental changes. There is strong international demand for expertise in environmental issues like biodiversity and climate change. Emergency efficiency will become another field of expertise which is demanded globally. Efficient energy use in housing and traffic will become an important area of research and development, for example renewable energy.

5. Infrastructure and Security
The modern infrastructure of society, like on transport & communications, energy, financing and health have made societies very vulnerable. Infrastructure and security must be inter-linked. External security threats include environmental threats, energy supply cuts, international crime and terrorism. ICT expertise can be used to improve security of information and energy networks, and these competencies can be exported as well.

6. Bio-expertise and Bio-society
Finland has created expertise in biosciences, like use of renewable natural resources, biofuels and modernizing forest industry. This research needs to be transferred into commercial products. This requires integration of various fields of research in biosciences. The multidisciplinary research has produced new areas of research like chemical biology, bionanotechnology, biophysics and bionenergetics. Advances in diagnostic methods, pharmaceutics and Finnish population genotypes are important areas of research to be developed further.

7. Ubiquitous (embedded and realtime everywhere present) Information and Communication.
In the future environment ICT is embedded increasingly in all areas of life, as people are living in real-time information environment where services are targeted and personalized. Development of hybrid media, ICT-based learning tools and the use of mobile digital media are examples of new areas of use of ICTs. There is need to find new innovations in collaborating research in forestry, ICTs and communication. The different ways of storing and using digital data are another field of research and innovation, particularly development of software and programming.

8. Understanding and Human Interaction.
Unserstanding the change in society and human behaviour become increasingly important. Investment in human technology, meaning technology that adds value to people's mental, physical and social well-being, becomes important. These solutions are intelligent information networks, smart devices, learning, cultural services, health technology and language technology applications.

9. Material development.
In the coming years more research is needed in material production. The need for new energy sources and new related technologies has created new challenges, opportunities as well, for research and innovation. There is need for interdisciplinary research between natural sciences and technology. Materials research and product development need to be integrated with design.
Major focus areas are surface engineering techniques and printed electronics, and effective use of wood and biomass.

10. Global Economy
In the global competition the key areas of innovation become important for Finland.. Global liberalization of trade as well as global environmental conventions will have a major impact on the Finnish economy. The focus areas for Finland are: creative innovation and research environment, focus on services, particularly welfare services for elderly people and business services. Finland has a unique resource, which is highly educated human capital. Finland needs to internationalize its research and business practices. Creative research inspires innovations.

The Finnsight 2015 draws a conclusion that: " The development and strengthening competences and innovation are the key to Finland's success in the future. Cutting edge basic and applied research together with broad-ranging expertise will help to reach international excellence".

Thank you