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Internationalisation of Finnish Education, Research and Innovation



RIC RESEARCH AND INNOVATION
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Internationalisation of Finnish Education, Research and Innovation

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Preamble

In November 2004, the Research and Innovation Council adopted a strategy for the internationalisation of Finnish science and technology. Since then, much has happened in Finland and globally, and different organisations have issued various operational principles and policy lines in relation to internationalisation. In view of this, the Council considered necessary to collect the experiences of the various players and revise the strategy document in 2009. The objectives and policy lines in this new document relate to the period 2010–2015.

The strategy provides overall policy lines for promoting the internationalisation of Finnish education, research and innovation (ERI). The main objective is sustainable and balanced social and economic development and citizens' welfare. The internationalisation of ERI environment will enable Finland to respond better to global cooperation and the competition for knowledge and capital. Finland's own high-standard knowledge is a prerequisite for successful interaction with the leading centres and for efforts to promote development in countries in need of support and in crisis areas.

In Finland, the rate of internationalisation is relatively low as compared with the major partner and competitor countries. This calls for measures to expedite internationalisation and establish strategic guidelines of development lines for it. We must enhance our capability to influence domestic development, progress in the neighbouring areas and in the EU and global development more widely. Finnish organisations need to devote more attention and resources to exploiting opportunities inherent in joint efforts and interaction.

Internationalisation needs to be promoted as part of all development of ERI. In the global economy, where there are no purely national operational environments and where a collective view of the measures needed is in the best interest of all, it is essential to make efficient use of global ERI and introduce incentives in support of it. Success in internationalising ERI also entails comprehensive action in society to promote openness in the living environment and genuine internationalisation in everyday life and in ways of working and creating new things.

1. Introduction

Global cooperation has been constantly increasing and gaining new forms with the opening of societies and the development of the ICT structure. One of the factors and prerequisites guiding the change in our operational environment is *globalisation* (Figure). Its advance has opened up new channels and mechanisms for economic, educational, scientific and technological development and stepped up interaction between cultures and communities. The international socio-economic division of work is more dynamic than before; the collaborative relations and directions may change – rapidly at times. The most visible change has been the emergence of China as a major economy steering global development. In a wider perspective, the BRIC countries (Brazil, Russia, India and China) and certain emerging economies in Asia, South America and Africa have been increasing their political and economic weight and significance in the ERI sector during the past decade.

The effect of globalisation is reflected in the worldwide financial and economic crisis. As links between international, national and local activities have become closer and the market relations have deepened, the unfavourable development has affected all the countries and regions. On the other hand, the interdependence of countries and regions has so far delayed protectionist measures. In Finland, the recession has manifested itself as a fast decrease of foreign trade and investments, a reduction in production and jobs, and further as a narrower tax base.

The major themes in *sustainable development* are those relating to the climate, the environment and energy and growing social challenges, such as the constant population growth, growing economic and social inequality, the availability of food and water, and the need to change consumption patterns and ways of life.

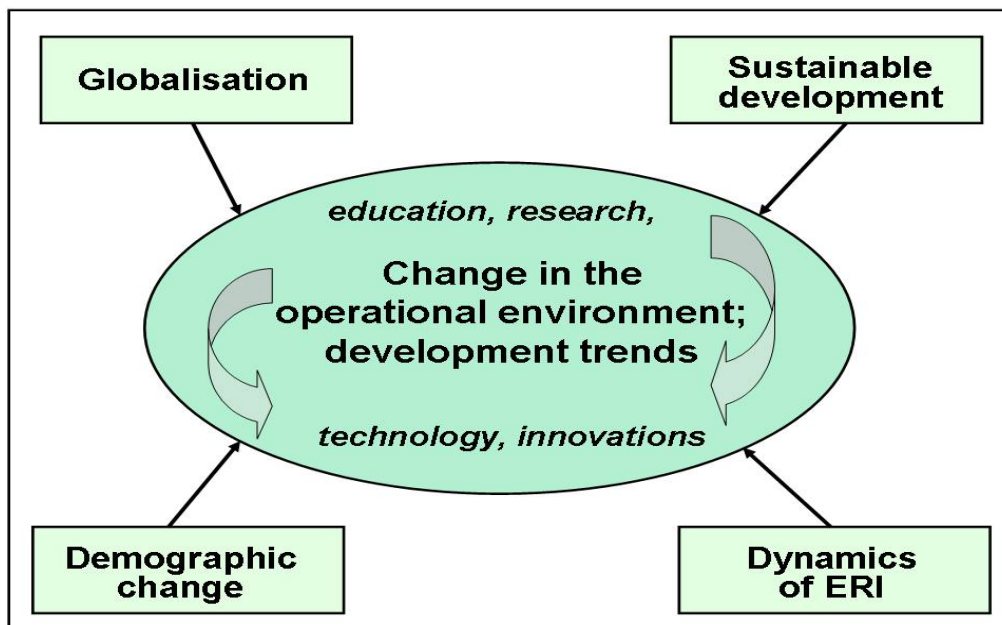


Figure. Factors of change and development trends in the operational environment.

The constantly internationalising quest for solutions and societal operations highlight the role of trans-national organisations (e.g. the UN and its special organisations, OECD, G20, WTO). The leading economies have to place much greater emphasis on the issues of sustainable growth, the stability of the (public) economy, climate change and reduction of poverty. Multilateral cooperation is crucial in efforts to find solutions to these issues.

In regard of *demographic change*, special challenges for Finland are the ageing population and the availability of skilful work force, as well as the question how to safeguard the quality and supply of welfare services. The working-age population is predicted to decrease nearly in all regions of Finland in the 2010s. Consequently, the volumes of production and consumption will decline and the tax base for public finances will shrink.

Developments within ERI will open up new possibilities, and, produce new knowledge and offer solutions to the challenges (incl. transitions in the dynamics of science and technology, advances in cross- and multidisciplinary approaches, demand- and user-orientation, broad-based innovation). Today, the advanced economies are systematically investing in technology and innovation and in conditions conducive to them. These investments have also been rapidly increasing in the emerging economies. This is due to the growing role of knowledge, know-how and innovations as key factors for societal development and competition.

The internationalisation of ERI is crucial for the renewal of society. High-standard education and scientific research are preconditions for the welfare and international success of society; they determine the level of intellectual development in society and create a basis for applications. Finnish research is faced with the challenge of consolidating its status as knowledge producer and user.

Despite first signs for recovery, it is difficult to assess how long-term the effects of the ongoing global recession will be. The key question is in what kind of operational environment the economic revival will take place and what this will mean for ERI policy. The division of work and competitive advantages may change rapidly, in a way difficult to predict, and lead to a redistribution of investments and jobs between sectors and regions.

According to estimates, manufacturing will remain an important sector of the economy although its relative share of production, jobs and tax income will decline in the advanced economies. Services and the third sector will grow in importance. At least so far, the R&D-intensive countries have been able to retain knowledge-intensive jobs to a large extent. In this respect, the situation will change as the emerging economies keep increasing their relative share of knowledge-intensive professions. Success in ERI will continue to be crucial for international cooperation and competition. Financing, contents and structures have to be developed simultaneously and in a proactive and comprehensive manner.

Finland is an R&D-intensive country specialising in advanced knowledge; for us, participation in the constantly intensifying international cooperation is of the utmost importance. Our long-term investment in the knowledge base and in research and innovation has smoothed the way for success in the global competition and generated welfare in our society, albeit making us increasingly dependent on developments elsewhere. Activity in the international environment is in Finland's interest because of the country's limited resources and due to the

fact that a significant proportion of knowledge and know-how is produced abroad. Cooperation is also a means of enhancing the quality and impact of operations, removing overlapping activities and pooling financing and entities (see Annex).

Based on various data, the Research and Innovation Council collated the premises of internationalisation into an overview of the Finnish ERI system in its document *Review2008* (Table). The baseline for Finland's success in the global competition is good. The system is of a high standard and capable of cooperation, albeit largely national. Apart from those listed in the Table, Finland's challenges include high taxes, a low rate of immigration and a need to develop new advanced business management practices.

Table. International strengths, opportunities and challenges of the Finnish ERI.

Strengths:

- ERI policies have been implemented in a sustained manner; ERI systems are of a high quality;
- Structures and activity of public education and R&D organisations are being reformed;
- Public sector and administration work efficiently and are trustworthy;
- Financing of R&D has been developing favourably for a long time;
- Level of education among the population is high; large number of R&D personnel;
- Quality and impact of research is of a fairly good standard; high activity in international patenting;
- Close partnership between public and private actors; lively collaboration between business community and public research;
- The economy and business and industry focus on knowledge-intensive growth sectors; knowledge-intensive business has remained in Finland;
- Foresight-oriented approach to major social and environmental changes (e.g. challenges in social and health services, energy supply and management);
- Sustainable development important; environmental issues crucial; competence and know-how in environment and energy technology are world-class;
- Strong evaluation culture and tradition;
- Rich social capital: openness, interaction, and networking;
- Good reputation as a country: trustworthy, safe (incl. stable business environment).

Opportunities and challenges:

- Internationalisation of the ERI systems; raising the participation rate of research organisations and businesses in international RDI programmes; active, strategically solid global cooperation policy: acquiring the best partners and knowledge (regardless of their location);
- In order to obtain foreign intellectual capital and investments, the attractiveness of Finland is enhanced by comprehensive joint actions involving various organisations;
- Consolidation of the quality and impact of research: development of PhD training; creation of a real research career system (tenure track); increasing mobility; creation of internationally competitive infrastructures;

- Pooling and prioritising the (partially too scattered) resources; selective decision-making;
- More accurate, demand-oriented quantitative planning and distribution of education and competence (joint effort for responsible organisations from different regional levels);
- Boosting integrated development of social and technological innovations <-> new shared procedures and forms of action are created, introduced and commercialised;
- Enhancing demand- and user-orientation: shared goals and operational models are being structured;
- Qualitative development and internationalisation of the services sector;
- Increasing business and marketing expertise in ERI activities;
- Increasing know-how in IPR in a way that meets the demands of operating in the global markets;
- Promotion of growth entrepreneurship: improving the availability of capital funding through partnerships; providing comprehensive and coordinated support to the internationalisation of businesses;
- Enhancing efforts to increase the number of innovative enterprises and to scale up the volume of enterprise RDI; intensifying the exploitation of knowledge and technology and encouraging risk-taking and utilisation of new opportunities; creating more favourable climate for business.

2. Basic policy lines

The role of the Finnish knowledge base is highlighted in efforts to respond to the open global competition and to the challenges of ERI. Education and training, from compulsory education to PhD education, lay the foundation on which our success rests. In this respect, Finland is relatively well placed. Pupils' and students' versatile knowledge and skills provide a solid basis for the development of knowledge-intensive, experimenting society. More resources need to be focused on the development of the education system because the renewal of intellectual capital is not a matter of course. In ERI terms, this is a question of enhancing the quality and content of higher education and the attractiveness of university education and research as a career in Finland.

So far, Finland has fared well in the international competition and succeeded in profiling itself as an ERI-intensive economy in some specialised areas, such as ICT. A key question is how we can put our strengths to better use and gain a new competitive edge on a global scale. The challenge is to try to stand out in a situation where advanced economies pursue success with similar ERI policy action and priorities. In Finland, centres of excellence in education and research, the Strategic Centres for Science, Technology and Innovation (so-called SHOKs), and world-class research centres and other internationally visible, selective actions occupy a central place in efforts to attain the goals. However, they alone are not enough to respond to the challenges. What is additionally needed is development that links up organisations and knowledge in the innovation system in a new way.

Finland must be visible and attractive as regards both cooperation carried out abroad and internationalisation at home. Success in this demands development efforts from all actors in the innovation system, jointly and individually. All forms of cooperation must be used in the promotion of internationalisation: official and informal, multilateral and bilateral.

In a situation where resources are limited and the economy is shrinking, it is ever more valuable to find sufficient resources for all important ongoing reforms. The magnitude of several on-going phenomena entails international interaction and procedures of a new kind. The challenge in it is the difficulty of operating in a "borderless world". While globalisation has advanced cooperation in a positive way, it demands ever greater input into creating joint action strategies and procedures for countries and international organisations, as well as coordination of mutually supplementary actions.

The ultimate goal of this strategy is sustainable and balanced societal and economic development and citizens' welfare. In the present state of affairs, too, development potential largely hinges on the population's solid education and the intensive development and extensive utilisation of knowledge and know-how across the economy and society. Self-created strengths must increasingly be maintained through international cooperation and competition. We must be able to acquire knowledge that complements our own know-how and generates added value and to combine different kinds of expertise in a way that generates innovation.

Alongside efforts to maintain the national competitive edge and assets, we must take care

that Finland will also be able to bear responsibility for common, global problems. One of the essential means of preventing social, climatic and environmental problems is to carry out multilateral ERI activities within the scope of development cooperation.

Internationalisation must be incorporated into all ERI development and decision-making. International cooperation must be an integral, natural part of Finnish ERI activities.

Finland's ERI strategy is built on the present strengths and on the ability to identify promising areas and to seize opening opportunities. In a global environment, this requires constant strengthening of the knowledge base; know-how and innovation capacity; investment in high-quality education and research; reform and diversification of production and corporate structures; improved knowledge of the international market; intensified utilisation of ERI; and introduction of new and efficient incentives for ERI.

The aim of international interaction is to support Finland's own growth and development, step up bilateral cooperation with the foremost partner countries and regions, enhance our influence as part of larger communities, and improve our capacity to bear responsibility for solving common, trans-border problems.

In Finland's development policy and cooperation, the best solutions for promoting welfare in the target countries and bilateral interaction on a sustainable basis must be identified. The premise in all cooperation is high quality and relevance.

For better impact, we must prioritise the fields of research and geographical regions of primary importance for us, and stress the fields in which Finland has high-standard special knowledge and development potential. Stepping up cooperation especially with the globally leading partners entails that Finland has world-class knowledge of its own.

International cooperation is multifaceted and demands a great deal of resources. This is why the organisations responsible for promoting cooperation must together and more closely coordinate their development action and seek to focus resources selectively to the foremost cooperation targets, knowledge areas and regions. We must improve our capability for identifying new potential for R&D cooperation and its utilisation in the development of society and the economy (business potential, value creation chains).

Cooperation areas and regions must be selected proactively. The choices have to be based on common goals and national priorities. In multilateral cooperation, Finland must seek to influence both the contents and objects of cooperation. Finnish business and industry and research organisations must be more active in seeking cooperation with the foremost international organisations and leading ERI countries.

Finland needs efficient, functional practices for disseminating the knowledge, know-how and experiences acquired by Finnish entities abroad as widely as possible. This must be taken into account in the operation of ERI organisations and companies as well as in projects and structures which support the international networking of research and innovation environments.

The transfer of knowledge and know-how must be further intensified. This must be accorded more attention in all international programmes and projects. The expertise and networks of Finnish expatriates have not been sufficiently utilised in domestic development and in efforts to intensify global cooperation and networking.

The on-going university reform and the structural development of higher education will improve the prerequisites for achieving the aforementioned aims. At the same time, the reforms will step up the internationalisation and competitiveness of higher education institutions. The division of work between universities and polytechnics needs to be further specified and their educational and research cooperation needs to be intensified with a view to promoting (growth) entrepreneurship and region-based international interaction.

This is a question of Finland as an attractive operational environment and cooperation partner. Despite a high level of knowledge and an effective infrastructure and operational environment, Finland is not enough attractive as an investment target and as a working and living environment for professionals. Nor has the situation significantly changed over the past decade. It will be increasingly challenging to put the situation right in the future as the competition for intellectual resources and financing keeps intensifying. Finland needs to attract more knowledge- and innovation-based investment that will generate new business. It is therefore necessary to enhance the quality and content – i.e. the attractiveness and competitiveness – of Finnish innovation environments across the board. Finland must press ahead with the important development currently being carried out in the national innovation system and focus measures on the basis of impact analyses.

A special challenge for Finland is to strengthen its high-quality knowledge base, maintain internationally competitive clusters of top quality and strong relevance and selectively create high-standard innovation environments in the regions. In ERI terms, this requires close interaction between administrative sectors and major urban areas (municipalities, regional councils, (inter-)municipal development companies and consortia, technology centres), the pooling of resources, and joint, mutually supportive development action.

To maintain competitive advantages in the global market, businesses must increase their international ERI activities. Awareness of the benefits of international joint action must be promoted. Also know-how and competence that will fortify the capability to participate in and influence on international collaboration must be enhanced by companies through their own action. The prerequisites for all this must be created through public measures, for example through increased international cooperation by VTT Technical Research Centre of Finland, together with business and industry, and through an increase in the relative share of international projects of all the projects supported by Tekes (Finnish Funding Agency for Technology and Innovation).

Goal-oriented and focused internationalisation entails the use of incentives and steering systems that efficiently promote organisations' networking and risk-taking in Finland and internationally.

Public and private actions and operational structures must be developed together as an entity, for example by means of close cooperation between ministries. A stronger systemic approach is needed in topical and demanding policy actions that relate to internationalisation. These include e.g. promoting growth business, streamlining and simplifying public innovation services and the business support system more widely, developing (public) services and strengthening (regional) innovation environments.

Compared with our partner and competitor countries, the institutes and teams groups in Finnish universities are as yet often small, operationally fragmented and/or insufficiently specialised in their fields of strengths. The diffuse resources and actions do not advance the objective to create internationally visible centres of excellence and knowledge clusters and to participate more effectively in international joint projects.

3. Strategic development needs

3.1. Contents and structures

The internationalisation of the Finnish innovation system and science and research is still insufficient and, compared with our international partners and competitors, at a low level. When seen from the viewpoint of publications, mobility, cooperation and research financing, Finnish science and research have clearly internationalised in the past decades. Yet the mobility of researchers from Finland abroad declined during the past few years. In a comparison of advanced science countries, the low degree of internationalisation is manifest.

Success in international cooperation and competition requires specialisation and reallocation of resources and functions. The choices must fall on areas already prioritised. These are those represented in the Strategic Centres for Science, Technology and Innovation¹, the bio field and the nano field insofar as Finnish expertise is of world-class standard, and expertise in computing and software engineering. In addition, Finland must concentrate on fields in which Finnish research exceeds the critical mass and is internationally known and on new openings and opportunities, for example sustainable, energy conserving and environment-friendly solutions and clean technologies. Similarly the need for knowledge, new procedures and innovations in the well-being sector is growing at a rapid pace, which calls for significant intensification of international cooperation in the sector.

In many countries, the economy has been revitalised for instance by investing in the energy field. In supporting environmentally sustainable energy, it has been considered important to increase investments in research and knowledge, step up international cooperation and identify new business potential relating to clean environment, alongside measures geared to secure energy management and develop infrastructures. In fact, it is essential to be able to identify cooperation opportunities opening up through sustainable development and new value creation chains.

Safeguarding human capital in the important fields requires sufficient education and first-rate experts and researchers. Optimal use of limited intellectual resources entails that education and knowledge base are correctly quantified and targeted on a basis of demand and needs. Finland must ensure the renewal processes and sufficient availability of experts and researches. An increase in the number of foreign researchers is as yet an unresolved challenge and it has not been possible to remove the barriers to the exploitation of knowledge and know-how. One essential development objective is to significantly increase domestic and international mobility rates.

Since the global competition for professionals is getting ever tougher, Finland has to be able

¹ The Strategic Centres for Science, Technology and Innovation established in Finland (first centre in 2007) are new companies based on public-private partnerships for speeding up innovation processes. The centres in operation are as follows: 1) Forest cluster: Forestcluster Ltd; 2) Information and communication industry and services: TIVIT Ltd; 3) Metal products and mechanical engineering: FIMECC Ltd; 4) Energy and the environment: CLEEN Ltd; 5) Built environment innovations: RYM Ltd; 6) Health and well-being: SalWe Ltd.

to keep talented young people in Finland, on the one hand, and to succeed in recruiting foreign professionals to work permanently in Finland, on the other. We need to increase the attractiveness of Finland significantly by means of the strengths of the national operational environment. Finland offers good opportunities for women to carve out a research career. The workings, rules and (administrative) procedures have to be changed to enable researcher families to be recruited smoothly. Also other new recruitment models have to be created.

To enhance the human capital and respond to educational needs, Finland needs to widen the recruitment base and activities, to internationalise education and enhance the quality of education. The crucial matters are the attractiveness of research careers, internationalisation based on a high standard of education and research, an increase in mobility, and Finnish actors' greater activity in international communities. These also require new, clearly targeted resources. Success in the quantification and allocation of education and knowledge entails close cooperation between organisations at different regional levels, coordination of planning and development action, and a common knowledge base and joint foresight activity.

The challenges of internationalisation are various. Finland is one of the few OECD countries to experience brain drain. In mobility, Finland is lagging behind others. University teachers' and researchers' visits abroad have decreased in the 2000s. Although there are a large number of degree programmes given in foreign languages, Finnish higher education institutions have not gained a foothold in the rapidly growing global education market.

The internationalisation of education must be accelerated by introducing research cooperation models already exploited both within the EU and with third countries. Higher education can be developed into an important sector of international services; professional marketing and exportation of knowledge and know-how is still at an initial stage. Success in them entails that our higher education institutions are well-known and able to provide degree education. This also requires new kinds of operational and structural solutions and dynamics. Our competitor countries use various university subsidiaries and other organisational forms and modes of action (e.g. *twining university* models) in the target and partner regions.

Labour-based, knowledge-centred immigration responds to the need to recruit more foreign researchers and professionals to higher education institutions and business in Finland. Equality independent of the background of the individuals is an important asset and attraction factor. Multicultural environments work as a favourable breeding ground for innovation.

More vigorous effort must be made to promote the integration of foreigners settling in Finland and wide-scale utilisation of their expertise in society. What is needed is an active, labour-based immigration policy and legislation in support of it. Comprehensive implementation of integration policy requires large resources. The preparation of multicultural policy needs to be initiated without delay at the Government level.

By intensifying internationalisation, Finland can enhance the quality of higher education and research and create conditions conducive to the exportation of education and knowledge. The funding base of the international, strong and attractive higher education and research community should be stable. This kind of community works in intensive cooperation with the

best foreign universities and research institutes. The Internationalisation Strategy for Higher Education Institutions (2009–2015; the Ministry of Education was responsible for drafting the strategy) is a crucial instrument in achieving these aims.

A key aim in development must be a genuinely international higher education and research community. This requires renewal of operational principles and procedures in universities, polytechnics and research institutes, and those of the financiers.

The recruitment practices of the ERI organisations must be changed to favour international students, researchers and experts better and more transparently. Researcher vacancies targeted to foreign researchers must be available on flexible terms and at a short notice. For example, the FiDiPro programme is not targeted in this extent and purpose to foreign professionals. Different kinds of support services provided by universities and polytechnics should be developed as one entity.

Measures need to be taken to enhance the quality and attractiveness of higher education by the universities and polytechnics themselves and in cooperation between administrative sectors and industry. The aim must be to identify promising young researchers and to have them settled in Finland, to internationalise graduate schools and the research career scheme, and to promote the exportation of education and knowledge.

The globalisation of societal problems has stepped up international, especially European, cooperation in *sectoral research*. However, the participation of Finnish public research institutes (PROs) in EU framework programmes has been waning. The procedures and modes of steering of PROs have largely focused on national level issues despite the increasing internationalisation of challenges to be addressed. Well-defined arguments have to be found for the benefits to be gained from international cooperation.

The knowledge, know-how and other critical production factors paramount to value creation in business are often dispersed into many enterprises and R&D organisations and into different regions. Therefore, to succeed, businesses need to be able to specialise and network internationally. Support services needed for internationalisation are abundant and their quality varies. From the viewpoint of businesses, the situation is far from satisfactory.

The internationalisation services and other services provided for business enterprises must be developed comprehensively in cooperation between public and private partners, with the aim of creating well-structured service entities. It is important to improve the impact of services and to ensure that needs are met. Special attention must be accorded to growth enterprises. Resource-intensive efforts to carve out a niche in foreign markets and to upgrade (business) know-how entail that support is sufficient and persistent.

A crucial precondition for success is that the ERI environments and infrastructures in Finland are of a high international quality and competitive. This makes for balanced cooperation with leading centres and experts and enhances world-class knowledge in Finland.

The structures must support strategic flexibility and dynamism and a capacity for renewal.

Structural reforms of particular importance for internationalisation are the overall reform of the university system, the detailed action programme to be devised for the structural reform of higher education institutions in 2010 and the corresponding structural reform of the government research institutes. This also entails a reform of the decision-making structures of these renewing sectors and organisations, the clarification of their role and duties, and the development of the division of work between them towards more efficiency through the removal of unnecessary overlapping activities. The structural and regional fragmentation of the university and polytechnic systems and the field of PROs must also be reduced with a view to creating internationally attractive and visible units and larger entities.

National infrastructure policy is always also international; hence, infrastructures are a central part of the internationalisation strategy. Official (inter-governmental) international research cooperation has been constantly expanding. Various RDI organisations and major infrastructures are pivotal to the development of knowledge and technology and for the enabling of research of a high international quality. Finland's participation in international infrastructures and in infrastructures of the magnitude of the EU ESFRI projects has so far been (a few) isolated cases. Systematic implementation of the Finnish national infrastructure road map (set up in 2009) will require the creation of necessary structures and parallel strategic policy lines and operational processes in all the organisations participating in infrastructure actions, as well as sufficient investment in current needs.

The research infrastructures are central to enhancing international attractiveness and visibility alongside high quality and interesting contents. The task is to pursue long-term infrastructure policy and strengthen cooperation between national and international organisations on a wide scale. Promoting these objectives requires the establishment of a national research infrastructures body and providing it with sufficient operational preconditions and financing.

Cooperation is an efficient means of acquiring knowledge and know-how for own use and for partners. Success in this can be promoted through joint selection and coordination of action by domestic organisations providing support to internationalisation. The possibilities offered by international organisations, infrastructures and projects and by the diverse European cooperation arrangements must be utilised better through collaborative efforts of the different administrative sectors and public and private entities.

Finnish companies and research organisations must seek more actively to enter into long-term interaction with the leading research and innovation (RI) regions and actors. This means that more attention needs to be paid to public and private RI activity outside the EU.

National cooperation must be intensified with a view to strengthening internationalisation. The agencies facilitating internationalisation [i.a. Finpro, Invest in Finland, Tekes, the Academy of Finland (i.e. National Research Councils), Sitra, the foreign office permanent representation network] must jointly contribute to coordinated promotion of bi-directional international cooperation within their remits.

By participating in the cooperation, the Finnish cultural and scientific institutes abroad may significantly contribute to the achievement of these aims. The know-how and networks of the

PROs that are most active on the international scene must be brought to bear in this development.

3.2. Global interaction

Global competition and cooperation have undergone significant changes over the past decade. The position of Europe, the United States and Japan as centres of the world economy has been affected by the growing relative weight of the rapidly growing economies in finance, production, science and technology. Developments have proceeded towards a politically and economically polycentric and pluralistic global environment in which the relations between the countries and priorities in action vary case by case. For example, changes in the transatlantic relations between Europe and North America and closer contacts between China and the USA are reflections of the major trends in the dynamics.

From the Finnish perspective, target areas to be prioritised in ERI are the FinNode countries, the foremost countries with bilateral agreements with Finland and emerging economies in Asia, the Americas and Africa, such as South Korea, Brazil, Chile and South Africa.

Finland's current international FinNode innovation centres are located in China, the United States, Russia and Japan (one in India being planned). Their establishment has brought together domestic organisations – Finpro, Sitra, the Academy of Finland, Tekes and VTT – and pooled resources in a novel way, which has improved coordination and the impact of cooperation. The aim is to help businesses enter the markets in the target areas, increase mobility and RI cooperation and spotlight Finland as an investment target. The FinNode network must be utilised more efficiently in the internationalisation of domestic centres and clusters of expertise and support them to become well-placed partners in global value creation networks.

It is necessary to create strategic programmes and consortia that bring together various organisations to enhance the impact of joint initiatives. These efforts must be directly linked to RI action taken within Finland. This would also contribute to the creation of attractive consortia of critical mass in the target areas abroad. Correspondingly, measures must be taken to intensify the utilisation of the knowledge of the FinNode countries and to attract investment to Finland. Intensive cooperation entails that the interaction involves organisations working within education and research as well as innovation.

Recent OECD innovation documents address a number of globalisation and innovation issues. They include the need to respond to global challenges, such as climate change and problems relating to health, food, security and development. Important objectives are to improve the operational capacity of developing countries through education and agricultural development and to promote innovation in accordance with local social and economic needs.

The UN and the World Bank represent other international dimensions. It is important to accord an increasingly central place to education, research, technological development and innovation in development cooperation and in support of emerging economies.

3.3. European cooperation

In Europe, ERI has become an important policy sector, increasingly used by governments to support their economic and employment policies. This development is reflected in the activities of the EU and its member states and in the development of European regional cooperation.

For Finland, the essential thing is that the EU makes initiatives for coordinating educational, research and innovation policies within the EU and for promoting the use of this entity in the pursuit of aims set out in the ERA vision 2020 and other aims set by the EU for the 2010s.

It is decisive how the EU succeeds in its aims to build a competitive education, research and innovation area. This is why Finland must be a prominent participant and influence in the development of ERI policy within the EU. It is only through active influence that we can make full use of the opportunities offered by the EU to enhance our own knowledge in selected fields and promote knowledge-based economy in Europe. The ongoing reform of EU innovation policy is a process in which Finland must be active. It is in our interest to influence European policy action and participate in the joint development of new instruments, such as those in relation to public procurement, demand- and user-orientation and the promotion of intellectual property rights practices.

Finnish research organisations and businesses have had reasonable success in applying for EU research programmes. Finland is a net recipient in R&D financing in the EU and also an active player in several new European research and innovation policy initiatives, such as in the deepening of cooperation between national R&D programmes and in the promotion of world-class research in Europe (e.g. ERC, JTI and EIT).

Finland endorses action for strengthening the status of ERI and increasing resources for it in the EU. The financing of world-class scientific research must be increased both within the EU and in its Member States. The application of knowledge and know-how is increasingly boosted through financing and by other means.

EU-financed RI activities must always seek to generate European added value. EU actions have to aim at increasing multilateral cooperation. As a rule, EU financing should support projects that are not possible to carry out nationally.

EU cooperation with third countries and parties must be intensified in selected fields of expertise in order to enhance the quality and impact of RI and to step up global cooperation.

For the efficiency of RI and for the impact of financing, it is essential that EU-financed research, the major programmes and structures (i.a. FP7, ERC, EIT, JTI) and work within the foremost European research infrastructures (e.g. ESA, CERN, EMBL) strategically supplement each other.

The opening of national programmes and national financing is one means to promote the development of the European research and innovation area. In this respect, the EU has

hardly made any remarkable progress. However, the opening is necessary for the strengthening of know-how and competitiveness and for positive development of the ERA. To increase interaction, the process of opening must proceed in a way that leaves room for pilot projects jointly undertaken by countries on a voluntary base. It is necessary to look for well-designed principles, procedures and criteria and to coordinate legislation. The cooperation can be further developed on the basis of an assessment of the experiences and added value gained. Finland must participate in experiments that are the most promising from our point of view.

Finland must strengthen the co-ordination of the internationalisation actions and improve EU knowledge and competencies at all participant levels. One means available in the public administration is to consolidate the operation of the so-called EU sections and the interaction especially between the EU20 and EU30 sections responsible for research and education (sections are responsible for discussing and preparing Finnish policy views and actions in the EU). It is also important to succeed in networking domestic programmes with EU-level research and development programmes.

It is necessary for the SME sector to increase participation in international cooperation. For example, the number of Finnish SMEs participating in the EU research framework programme is modest. Correspondingly, EU initiatives should better accommodate the needs of this sector. SMEs expect more relevant development action and instruments that respond to short and medium term needs. In the EU financing programmes, topical themes should be more to the fore. There is room for development in the flexibility of the programmes and their capacity to respond to changing (economic) circumstances. Another important aspect is the transparency of the application processes and the programmes, the implementation of more challenging and risky projects and the streamlining of administration. Enterprises also need to actively use other channels of international cooperation, such as the COST and Eureka.

3.4. Cooperation in the neighbouring area

ERI cooperation within the Nordic area and the Baltic Sea region as a whole has to be stepped up in a way that also promotes cooperation in the EU area more widely and at the global level. Nordic interaction must be further developed based on the countries' own priorities and common interests. The cooperation must be intensified by extending it towards the Baltic countries. In terms of effectiveness, it is important that the cooperation is closely integrated into the countries' own structures and that the measures do not remain detached and short term action. The same demand for integration concerns all cooperation with neighbouring areas.

Examples of viable Nordic research cooperation include the NordForsk graduate schools and the centre of excellence programmes in the foremost strong domains. Projects of relevance to all the countries adjacent to Finland (in the fields of education, research and innovation) are those relating to climate, energy and the Baltic Sea. Cooperation like joint provision of university education with neighbouring countries, such as the Finnish-Russian *cross-border university* concept, needs to be increased. Closer cooperation is also needed to form cross-border clusters. This would promote partnerships between (SM) enterprises and public ERI

organisations, as well as knowledge networking. New instruments for innovation policy need to be developed in cooperation with neighbouring areas.

Bilateral cooperation with the neighbouring countries will be carried out where common interests meet and in situations where it is the most viable option. However, efforts must be made to cooperate through large multilateral action. Cooperation with Russia must be strengthened and the resources allocated to enhancing knowledge about Russia in Finland need to be increased. We need new concrete joint initiatives and actions enabling us to tap into Russia's growing role and potential as a cooperation partner and as a market area.

Finland must seek sustainable and optimal forms of cooperation and solutions with very different actors and countries. Cooperation in the neighbouring areas is determined by various marginal terms: the bilateral relations of the countries, regional cooperation and joint operations, Nordic cooperation, EU membership and the Northern Dimension and the Arctic strategies.

In a nutshell, it can be said that ERI cooperation must be fortified among the Nordic countries and with the Baltic countries and Russia. Wider collaboration within the Baltic Sea region must be carried out through multilateral action and through the EU. Care must be taken to ensure that cooperation is stepped up in chosen fields in a coordinated manner that generates added value.

4. Implementation of the strategy: financing, monitoring and evaluation

The internationalisation of ERI requires careful consideration of resources. For systematic promotion of internationalisation across the board, the present resources are not enough even with the potential in the reallocation of existing resources. It requires new money, and in its allocation, the selection of measures, contents and targeting are paramount.

One challenge in resource allocation is appropriate quantification. However, it is often difficult to distinguish resources allocated to internationalisation from other resources. On the other hand, internationalisation must be a natural, integral part of all development, not a separate operation with separate funding. Instead of determining overall funding, some key targets and programmes could be singled out. These include research infrastructures (incl. annual contributions and the cost of use) and the FiDiPro programme.

The strengthening and internationalisation of Finnish knowledge base require an increase in both public and private investment in ERI. It requires new, co-financing arrangements by different parties and an evaluation of the internationalisation of ERI. Comprehensive development is needed for instance in efforts to assure the quality and sufficiency of human resources, to create and maintain infrastructures and to speed up the internationalisation of ERI activities in (growth) entrepreneurship.

Improving competitiveness and cooperation capacity requires prioritisation closely linked with (transparent, predictable) performance management, financing and incentives, as well as building of internationally high profiles and development of selective decision-making by research organisations.

In the monitoring of development, special emphasis needs to be placed on the extent to which it has been possible to enhance the Finnish knowledge base through international cooperation and how this collaboration has been utilised by different domestic organisations and in various fields. Promising headway has been made in demonstrating results and in impact analysis in recent years. This development must be carried on in multilateral cooperation in Finland, and increasingly in international cooperation.

Attention must be increasingly paid to quantifying and monitoring development aims. In order to boost goal-oriented internationalisation, the information base and indicator systems need to be further developed and their quality enhanced in a way that enables new indicators to be created. The key parties in this development are the Ministry of Education, the Ministry of Employment and the Economy and the ERI expertise and funding agencies. The responsible organisations must carry out this development in multipartite cooperation, not separately as part of their respective operational development.

It is very difficult to measure the impact of international cooperation. Improving this situation is a joint task for the public expert organisations – notably the Academy of Finland and Tekes – and for R&D institutes.

The Research and Innovation Council will follow developments in internationalisation, include observations in its next ERI policy review to be published in the end of 2010 and make its interim assessment of the situation and development needs in 2013. The Council addresses individual internationalisation issues on a constant basis.

International education, research, technology and innovation cooperation helps to:

- make international research findings and knowledge swiftly available domestically
- pool resources in ERI activities for which no individual country has sufficient financial and intellectual resources (e.g. carry out major RDI programmes; create and maintain large international infrastructures)
- manage and share risks and costs
- gain multilateral benefit, which may be scientific, technological, social and/or cultural and which in environmental terms are sustainable, safeguarding diversity
- combine national knowledge areas and units with small-scale resources into larger, internationally networked entities
- reduce the fragmentation of research activities and form shared views of research problems, approaches and objectives
- improve the quality and international compatibility of research
- promote extensive utilisation of research findings
- create internationally attractive, creative research and innovation environments
- advance new procedures and modes of action (demand- and user-orientation) and policy supporting them
- improve the visibility and international recognition and appreciation of research
- improve the quality and increase the volume of PhD training
- attract new knowledge, investment and R&D-intensive business
- promote research and the creation of innovations in favourable environments, such as multidisciplinary and multicultural networks.

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