Kymenlaakso's smart specialisation RIS3 strategy 2016-2020

Leverage from the EU 2014–2020

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KYMEN LAAKSON LIITTO

Foreword

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Summary

Kymenlaakso's Smart Specialisation RIS3 Strategy

Kymenlaakso's RIS3 strategy (Research and Innovation Strategy for Smart Specialisation) applies to the province's regional plan for the years 2016–2020. Under the European Commission, each member state / region is obligated to create its own research and innovation strategy for smart specialisation. The importance of RIS3 strategies is emphasised by, for instance, the fact that their formulation has become a prerequisite for the granting of structural fund monies during the current programme period. RIS3 strategy work is closely linked with the regional and structural policies of the European Union as well as the Europe 2020 strategy, in which smart, sustainable and participatory growth is emphasised.

The RIS3 strategy is a positional, tailored economic change process whose objective is to produce greater added value and better competitiveness for the region. As a tool, financial support targeting on research, development and innovation activity with specific prioritised selected strengths is used. Smart specialisation helps via critical selections to better understand the region's own innovation potential. It encourages experimental action and helps direct the industrial and expertise structure towards new fields, products and services. Over the long term, the objective of implementation of RIS3 strategies should be the cooperation between regions, internationality and international breakthroughs in accordance with the themes of smart specialisation.

The planning stage of Kymenlaakso's smart specialisation strategy process was initiated in spring 2015. During the summer, the KymRIS Smart Specialisation in Northern Growth Zone project, administered by Kymenlaakso University of Applied Sciences, arranged a launch event in which a wide group of the province's actors produced, via group work, a joint perspective on the potential expertise-/growth sectors selected as the starting point for Kymenlaakso's smart specialisation-based key strategy points. The fields that came to the fore were digitalisation, logistics, bioeconomics and tourism as well as health and well-being. The strategy work was continued during the summer and autumn with working in project and sector-specific consultation working groups where the joint set of criteria directed the assessment of the potential in each sector. On the basis of the working groups' presentations, the steering group of the KymRIS project ended up with logistics, bioeconomics and digitalisation as the choice of sectors. Digitalisation was regarded from the perspective of the RIS3 strategy as a dynamically cross-cutting theme, with the interfaces of the expertise fields particularly advantageous to the creation of innovations.

After choosing the growth fields, the strategy process was continued by sharpening and selecting the key strategy points. The key strategy points were further worked out on the strength of the project and consultation groups. The final key strategy points selected were

1. security and smart logistics (logistics)
2. energy, new products and entrepreneurial activity (bioeconomics) from resource-effective and low-carbon bio- and circular economy
3. a) cyber-security and gamification as well as b) digital applications in logistics, bioeconomics and tourism as well as in health and well-being (digitalisation).

According to the vision of the RIS3 strategy, Kymenlaakso in 2025 will be profiled in accordance with the selected growth fields – logistics, bioeconomics and digitalisation as well as the RIS3 key strategy points; it will be nationally and internationally competitive; and it will be a vital province in the Northern Growth Zone that is attractive to foreign investment and outside expertise. National and international strategic partnerships and cooperation will consolidate and supplement the profile selected for the province.

Kymenlaakso's RIS3 strategy will create, via its chosen key strategy points, the framework for the direction of the province's development effort, as well as the implementation and objectives of project activity. The RIS3 strategy steers the use of structural fund monies, and the province's cooperation group makes the decision regarding their coordination into projects in accordance with the strategy. The open cooperation of all of Kymenlaakso's innovation actors, follow-up of the implementation of strategy, and nimble reaction to changes in the working environment are decisive factors in achieving

this desired vision. The RIS3 strategy is a collaborative process that in practice is achieved in partnership between the province's actors (SMEs, large companies and start-ups), the university of applied sciences, other educational institutions, business interests, associations, organisations, citizens and related innovators, etc.) with various innovation/operational platforms and at the interfaces of expertise. The RIS3 strategy is also a continuous learning process in which the procedures undertaken are evaluated and the results both measured and reported. If required, the strategy will be revised and the measures re-directed on the basis of the observations and experiences obtained.

1. Introduction

The Kymenlaakso RIS3 Strategy[1], a Research and Innovation Strategy for Smart Specialisation for the Years 2016–2020, is the province's regional smart specialisation-based plan which, according to the guidelines issued by the European Commission, each member state / region should have. The development of research and innovation strategies based on smart specialisation has received increasing attention from member states / regions, as RIS3 strategies have become one of the requirements to grant structural fund monies since 2014.

The RIS3 strategy effort is a concrete part of the EU's 2014–2020 cohesion policy and Europe 2020 strategy. The purpose of the cohesion policy is to reduce the development differences between regions as well as the exclusion of the least developed regions. The strategy of Europe 2020 is the European Union's growth strategy for the next decade. The strategy emphasises smart, sustainable and inclusive growth. Smart specialisation is regarded as the most important regional instrument in the implementation of the strategic objectives of Europe 2020.[2]

1.1. Definition of smart specialisation

RIS3, the national/regional smart specialisation research and innovation strategy, is a positional, tailored process of economic change, which

- is based on the existing recognised strengths, competitive advantages and peak expertise potential in each country/region
- concentrates support measures and investments on national/regional priorities and challenges
- supports technological as well as practically-oriented innovations and endeavours to promote investments in the private sector
- involves all pivotal interest groups
- promotes innovation and experimentation
- is based on evidence and contains workable follow-up and assessment systems.

Smart specialisation is a strategic approach for economic development and renewal, in which the targeting of financial support on research, development and innovation (RDI) operations is utilised as the tool. Smart specialisation requires that research and investment measures as well as structural fund monies are targeted on a few specific strengths and priorities (maximisation of influence) whose developmental possibilities are the greatest.

From the perspective of the RIS3 strategy, the normal approach to investments is no longer adequate. The priority should be in thematic investment and the prioritisation of strategic fields so that the result is an investment combination that best serves each region's needs. What is concerned is the making of critical choices under the restraints of spare financial resources.

To attract private investments and foreign investors, it is important to brand the region's know-how: i.e. package special expertise to make it attractive or suitable for a certain market niche.

In smart specialisation, decisions are made in processes that promote interactive entrepreneurship (the entrepreneurial discovery process) on behalf of a joint vision for pivotal interest groups[3].

[1] RIS3 = Research and Innovation Strategy for Smart Specialisation.
[2] European Commission (2010). Commission notice. Europe 2020: A strategy for smart, sustainable and inclusive growth. 03/03/2010.
[3] Public administration, decision-makers, universities and other institutions of higher education, research facilities, development companies, business enterprises, innovators, inventors, residents, etc.

The merging of information fragmented over various interest groups concerning entrepreneurship as

well as the generation of new information about new operational possibilities are emphasised in the process.[4]

The objective of RIS3 strategies is to promote experimental operations in current and new sectors. If required, selected key features should be sharpened and/or modified on the basis of, e.g. experiences obtained from experiments and in accordance with the competition situation or market demand.

The development of performance measures as well as the use of the coordination and adaptation of measures and programmes are solidly linked with the RIS3 strategy. Systematic evaluation, continuous learning and the possibility to distribute experiences and best practices amongst the strategies of various regions are thereby promoted.

1.2. Smart specialisation as the promoter of innovation, economic growth and internationalisation

Innovation will be one of the most important priorities in the years to come, because it will have decisive significance as a driver of economic growth and the creator of new jobs. Each member state / region can be a top expert in some sector of research and innovation: not all need to have – nor is it possible to have – peak expertise in every field.

The objective of smart specialisation is to generate, via a process of economic change, greater added value and better competitiveness for the region. Via critical choices, smart specialisation helps regions to better understand their own innovation potential and to direct their industrial and expertise-based structure anew towards ascending fields, services and international markets.

During the 2014–2020 programme period, the use of various financial instruments and programmes as well as the utilisation of the synergies they offer to maximise the influence of EU funding are being emphasised. On the regional level, structures, capacity and readiness are being developed with RDI operations. On the EU level, internationalisation is being advanced with RDI operations funded by programmes and RIS3 strategies by linking the development effort conducted in the region as part of the international frame of reference.

The RIS3 strategies link regions as part of national and international networks, value chains, other regions, concentrations and innovation actors for the internationalisation of the regions' business enterprises and for the growth of the region's expertise and readiness. The implementation of RIS3 strategies as a long-term objective should be the international dimension: cooperation between the regions within the context of smart specialisation themes.

Kymenlaakso's target status in 2025

With the smart specialisation strategy in Kymenlaakso, the systematic development of a competitive and magnetic innovation ecosystem is being striven towards as well as an increase in research, development and innovation investment, along with the achievement of smart, sustainable and inclusive growth. The resources of the province are being concentrated in accordance with the profile of the RIS3 strategy on rarer and more effective RDI projects.

The region has a magnetic, workable innovation ecosystem that

- attracts external top expertise to leading strategies in the province via related individuals and companies

[4] European Commission (2014). National/regional innovation strategies concerning smart specialisation (RIS3); Cohesion policies 2014–2020.

- gives to all actors in the region including large, SME and start-up companies, citizens, associations, communities and cities, the opportunity to participate and affect innovation and renewal processes
- broad-mindedly collides various actors and ideas with strategy-based key features with established innovation platforms
- realises a culture of experimentation in the form of product and service innovations and project experiments.

The prosperity of the province is being built by a strong financial investment in research, development and innovation operations as well as concentrated cooperation with domestic and foreign RDI partners. As a result of this cooperation, several EU-funded international RDI projects have been launched in whose consortia both European and Russian peak expertise are combined. A long-term investment in RDI operations has consolidated cooperation in the world of research and business life and has promoted the commercialisation of research findings, the renewal of products and services generated by the region's enterprises, and the growth of competitive ability.

The province, having proceeded through structural change, has renewed, via the smart specialisation change process and furthering the competitiveness of its business and industrial structure, its own strengths, whilst taking the factors for change in the operational environment into account. In 2025, Kymenlaakso is a vigilant implementer and, when required, a nimble modifier of the RIS3 strategy which has adopted the experimental culture as an essential part of its smart specialisation strategy process. Kymenlaakso has a deep understanding of the cross-cutting role of digitalisation and is a utiliser of the same. New products and services are being developed and commercialised particularly by taking advantage of the innovation and digital applications active at the interfaces of various fields.

"In 2025, Kymenlaakso will be a vital province in the Northern growth zone that, profiled in accordance with its chosen fields of growth, logistics, bio-economy and digitalisation as well as know-how in its RIS3 strategy-based key features that is nationally and internationally competitive in addition to being attractive to foreign investments and external expertise. National and international partnerships and cooperation consolidate and supplement the profile chosen by the province."

1.3. RIS3 strategies: current status and challenges

The European Commission has assessed already conducted smart specialisation strategies by means of SWOT analysis. Challenges (weaknesses and threats) noted have included the following, for instance:

- the "packaging" of old existent strategies into a new format
- shortcomings in the inclusivity of the process (entrepreneurship-promoting process)
- overly broad selection of front-line sectors, which does not exclude anything
- minimal attention given to possible future strengths and rising industries
- little emphasis on an international perspective
- the process of smart specialisation does not continue after fulfilment of the formal prerequisite
- too little attention is given to the appropriateness of follow-up systems, reporting and changes in selected front-line sectors, even if the RIS3 strategy is a continuous process.[5]

According to the European Commission, a great challenge to the smart specialisation strategy effort is also regarded to be whether the regions' key operators have sufficient readiness and capabilities to direct funding to RDI activities that are of benefit to the region[6]. From this perspective, high-level educational institutions, general universities, colleges and universities of applied sciences and active participation in the planning and execution of the regions' smart specialisation strategies are decisive to the accomplishment of the strategic objectives. All too often, institutions of higher learning have only a minimal role in national/regional innovation strategies[7].

[5] European Union (2012). Inforegio Panorama journal, no. 44. Smart specialisation – The driver of future economic growth in Europe's regions.
[6] RDI = Research, development and innovation operations.
[7] European Commission (2013). Joint Research Centre Technical Reports. Universities and Smart Specialisation. S3 Policy Brief Series. No. 03/2013.

Because high-level institutions of learning have an undisputed and critical significance as promoters of innovations and innovation itself,
special attention should be given in RIS3 strategy processes to harnessing their non-utilised potential in regional development efforts, as well as improved integration of these institutions in the regional economy.[8]

2. Analysis of operational environment

2.1. Kymenlaakso today

Kymenlaakso is an international logistics-based centre for business and know-how in the Baltic region. This is supported by the following, for instance: Kymenlaakso's position in the development corridor between St Petersburg and Helsinki; the Allegro train connection; HaminaKotka – Finland's largest joint port; Finland's largest railway traffic centre in Kouvola; and the E18 motorway.

Industry has a significant role in Kymenlaakso's business operations. Export in the province is composed virtually entirely of industrial products, even if structural change has accelerated the diversification of the production structure. Long-term development work is challenging due to the economic depression. The readiness of businesses for investments and growth is quite low. Moreover, the share of entrepreneurs in the province is smaller than the average. Growth companies are few.

Forestry has great significance for the region's prosperity. The foundation for industry in Southeast Finland rests in forestry. Despite the structural change, one of the most significant forestry concentrations in Europe is still found in Southeast Finland. New growth is aspired towards, both with regard to the renewal of traditional fields and entirely new sectors. Possibilities are seen in, e.g. new products developed from raw forest materials and in renewable energy, as well as in game-playing connected with the ICT sector.

Kymenlaakso's populace is ageing and is decreasing at considerable speed (the average decrease is approx. 500 inhabitants / year). The total population of the province is expected to continue declining. Unemployment in the province is high. As a result of structural change, Kymenlaakso has lost a great many jobs.

The proximity of the Russian frontier and the St Petersburg region has traditionally had a positive impact on the economy of the province. The recent collapse of the Russian economy as well as the sanctions against Russia have clearly had negative impacts on the business operations of companies in the province. Russia's crisis is seen in the reduction of border traffic in Southeast Finland and in the decline of Russian customers, particularly in the fields of tourism and commerce.

From the perspective of the advancement and development of the province, critical questions include the development of European Union – Russia relations, Russia's economic development, the future of forestry, and competitiveness in international markets.[9]

2.2. Research, development and innovation operations

In Kymenlaakso, innovation operations are supported by means of development companies, cities and educational institutions with various processes and support services. Funding from structural fund monies is being applied for with regard to innovative projects. Cooperation is also underway with the Tuoteväylä (Product Track) service (Tekes) and the invention agent network. There is, however, much

[8] European University Association (2014). Report on joint EUA-REGIO/JRC Smart Specialisation Platform expert workshop: The role of universities in Smart Specialisation Strategies.
[9] Regional Council of Kymenlaakso (2014). Kymenlaakso-ohjelma 2014–2017, Elinvoimaa Pohjoiselta kasvuvyöhykkeeltä [Kymenlaakso programme 2014–2017: Vitality from the Northern growth zone]. A:52 2014.

to improve in RDI operations in volumes, since in the comparison of provinces the expenditures used for Kymenlaakso's research and development activities are amongst Finland's smallest. In 2012, Kymenlaakso's R&D outlays totalled MEUR 23.4 / 0.3 per cent. Those lagging behind were only Central Ostrobothnia and Åland (Annex 1).

There is no concentrated/coordinated operational mode for the advancement of innovations in Kymenlaakso. The development of services is important, particularly in thematic innovation platforms in accordance with the RIS3 fields. The networking of regional innovation platforms nationally and internationally is necessary. The networks bring added value to provincial activities in which critical mass is not necessarily sufficient for the maintenance of project funding-based operations after the termination of the project.

2.3. Factors for change in the operational environment

The innumerable factors for change in the external operational environment will both directly and indirectly affect the possibilities of Kymenlaakso to succeed in the stringent competitive circumstances of the future. Some of the factors for change will establish new potential for the province, whereas some will create threats to future growth and the path of competitive ability. The operational environment-based factors for change affecting Kymenlaakso's RIS3 strategy work have been:

Regional economy
Finland's economic growth in recent years has been very weak. The structural change affecting industry has driven many industrial sectors (incl. forestry) into problems of competitiveness. Kymenlaakso is plagued with continuous structural change. Industrial production has decreased, and as a result jobs have been lost. The rate of unemployment in the province creates challenges: on the other hand, considerable labour reserves are available in the province. The pronounced ageing of the population base is also creating its own challenges for the development of the province.

Digitalisation
Digitalisation is regarded as a driver of better productivity and economic growth, which generates new business opportunities and jobs. The provision of electronic services is growing. The 'internet of things' (IoT)[10] is developing at impressive speed. New and distinctive networked devices are emerging in their own markets. Finland has excellent starting points for the utilisation of digitalisation.

Cleantech, bio- and circular economy
The objective of the EU's climate and energy policies is, e.g. the radical reduction of greenhouse gas emissions, raising of the share of renewable energy in the production of energy, and improvement in energy efficiency. Climate change and the depletion of natural resources are significant global challenges. The amount of small production of distributed energy is set to grow. Finland's extensive forest reserves superbly enable the development of bio-business operations.

Growth in the significance of services
In Finland, the traditional branches of industry such as the metal, wood and paper industry have diminished while, at the same time, services have risen to replace declining industry. The share of services in the formation of Finland's GNP has increased year after year following the economic crisis.

Russia
The Ukraine crisis and economic sanctions against Russia, together with the fall in world market prices for oil as well as the deterioration in the rate of exchange against the rouble, have led to desperate straits in the Russian economy. Russian investment in Finland has diminished and Russian tourist travel has declined considerably. On the other hand, the companies operating in Russia have even been able to benefit from the situation by increasing their business operations to consolidate their positions on the market.

[10] IoT = internet of things.

Emphasis on well-being / well-being and health field

Looking after one's own health and well-being represents a growing current global trend. Personally coordinated measurement of one's health status and well-being as well as related information analysis represent a modern trend. Health technology is one of Finland's fastest growing technological fields. The rapid ageing of the populace and increasing interest in taking care of one's own well-being and health are accelerating demand for new technical innovations.

Smart City and Smart Citizen

Cross-cutting dimensions in smart specialisation are also found in the smart city development and citizen participation themes. These are emphasised particularly in the development and operation of innovation platforms as well as in the deployment of the newest models in innovation operations, such as open innovation[11] and the Quadruple Helix model. The basic idea behind the traditional Triple Helix model is that the three pivotal partners in innovation operations are business enterprises, universities / other institutions of higher education, and public administration. In the more developed version, Quadruple Helix – which is based on the Triple Helix model – the influencers of the innovation environment are also regarded to be citizens, organisations and foundations[12].

Pivotal actors in regional development are the cities, together with their functions (e.g. social welfare and health field) and acquisitions. The city as an Innovative Contractor format can significantly promote, e.g. the development of new product and service concepts amongst the region's businesses. The participation of citizens in innovation operations is challenging, but it is also an approach that creates opportunities. An example of this is the Living Lab innovation environment projects, in which the users and their experiences form the nucleus.

3. Main fields in smart specialisation and their strategic key features

Kymenlaakso's smart specialisation strategy process (Annex 2) was initiated during the planning phase in spring 2015. In the summer, the start-up occasion for the KymRIS Smart Specialisation in Northern Growth Zone project was arranged, in which a wide group of provincial actors compiled their perspectives through group work with respect to those fields which could offer more initial potential for the selection of strategic key features. The objective of group work was to find Kymenlaakso's strengths and possibilities, on the basis of which smart specialisation could be built.

The joint criteria used as the foundation of the choices were:

- Growth potential rising from the development of the operational environment and markets
- Peak expertise in business enterprises and at universities and other higher level educational institutions
- Requirements for the development of expertise
- Leaning on the region's strengths
- The willingness of the region's businesses to participate in development
- Targeting of the region's public investments
- The possibility to stimulate investments in the private sector
- The possibility to create rising scale benefits in specialisation for the region
- The possibilities to succeed in EU funding searches
- Networking potential both internationally and nationally
- The "leverage" of the field in the province's other fields (image) What sort of smart specialisation entity elicits the greatest benefit from the perspective of the region itself?

[11] Open innovation = the merger of the company's internal and external ideas as well as internal and external commercialisation methods in order to promote the development of new technologies.

[12] Rakhmatullin, R. (2014). European Commission, DG JRC, IPTS, Smart Specialisation Platform. Triple/Quadruple Helix in the context of Smart Specialisation. PowerPoint presentation. 29-30 May 2014.

As an aid for working and initiating discussions, the system description foundation (Annex 3) was utilised, which was supplemented as the process continued with actors, know-how and mutual dependencies so that, as the final result, the potential expertise concentrations, digitalisation, logistics, bio-economics, tourism and health & well-being rose to the fore as the basis of the selection of the strategy-based key features.

Group work materials were worked out during the summer and early autumn through the contribution provided by the KymRIS project group and consultation groups established on a sector-by-sector basis. A joint set of criteria directed the continuing work completion process of the start-up occasion-based and field-specific consultation groups, by which the potential of the sectors and choices were assessed. The sector-specific results of the final work completion with grounds were presented to the project steering group, which decided on logistics, bio-economics and digitalisation in the selection of the sectors (Fig. 1).

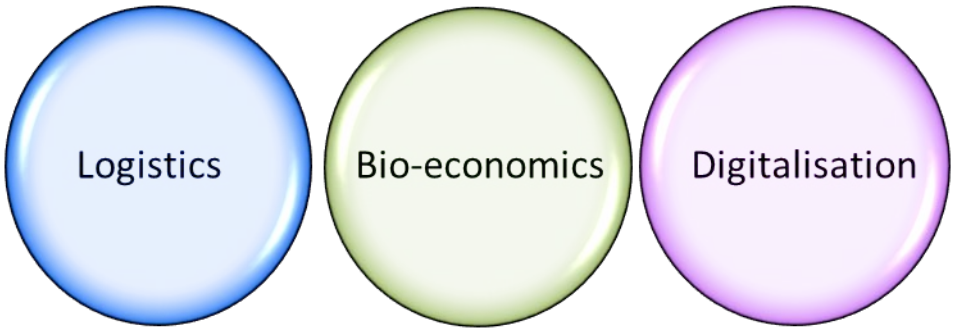

Figure 1. Kymenlaakso's growth sectors

Tourism as well as health & well-being were regarded as important sectors for the province, but not, on the basis of the selection criteria, to the extent that they would be boosted as independent initiatives of their own. In the tourism sector, the generation of information and its utilisation rose vigorously to the fore. The utilisation of individual health information and telemedicine were on their part visibly presented in the consultation group work on health & well-being. For this reason, tourism as well as health and well-being ended up as combined and to be dealt with under digitalisation.

After selection of the main fields, field-specific smart specialisation strategy key features became the object of the final completion work, still benefiting from the contribution of the consultation groups. As the final result, Kymenlaakso's RIS3 strategy key features crystallised
on a sectoral basis into the following form (Fig. 2):

Logistics:
safety and smart logistics

Bio-economics:
from resource-effective and low-carbon bio- and circular economy into energy, new products and entrepreneurial activity

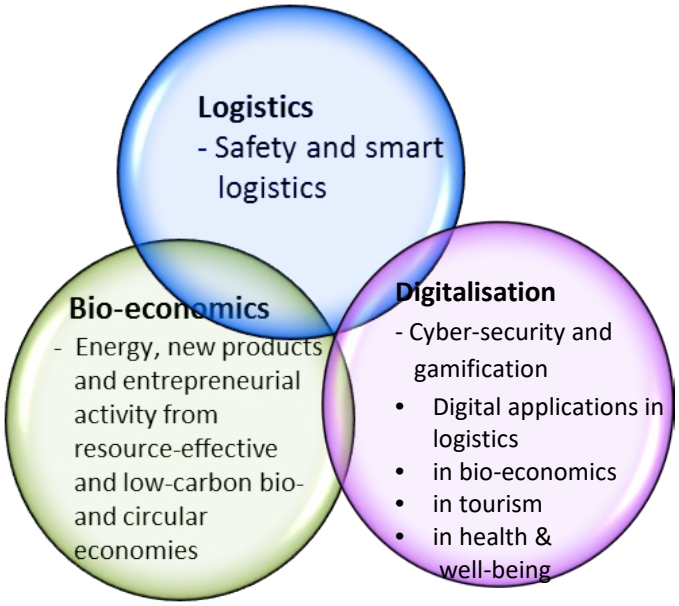

Figure 2. Kymenlaakso's RIS3 strategy key points

Digitalisation:
cybersecurity and game-playing as well as
digital applications in logistics, bioeconomics and tourism as well as in health & well-being.

Logistics, bioeconomics and digitalisation make up Kymenlaakso's strong basis of expertise, which offers a strong foundation for growth. In the mutual interfaces of the growth sectors, there is great potential for the emergence of innovations. In the selected RIS3 key features, the region's strengths in innovation, the creation of added value and the generation of international breakthroughs are all utilised (Fig. 3).

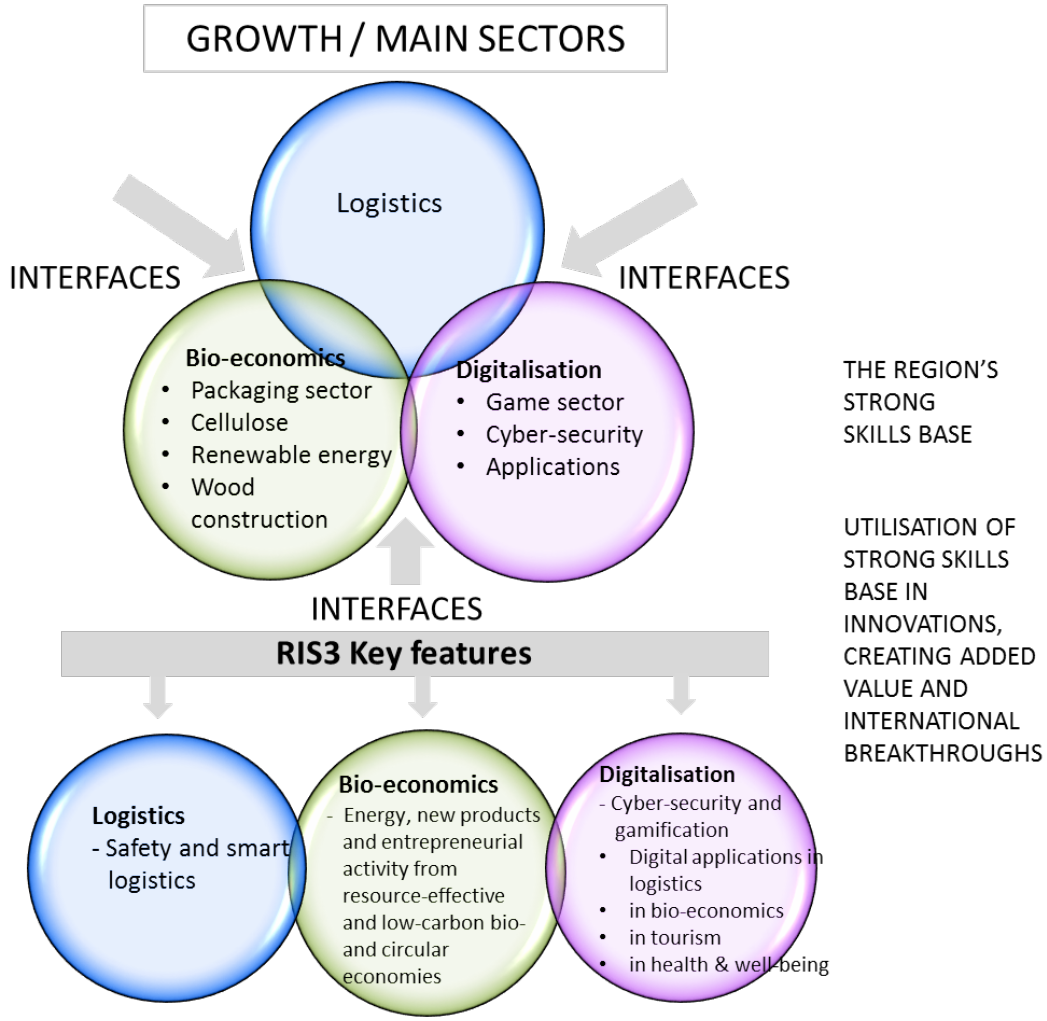

Figure 3. Kymenlaakso's growth sectors and the RIS3 strategy key features that benefit from them

3.1. Description of main sectors and RIS3 strategy key features

3.1.1. Logistics as a phenomenon

A great period of transition is underway in the logistics field. Many drivers direct the modern logistics field, of which the most significant are, for instance, the internet of things (IoT), digitalisation, automation, robotics and green values as well as globalisation and security.

- Smart solutions are increasing in all parts and interfaces of the logistics chain. Digitalisation, automation and robots are reducing the labour-intensiveness of the field. Working methods are changing.
- Automation is increasing in transport monitoring, storage and the handling of materials. Sensors and monitoring devices are following the delivery chains. Both the availability and significance of skilled labour are growing.
- Intelligence, identity and real-time monitoring are better enabling optimisation, anticipation and simulation, which is thereby increasing efficiency.
- The accelerating growth of online commerce is changing logistics-based goods-, information- and cash-related flows. The buying behaviour and expectations of consumers are changing. Speed and flexibility represent service assets.
- Digitality and IoT are creating new business opportunities for the field. New packaging requirements and methods (smart packaging) are being generated. New transport methods are being generated, such as package transport by taxi / by private citizens or driverless vehicles.
- On the other hand, the development of 3D printing may in some sectors even reduce the need for transport.[13]
- The EU's sanctions against Russia and Russia's counter-sanctions are affecting the field. According to the Finnish Customs statistics, transit transport from Finland to the East fell 39 per cent in 2015[14].

3.1.2. Engagement with the region, networks and the international dimension

Kymenlaakso is, on Finland's scale, a unique logistics centre. The province has Finland's largest general port, HaminaKotka, which is composed, together with the rail and motorway traffic, of a logistics service entity that provides employment and creates entrepreneurial activity. Kouvola is the only intermodal rail&road terminal centre that belongs to the EU's traffic-based core network, TEN-T (Trans European Network). There is also the E-18 motorway and Russian frontier-crossing point in the region. In the province, logistics exerts a significant impact on added value[15] – over double the share compared to other provinces.

The province has research, development and innovation operations in the field, as well as teaching. A training pipeline in the form of a logistics-oriented upper secondary school, Etelä-Kymenlaakso Vocational College (Ekami), Kouvola Region Vocational College (KSAO), Kouvola Railway and Adult Education Oy (KRAO), Kymenlaakso University of Applied Sciences and Lappeenranta University of Technology (LUT). Ekami and KRAO are partners in the development of simulator training.

NELI's[16] research partners are, e.g. Kotka Maritime Research Centre (KMRC), University of Turku's Brahea Centre / Centre for Maritime Studies (CMS), Tampere University of Technology (TTKK), LUT, University of Helsinki, Aalto University, VTT and Sito Oy. Close cooperation is engaged in also with many universities of applied sciences, such as Novia, Saimia, Laurea, HAMK, Haaga-Helia and Metropolia. The region also has a ready infrastructure, experts, enterprises and business operations in

[13] Oy Capful Ltd (2015). Chosen factors for change in the operational environment. PowerPoint presentation. 21/08/2015.
[14] Talouselämä [Economic Life] (2016). Transit transport. A truly bleak Russian figure from Finland: -39%. 05/02/2016. http://www.talouselama.fi/uutiset/todella-synkka-venaja-luku-suomesta-39-6298974. (Referenced 05/02/2016.)
[15] Added value = an indicator of total economy eco-efficiency which measures the economic values produced.
[16] NELI = North European Logistics Institute: a logistics development organisation, which functions in the Kymenlaakso University of Applied Sciences.

abundance. The partners are top-level enterprises in the field, such as Konecranes, Cargotec, Lamor and Mevea.

The field is quite international. Long-term cooperation with international research organisations and network partners has established not only good relations but also confidence in the quality and

expertise of our region. We are a desired partner in project cooperation in the field. Evidences of international projects also already exist: EFP Ecologically Friendly Port[17] and 30MILES[18].

NELI is a Ministry of Transport and Communications expert working group member in the support partner group, Fintrip. NELI is also actively involved in logistics- and traffic-based international cooperation as an expert member of TEN-T INEA[19] Advisory Board, CPMR's[20] Transport partner group as an expert member set by the Regional Council of Kymenlaakso and in ALICE[21] logistics developers' network operations and the expert working group, as well as in the ERRIN[22] Transport working group as a member and in DevLog network[23] operations.

In addition to domestic partners, there are also, for instance, the logistics enterprises network, Finnhub; the internal logistics enterprises' association, Limowa; the Finnish Association of Purchasing and Logistics (LOGY); the Finnish Environmental Centre (SYKE); development companies and ports. High-level cooperation with the authorities is also ongoing with the Finnish Transport Safety Agency (Trafi), the Finnish Transport Agency (Liikennevirasto), and the Ministry of Traffic and Communications.

3.1.3. RIS3 key feature of smart specialisation in logistics

Kymenlaakso's logistics-based key feature of distinction is found in the safety and smart logistics (Fig. 4) in logistics areas, ports and maritime navigation. Our region's expertise in safety in both maritime transport and port operations observes the top international level. Smart logistics is a means to intensify operations by which the environment, costs and work time are saved and safety is also added.

Smart specialisation as a **regional objective** is to connect, by means of digitalisation, ports, logistics actors and multimodal terminals into a more active, closer part of the European core transportation chain (TEN-T).

Core ports form experimental environments (promotion of experimental culture) for digital services and port and warehouse technologies, as well as for innovative business models.

An innovation system is being created – a new type of learning and innovation environment – to respond to the needs of future services in addition to developing domestic and international companies and associations together with the needs of researchers.[24]

[17] In the ENPI project (01/12/2012–30/11/2014), Ust-Luga port-related as well as the surrounding business and residential area-based environmental safety was improved, HaminaKotka and Ust-Luga energy efficiency was developed, and noise detriment as well as emissions from the ports were reduced.
[18] The objective of the Central Baltic project (01/09/2015–31/08/2018) is to develop Gulf of Finland water network tourism by improving the safety, service level and markets associated with marinas.
[19] INEA = Innovation and Networks Executive Agency. The agency administers infrastructure and research projects in the fields of traffic, energy and telecommunications.
[20] CPMR = Conference of Peripheral Maritime Regions of Europe. The organisation engages in cooperation with regard to special questions related to coastal areas. The Regional Council of Kymenlaakso belongs to the organisation's Baltic Sea Commission.
[21] ALICE = Alliance for Logistics Innovation through Collaboration in Europe.
[22] ERRIN = European Regions Research and Innovation Network.
[23] Devlog Oy = An expertise network specialised in logistics-based strategic development and management.
[24] The objective of NELI's Logistics Workshop project (01/01/2016 - 31/12/2017) is to establish a Logistics Workshop for Kymenlaakso and formulate an action model that integrates the development needs of companies, scholastic institutions and developer interests. This sort of logistics field-based development and innovation environment is missing in Finland.

A Baltic network of core ports which enables the development and deployment of smart, effective and safe transport solutions will be established. Uniform operational models, sets of concepts, and tools for the quality improvement of network operations will be built.

Figure 4. Logistics RIS3 key point

Port of HaminaKotka Ltd is an active provincial implementer of logistics-based safety and intelligence-related RDI operations. In international RDI projects, the Port of HaminaKotka's energy efficiency, reduced noise detriments and other emissions (Ecologically Friendly Port project) have been developed, and a new type of information-sharing information centre (Mobile Port project) has been created. **Finnhub** from Kotka is a cooperation network in the nationwide logistics field consisting of export and import enterprises as well as internationalising SMEs, whose enterprises are actively involved in logistics field-related RDI projects.

New ideas and possibilities

A significant amount of Finland's logistics-based performance and competitiveness is composed of seamless national and international supply chains that fluent data transfer and electronic operational modes support (e.g. Portnet[25]). Logistic functions will inevitably digitalise further. This is creating new needs and possibilities for the field:

- E.g. the development and deployment of electronic documents and operational models.

Transport safety is frequently in the hub of international cooperation in the field on land, sea and in the air. In this respect, the special expertise of Kymenlaakso's actors is assuming a significant role. The improvement of traffic safety, advance risk detection and more effective prevention of accidents are establishing demand for smart transport innovations:

- the development of new types of monitoring and control systems to reduce drivers' human errors and hazardous situations owing to error estimates
- the development of monitoring systems to follow the transport of hazardous substances, which will intensify the effectiveness of the work of the rescue authorities and facilitate the acquisition of up-to-date information in accident situations.
- the utilisation of the data generated by smart transport sensors in, e.g. traffic planning, which will reduce traffic accidents.[26]

3.2.1. Bioeconomics as a phenomenon

The energy policies of the European Union emphasise sustainable development, competitiveness and the assurance of energy security. The objectives are being striven towards by, e.g. improving energy efficiency, with new technologies, and by better utilising renewable energy sources.

[25] Portnet (www.portnet.fi) is a port traffic information system that is maintained by the Finnish Transport Agency (Liikennevirasto). Information from all vessel visits directed to Finnish ports is inputted into the Portnet system.
[26] Towards a new transport policy: Intelligence for traffic and wisdom for mobile actors. Second-generation smart strategy for traffic. Programmes and strategies, 1/2013. http://fi.opasnet.org/fi/Kohti_uutta_liikennepolitiikkaa_-_%C3%84ly%C3%A4_liikenteeseen_ja_viisautta_liikkujille#4.7_.C3.84lyk.C3.A4s_logistiikka . (Referenced 04/02/2016.)

Climate change, population growth and the depletion of natural resources are global problems whose resolution requirements are accelerating the advancement of bioeconomics. Resource efficiency, low carbon, bio- and circular economics are themes showing increasing demand.

- The use of renewable raw materials and environment-saving clean technology as well as the effective recycling of materials are characteristic of the bioeconomy. The bioeconomy converts renewable raw materials and added-value products related to waste streams.
- Forestry (incl. the cellulose industry) has a strong role in the bioeconomy, but the latter is also vigorously linked with other sectors, where renewable materials are being sought to replace non-recyclable materials.
- Bioeconomics promotes sustainable economic growth and creates jobs.
- It establishes new business operations such as the circular economy, which is one of the world's fastest growing business areas. The resources in the circular economy model (e.g. materials and energy) are completely utilised before they are eliminated from circulation. This way the need for new raw materials and resources is compensated.

Finland is a bioeconomy-based, pioneering nation in the production and utilisation of bioenergy. The forest sector is the foundation of the Finnish bioeconomy.[27] The cellulose industry is clearly growing. New cellulose factories are being planned for Äänekoski, Kuopio and Kemijärvi.

The biomass of the forest is traditionally utilised in wood products and paper. Biomass is also applied in, for instance, fibre fabrics, medications, functional food products, plastics, smart packages and bio-oil. Innovations in the field include, for example, smart price tags in paper format, car parts manufactured from wood composites, biodegradable packaging materials, and smart packages made from nano-cellulose.[28]

3.2.2. Engagement with the region, networks and the international dimension

Cellulose

A strong and versatile forestry tradition and related know-how are creating positive prerequisites for the development of bioeconomics and business operations in Kymenlaakso. Southeast Finland has Europe's largest forestry sector (cellulose and paper production). Cellulose operations form the foundation round which other functions are being developed. The region boasts, for instance, UPM-Kymmene Oyj's Kymi cellulose factory in Kuusankoski (cellulose production, biofuels, sticker materials, etc.) and Stora Enso's Sunila cellulose plant (lignin separation). The expansion investment in the Kymi cellulose factory has been deployed, and as a result its capacity has risen 32%. MUAS's[29] Fibre laboratory in Savonlinna offers facilities for the development of various cellulose qualities and applications, in addition to new products (e.g. AaltoCell™[30]).

Wood construction

Wood raw material reserves in the immediate area are a regional strength as well as the strong tradition of wood use particularly in the built-up environment (wooden blocks of flats) and versatile industrial operations. In Kymenlaakso, expertise in wood construction has been developed systematically. As support for KSAO's upper level training and KyUAS's wood structure designer and wood designer training, a professorship in the wood field has been established by joint funding at Aalto University and the City of Kouvola. Vertical cooperation is being closely conducted between various educational institutions. Several significant RDI projects have been implemented in connection with wood construction, such as *Woodinno* (2010–2013), *WoodAkademy* (2011–2014) and *Restorative Environments: Well-being and Business from Wood* (2013–2015). The Kouvola region is involved in the Nordic Wooden Cities network, and the network's Forum Holzbau event was arranged here in 2013. At the moment, a low-

[27] Capful Oy (2015). Chosen factors for change in the operational environment. PowerPoint presentation. 21/08/2015.
[28] Wood and forest. http://www.biotalous.fi/puu-ja-metsa/. (Referenced 08/02/2016.)
[29] KyUAS and MUAS will merge on 01/01/2017 into Southeast Finland University of Applied Sciences (Xamk).
[30] AaltoCell™ = a patented microcrystalline cellulose production process.

carbon building-related innovation and action network is in progress – a project that acts as a mutual forum for upper level scholastic institutions, businesses and development organisations.

Packaging industry

The region has significant forestry-based cellulose and package material production in addition to expertise in related international logistics, technology and entrepreneurial activity. In Inkeroinen (Kouvola), there is a packaging[31] production concentration (including, e.g. Stora Enso, A & R Carton Oy, and Pyroll Kouvola / PackageMedia Oy). Kotkamills Oy's cardboard production is found in Kotka. Kymenlaakso has the potential to launch its own special expertise and, as a result of its platform of existing business enterprises, it boasts Finland's (Europe's) "capital city of packaging". The region's vigorous logistics-based expertise supports the vision.[32]

Renewable energy

Kymenlaakso has production expertise in bioethanol: Hamina Bioethanol Plant and a bioethanol facility planned for Myllykoski. Vigorous RDI operations to promote energy savings and renewable energy use have been carried out in the province. E.g. under LUT administration, in the BIOTULI project[33] (September

2010-August 2013) a torrefaction plant was built[34].

BioSampo Training and Research Centre, owned by KSAO and also in the teach and cooperative use of KyUAS, is developing vocational education in the bioenergy field, together with educational institutions and enterprises. BioSampo offers the possibility to develop bioenergy field training in addition to studying the utilisation of wastes (in particular, agricultural wastes) in energy production, the production of liquid biofuels, gasification of solid fuels, torrefaction, renewable fuels in the production of electricity, and generated electricity feed into the grid. What this concerns is distributed energy production. In addition, BioSampo can function as a testbed platform for experiments and development work undertaken by companies.

Hamina's Mäkelänkangas has a solar energy park (1 MW) and a windmill park (4*1.5 MW), both owned by Finnish Power Ltd. The park partners consist of 13 energy companies, and the facilities are used as research/teaching facilities by KyUAS. There is close cooperation with dozens of energy-field enterprises and research organisations. A closed methane circulation pilot plant is being planned as a cooperative effort between KyUAS, LUT, Oy Woikoski Ab, Hamina Energy Ltd and Kotka Energy Ltd. KSAO and Ekami are endeavouring along with KyUAS to develop the solar power park by applying for a joint project. Significant international partnership interests include, for instance, network partners Eseia[35] and the ERRIN Energy working group, as well as St Petersburg State Polytechnical University.

Environmental technologies / the effective use of energy

There have been long-term RDI operations for the reduction of emissions and the promotion of the beneficial use of wastes in Kymenlaakso. KyUAS has an accredited emissions measurement laboratory.

The region has a large number of enterprises utilising the latest waste disposal technologies, such as the Hamina and Mäkikylä biogas plants, Kotka Energy Ltd's waste incineration facility, Kymenlaakson Jäte Oy-related waste recycling and processing plant, and Hyötypaperi Oy. Cursor Oy is developing,

[31] Digital package = a package that protects the product, in which, e.g. individualised texts, graphics or encrypted codes identifiable on a smart phone can be printed.
[32] Kouvola Innovation Oy (2016). InnoPak packaging field innovation concentration development project. PowerPoint presentation. 22/01/2016.
[33] In the BIOTULI project (the bio-refinery's new products and business models), the utilisation of, e.g. refining processes in the utilisation of by-products as well as their use as a source of energy were studied. The project partners were: LUT, Saimaa University of Applied Sciences, KyUAS, Kouvola Innovation, Cursor, Andritz, UPM-Kymmene, StoraEnso, Imatran Seudun Kehitysyhtiö KEHY and Wirma Lappeenranta.
[34] Torrefaction = thermal treatment of biomass.
[35] Eseia = European Sustainable Energy Innovation Alliance.

along with its partners (incl. local equipment manufacturers), the BioA processing plant concept[36] for the recycling of cellulose waste.

The research object of the joint project implemented by KyUAS and Cursor at Karhula's industrial park at the former Hans Ahlström mechanical separation techniques laboratory is based particularly on the separation of heavy metals from ash and drying of the silt.

In KyUAS energy technology teaching, energy-saving and the effective use of energy are especially emphasised alongside energy production expertise. Research work in the reduction of energy production-related environmental impacts and the intensification of energy use has already gone on for 25 years. The most recent projects include, for instance: Step to Ecosupport (an ENPI project) and ECool, a research project on energy savings possibilities in demanding special applications.

The corporate sector also has know-how connected with energy efficiency, such as Produal Oy, Nuuka Solutions Oy, Rentratek Oy and the region's design offices.

3.2.3. RIS3 key feature in bioeconomy-based smart specialisation

The key feature of Kymenlaakso bioeconomics is to develop resource-effective and low-carbon bio- and circular economy energy, new products and entrepreneurial activity (Fig. 5).

The forestry know-how and industrial side streams characteristic of the province create a unique foundation for the development of bio- and circular economics, particularly from the perspective of industry. A good starting point is also the fact that in Kymenlaakso the utilisation of bio and waste energy is nationally on a very high level.

Smart specialisation **as a regional objective** rests in the improved utilisation of forest and other natural resources, raw materials and wastes, e.g. in energy use, biofuels, material refining and added value-based innovative products. This establishes the foundation for growth in the vitality of entrepreneurial activity in the province.

New ideas and possibilities

In innovation platforms formed in bioeconomic divisions, there is active cooperation in promoting the joint vision of the pivotal interest groups[37]. Kymenlaakso's good logistic location and already functional bio/circular economy field enterprises, as well as the regional concentrations that utilize side streams, offer good growth platforms for new products and services. Kymenlaakso's hospital projects could, for example, function as development platforms and enable the deployment of an experimental culture and companies' reference deliveries.

Figure 5. Bioeconomics RIS3 key point

- Potential connected with industry
  - ❖ Resource-effective utilisation and refining linked with forestry side streams (e.g. chemical products, fuels, microcrystalline cellulose).
  - ❖ Use of raw wood materials in 3D printing (3D Navetta in Pyhtää).
  - ❖ Functions related to the synergy and symbioses of various industrial sectors, such as forestry and the chemical industry.[38]

[36] BioA concept = purified ash and silt as fertiliser is profitably processed from paper and cellulose industry-related bio and fibre slurries.
[37] public administration, decision-makers, universities, research facilities, development companies, business enterprises, innovators, inventors, inhabitants
[38] Cursor Oy (2015). Renewable industrial and logistics strategy project. PowerPoint presentation. 19/08/2015.

- ❖ Closer cooperation between large forestry companies and SMEs. E.g. Andritz wishes to engage in cooperation with SMEs (a problem is provided for SMEs to resolve, or a development kit which, due to time constraints, is given to SMEs for further refining).

- Possibilities in the packaging sector and in wood construction:
  - ❖ Commercial field transition and changes in consumer buying habits are creating new business possibilities. The direction from big units to smaller ones is increasing the need for packaging as well as demand for new packing materials and packaging methods. There is a niche for tailored, smart and recyclable packaging innovations connected with new biomaterials, new package production processes, and package planning/design. E.g. the new type of carton production at Kotkamills Oy: also links with digital packages.
  - ❖ There is an increasing need in Finland and internationally in the future for Finnish wood element structures which can be addressed when there is enough know-how to respond to it.
  - ❖ Wood construction and healthy building. Interface with health and well-being.
  - ❖ A grandstand for wood construction will be provided by Kouvola's Housing Fair in 2019.

- Possibilities in renewable energy:
  - ❖ Management of the distributed energy model / distributed energy expertise / utilisation of distributed energy. The production of renewable energy – solar and wind energy in particular – is independent of the weather. In order to balance out production and consumption, energy storage and flexibility in demand are required. In the future, customers will be a fundamental part of this balancing process.
  - ❖ In the Kymenlaakso region, there are good possibilities to develop technologies based on encouraging the transition to a hydrogen economy (e.g. closed methane circulation) and infrastructure.
  - ❖ New biofuels such as liquid biofuels, pellets and torrefied wood carbon enjoy great export volumes.
  - ❖ Growth in energy wood demand and provision will be able to generate new entrepreneurship in energy wood, which will support local energy production and renewal of the rural economic structure.[39]

Endev Oy is a Kotka-based corporate case example of long-term development and innovation operations in the bio field. Some of its latest results include Endev Oy's economically and ecologically sustainable community silt processing method, developed in cooperation with LUT. The developed PAKU technology is, compared to other methods, superior in terms of cost effectiveness. The company has built a prototype plant in Kotka based on the method for the processing of silt accommodating 5,000 inhabitants. The idea developed is quite scalable and includes several business models for growth and internationalisation. The commercial potential for the concept is also great.

3.3.1. Digitalisation as a phenomenon

There is a digital breakthrough currently in progress that is re-defining the customer experience, changing business models and continuously offering new technological solutions. Digitalisation is changing the operational environment more quickly and radically than any other phenomenon.

- Digitalisation refers to the automatising, intensification, electrification and creation of new economic added-value business and community functions. Big data, cloud services, social media, industrial Internet, mobility, new services and applications represent the peripheral phenomena of digitalisation.

[39] Finnish Forest Centre (2016). Entrepreneurship from energy wood for the bioeconomy in Southeast Finland project. PowerPoint presentation. 17/02/2016.

- Information technology is a community engine and enabler. In more and more products and services, information technology is merged, or they are produced and distributed digitally.
- In the future, there will be online sensors and equipment that monitor, analyse and optimise our everyday environs automatically and digitally.
- Digitalisation will be seen in the developed countries as a pivotal driver of economic growth. Though digitalisation and, as a result, growth in productivity will also reduce the need for labour in many modern sectors, it will also open enormous possibilities for new business models and services such as Über (taxi), Airbnb (accommodation), Spotify (music) and Netflix (films and TV).
- Digitalisation and electronic services such as online shopping have increased explosively. The deployment of new technologies is accelerating at the same time that prices are coming down.
- The game industry and sector represent a global phenomenon which, it is believed, will continue its dynamic growth both globally and in Finland[40].
- Finland has excellent starting points for the utilisation of digitalisation.

The potential to implement cyber-threats in the modern world is growing. Effective means and counter-actions are being earnestly awaited to deal with cyber-threats so that the safety of the community can be ensured. There is both demand and a need for cyber-security expertise as well as for the related service providers. Finland's prerequisites for the development of cyber-security sector know-how are excellent:

- In Finland, there is research, development and innovation activity connected with a high standard of cyber-security as well as related expertise not only in enterprises but also in universities and other advanced-level educational institutions and research facilities.
- The foundation for expertise in the sector is, however, rather narrow, and cutting-edge know-how is concentrated on a few select operators. Know-how is also dispersed to many organisations. Cooperation in the field is just beginning to develop[41].

3.3.2. Engagement with the region, networks and the international dimension

Kymenlaakso has the appropriate starting points for the development of know-how and services connected with digitalisation on both the national and international scale. There is teaching linked with the field in the province, together with research, development and innovation activity.

KyUAS offers specialist training to information technology professionals who lack the current knowledge and skills in cyber-security, which is emerging from the needs of the work world. Specialist training will be starting in September 2016.

Data centre technologies and expertise have a significant role in Kymenlaakso (Google's data centre investment of over MEUR 700 in Hamina). There is a data centre expertise learning environment in Hamina as well as multidisciplinary specialised data centre expertise (automation, ICT, process field, data processing).

The region's know-how in the game sector is high in quality and versatile, establishing excellent prerequisites for the application of game play[42] also in other fields. The game sector can be studied at KyUAS and KSAO. Ekami offers game sector and Vocational Qualification in Business Information Technology studies. Game programming can be studied as part of the Information and Communication Technology training.

Playa Game Industry Hub, ICT and game industry concentration, a cursor-coordinated game sector open association (including, for instance, Goodlife Technology, Kotka Games Ltd, Kiemura Ltd, Kukouri Mobile Entertainment Ltd, Songhi Entertainment Ltd and Nitro Games Ltd) has functioned in Kotka since

[40] Capful Oy (2015). Chosen factors for change in the operational environment. PowerPoint presentation. 21/08/2015.
[41] Finnish Government (2016). Kyberosaaminen Suomessa – Nykytila ja tiekartta tulevaisuuteen. [Cyber-expertise in Finland – Current status and roadmap for the future.] Report and research activity publication series 9/2015. 15/02/2016.
[42] Gamification = the application of elements and methods used in games other than in game environments.

2011, representing the development and internationalisation of all game sector companies' business operations in Southeast Finland. The association is made up of various enterprises, actors and expertise whose key feature of activity is the application of game sector strengths and the application of gamification in new sectors (e.g. the social welfare and public health services-related sector, cyber-security, IoT). The game sector in the province has a good reputation as well as comprehensive networks on both the national and international level.

The project cooperation in the cyber-security field is active. Cooperation between the universities of applied sciences (KyUAS, MUAS, LUAS, TUAS, HUAS, KUAS, TuUAS, Laurea University of Applied Sciences, Savonia University of Applied Sciences and Metropolia University of Applied Sciences) is being undertaken in, e.g. the ICT field training 10 paths training project, in which, for instance, a cyber-security course series is being produced for the joint use of universities of applied sciences.

Cyber-security expertise and business in the field are being developed in, e.g. KyUAS-, LUT-, Cursor- and enterprises-based project cooperation. As a result of cooperation in the KyUAS premises, a new centre of expertise has been initiated – CyberPros Academy – as well as operations towards the development of cyber-security, the piloting of services and the surveying and examination of cyber-related threats. The implementation of cyber-security teaching by involving games is an innovation. The expertise centre's operational environment is comprised of a modern data centre and related teaching class, equipped with effective computers.

CyberPros Academy's business partners are, e.g. Elisa, Nixu Corporation and GoodLife Technology as well as Clarified Security OÜ from Estonia. Special know-how at the expertise centre is found in information technology networks-based cyber-security. This is also supported by the contract between KyUAS and Cisco Systems regarding the use of virtual products in teaching and research. There is a contract between Elisa and KyUAS concerning the use of Elisa's IoT development environment in teaching. Aalto University is also a natural partner in the expertise network.

3.3.3. Digitalisation-related smart specialisation RIS3 key feature

The ***main key feature*** of Kymenlaakso's digitalisation is *cyber-security* and *gamification* and the sector key feature is ***digital applications in logistics, bioeconomics, tourism*** and health & well-being (Fig. 6).

Digitalisation is regarded from the perspective of Kymenlaakso's smart specialisation RIS3 strategy as a dynamically cross-cutting theme that significantly affects not only cyber-security and gamification but also other selected strategic fields, logistics and bioeconomics and their key features. Possibilities for new ideas and innovations are seen especially at the interfaces in digital applications.

Figure 6. Digitalisation RIS3 key point

Tourism as well as health & well-being are important sectors for the province, but from the perspective of RDI they are not regarded as having the same great potential that logistics, bioeconomics and digitalisation have. In both the tourism and health & well-being sectors, information and the utilisation of information rose in the strategy process as the common strong denominator. For this reason, both the tourism and health & well-being sectors are being examined within the context of digitalisation and digital applications.

2.3.3.1. Cyber-security and gamification

Our region has significant know-how in, for instance, game programming, cyber-security and data centre expertise. Through their utilisation and further development, it will be possible to successfully react to the challenges of modern cyber-security threats both nationally and internationally. With digitalisation mounting great speed, the management of companies' data security and cyber threats must be invested in, specifically by raising expertise.

- Smart specialisation **as a regional objective** is the establishment of an open cyber-security network and expertise concentration in which cyber-security services and training (in particular, training in gamification-related cyber-security) are performed together with companies.
- As a new perspective, there is the development of the network and open expertise connected with cyber-security as well as the production of open information (compared to the old closed perspective and confidentiality agreements).

New ideas and possibilities

Through the growth in the demand for cyber-security expertise and skilled labour (local know-how but also expertise attracted from elsewhere), new jobs can be established in the province. As a result of the peak expertise in the field, new possibilities may include, e.g.:

- ❖ Services connected with the surveying of data security risks at data centres, information networks and operating systems such as the provision of penetration testing[43] and data security reviews and auditing. The CyberPros Academy CyberLab environs provide excellent opportunities for learning and practising these skills.
- ❖ The application of gamification solutions for various operational uses creates new possibilities. Gamification can be applied to produce, e.g. MOOC studies,[44] which are growing in popularity.
- ❖ Given the increase of international competition, methodical procedures are required to further develop expertise in cyber-security. Cooperation should be intensified and utilised with regard to, e.g. public contracts[45] in the development of related expertise[46]. Via innovative public contracts, public operators can influence the development of innovative products and services as well as the creation of new markets.
- ❖ In Public Private Partnership cooperation,[47] there are enormous possibilities if the public sector opens its functions as joint development platforms (e.g. the development of Kantasatama Harbour, the new KyUAS campus).

2.3.3.2. Digital applications

New digital services and applications (mobile applications and online services) appear on the market continuously, both for the entertainment of private persons and for the use of companies. Digitalisation and mobile devices can radically change the business models of enterprises, their game rules, and the ways they deal with customers. Modern digital services and tools include, e.g.

- Social media services such as Facebook[48] (http://www.facebook.com), Flickr[49] (http://www.flickr.com) or Twitter[50] (https://twitter.com)

[43] Penetration testing = the testing of any system whatsoever against data security risks.
[44] MOOC (Massive Open Online Course) refers to courses arranged online whose total number of participants is not restricted. These courses can have thousands of participants. MOOCs are appropriate for, e.g. the updating of expertise occurring alongside work.
[45] The Horizon 2020 programme offers funding possibilities such as Public Procurement of Innovative solutions (PPI) through international contract-based cooperation.
[46] Finnish Government (2016). Kyberosaaminen Suomessa – Nykytila ja tiekartta tulevaisuuteen. [Cyber-expertise in Finland – Current status and roadmap for the future.] Report and research activity publication series 9/2015 15/02/2016.
[47] Public Private Partnership.
[48] Facebook = a service for sharing everything.
[49] Flickr = distribution service for images.
[50] Twitter = microblog service.

- Google's services, such as Google docs[51] (http://docs.google.com)
- Corporate processes are made more effective by services such as Dropbox[52] (http://www.dropbox.com) or Yammer[53] (https://www.yammer.com).
- Tools such as Skype[54] (http://www.skype.com) or YouTube[55] (http://www.youtube.com).

Digital applications at logistics interface

Digitalisation- and logistics-based interface analysis raises many challenges and possibilities in the logistics field to the fore, for which digital smart logistics applications are able to generate new solutions. Smart digital applications can be used in logistics in many varied connections:

- The planning of logistics-based long and short timelines can be supported by, e.g. modelling the infrastructure, supply chain, terminal or production plant's operational alternatives.
- By means of programmes, transport task routes and equipment or storage processes can be optimised.
- With smart transport solutions, it is possible to provide information on the precise conditions or timetables for travellers and cargo drivers.
- The systems can produce monitoring data and forecasts regarding traffic flows or individual freight deliveries.
- With respect to renewable industry and logistics, IoT is vigorously changing sectors and revenue logic. In logistics-based solutions, new technologies such as IoT (temperature monitoring of deliveries), mobile applications (event collection concerning delivered goods) and Big Data (traffic management) are being actively applied. As a result of the province's industrial background, the pivotal factor emerging is how it will be possible to get involved with the development of IoT.
- The IoT solutions are currently frequently vulnerable, so there is great potential in the solutions for their cyber-security problems.
- The open interfaces and Open Data are closely linked with the world of IoT.

Digital applications at bioeconomic interface

At the interface of digitalisation and bioeconomics, there is considerable potential for the development of innovative product and service concepts. There are already several examples of the basis of continuing development:

- Smart packages as an extra-information provider / guide / information collector (nanocellulose packages that monitor the suitability to eat certain foods), with codes (e.g. QR) to products, additional services, monitoring of consumption behaviour (e.g. RFID chip) and "remote-controlled" price tags in paper format.
- Bio- and circular economy processes utilising automation (smart electrical grids: smart, remotely read electricity meters and electrical companies' ICT systems; energy production; consumption; storage and smart control of transfer; and a smart electrical grid as a market niche for distributed energy production and for consumers)
- Energy storage for the balancing out of production and network loads as well as reserve power (e.g. the use of electric car batteries as energy stores)
- Flexibility in electrical demand (voluntary and temporary adaptation of electrical demand: e.g. charging of battery when there is over-supply of electricity).

PackageMedia Oy is an example of an open-minded and innovative enterprise situated in Inkeroinen, Kouvola, rising at the interface of digital applications and the bioeconomy. PackageMedia is Finland's only digital package plant and it is the largest in the Nordic countries. The company combines tailored

[51] Google docs = cooperation-based editor for cloud documents
[52] Dropbox = an internal distribution service for files.
[53] Yammer = Twitter for business enterprises.
[54] Skype = Internet phone call and videoconference service.
[55] YouTube = video distribution and viewing service.

digitally printed packages with growing online markets and commits customers to products in a new way. It is possible to print information about various competitions that activate consumers on the package, or build links to social media by means of games. The packages can be supplied with elements that are three-dimensional or contain smart technology. Digital printing is suitable as a cost-effective solution for small series that particularly require flexibility and speed, packages tailored on an advertising campaign basis, or when printing on the product in several language versions is required.

Digital applications at the interface of tourism

Tourist travel as a phenomenon

Tourist travel represents an enormous business. Despite the weak economic situation, tourist travel is expanding globally – and it is expected that the field will continue growing in the future. Drivers that are shaping the field include, e.g. the utilisation of digitalisation, new service providers, ageing, the growing influence of the Y generation, authenticity, and new experiences that have more impact than previously.

- The effect of digitalisation on the tourist field is tremendous. It is seen in, e.g. the explosive increase in the number of bookings made via the Internet. Online reservations, tablets, mobile devices, comparison evaluations (e.g. TripAdvisor), Big Data analysis and Internet services offered by hotels are the fastest growing trends in the field.
- A sense of community offers consumers the possibility to better choose services and participate in their implementation.
- Individualism and self-development are rising trends that many new services support. For the modern-day traveller, an authentic experience is important as well as getting familiar with a new culture, learning new things and having totally new experiences.
- The significance of filtering content grows with the increase in the amount of information.

Tourism is an important field and employer in Finland. From Finland's perspective, Russians represent the most significant group of tourists. The recent situation in Russia has led to a decline in the number of Russian tourists. In the future, Asia may be a potential marketing target for Finland.[56]

Engagement with the region, networks and the international dimension

Kymenlaakso's traffic connections and flows are good from the tourist business point of view: the location is central Asia – Europe – corridor and St Petersburg – Helsinki – with the axle in the area of impact of the large metropolises. The province has a rather good image, magnetism, recognition, events and things to see. The region also has an adequate skilled and educated work force which lives, studies or goes to work right in Kymenlaakso.

In addition to tourist businesses, operators in the field are Cursor (Kaakko 135°), Kinno and XUAS [Xamk] (KyUAS and MUAS combined). MUAS's tourist field training brings new potential and opportunities to the development of the field. There is know-how connected with significant nationally recognised customer understanding at MUAS (Big Data, social media, etc.). MUAS is also involved with the Digital Humanism Research Centre, where the text masses of the past are examined in order to obtain a better understanding of the past, present and future.

The corporate field for the tourist field in the region is plagued by the scarcity of cooperation and the lack of comprehension with regard to "digital-ese". New electronic tools are not used due to a lack of courage or skill. Operators in the field have a deficient understanding of customers and inadequate skills in collecting online customer data. Having products made also requires investment.

At the moment, tourist travel to Kymenlaakso is an under-utilised possibility. The demand and provision for tourism are scattered, unlike the situation in large tourist centres (e.g. Lapland): this represents both an opportunity and a challenge:

[56] Capful Oy (2015). Chosen factors for change in the operational environment. PowerPoint presentation. 21/08/2015.

- The region's natural environs, infrastructure and services can be productised for many types of travellers: in particular, modern humanists (nature, peace, well-being, local culture, responsibility) and for Russian tourists. Asia is also a new potential target.
- New solutions are discoverable by means of networking and digitality:
    - the networking of businesses and other actors (e.g. joint marketing and sales channels, a new type of product packaging, development of route networks, equipment rental, security)
    - the networking of customers (e.g. bringing "pearls" into the wider consciousness by means of recommendation marketing or the gathering of individual tourists into a larger group for the purpose of more cost-effective production)
    - smart traffic solutions.

New ideas and possibilities

The digitality of the tourist field is seen in the product development of the field in the sense that tourism-related innovations are no longer products but rather, to an increasingly advancing degree, processes carried by technology from the productisation of information. The following form the hub of tourism-based digital applications:

- user-oriented platforms and customer experience
- digital information management
- utilisation of customer understanding
- development of the customer experience
- activation of recommendation as well as
- the understanding of the various phases of a journey and benefiting from the information obtained.

Other potential tourism-based digital applications can be:

- new electrical applications in service business operations, as well as
- development of the utilisation of open data in public transport.

The tourist businesses that are sensitive to modern trends collect, analyse, comprehend and benefit from the unlimited amount of information in their operational environment in order to respond better to their customers' needs and wishes. By taking positive advantage of the digital information already available at the moment, as well as by creating new types of methods/applications to collect and distribute information, it is possible to:

- improve the understanding of customers (Big Data, social media, etc.)
- reach new potential customers
- establish commitment amongst old customers
- bring current and potential customers into taking part in product development and market products
- create new products in which the physical environment, concrete products for sale such as food and service merge in a smart manner (e.g. a well-being holiday at a location in which a smart line generates information about the composition of nutrition; the monitoring of one's own nutrition online before, during and after the journey)
- offer customers more and better purchase opportunities for individual products and product packages – also tailored and mass-tailored products.
- streamline business processes (marketing communications, reservations, payment traffic, warehouses, information about the use of rental equipment, etc.)
- by means of various smart solutions, to reduce the company's fixed and variable costs connected with, e.g. the delivery and transport of goods, energy solutions, storage, waste management or other house technology).

The objective of all this is improvement in the profitability of the tourist trade, taking the sustainability perspective also into account.

New kinds of revenue logic can emerge from new requirements and possibilities as well as new firms and jobs – especially at the interfaces of digital know-how and tourist businesses. Enterprises can, e.g. productise information about consumers and consumption habits for the use of companies in tourism. In the development of tourism, cooperation with experts in information management and digital technology introduces quite new business opportunities and is also necessary, since the development of processes taking advantage of digital info keeps the following components in the order that follows (in principle):

1) Operation: what the traveller wants to do and which sorts of possibilities for action are offered to the visitor during the various phases of the journey (before, during and after). Possibilities for this utilising innovative digital information can be found (link with, e.g. gamification).
2) Information: the details needed for the accomplishment of some operation (about/from the customer, product, enterprise, etc.)
3) Information system.
4) Technology.

Sections 1 and 2 require, in particular, familiarity with the tourist field. Sections 3 and 4 especially require expertise in information management and digital skills.

Digital applications at the interface of the health and well-being sector

Health & well-being as a phenomenon

A big trend in the health and well-being sector is to take care of one's self holistically. The balancing of work and free time, learning more about diet, well-being holidays, well-being at work and performing measurements on one's own body are hot topics.[57]

The ageing of the populace both globally and in Finland is creating pressures for the public health care sector. Given the decrease in the working population, there is a need to boost the effectiveness of operations. The ageing of the populace and decline in the total number of those of working-age are leading to an intolerable situation, given the current public health care services and concepts available.

Digitalisation is changing private and public welfare services radically by enabling new types of methods to respond to the service requirements of clients. With digitalisation, the goal is to build more effective services and structural reforms in the field of health and welfare (e.g. digital health services, self-diagnosis). New types of information use, the utilisation of web resources and new technological applications are all opening up new possibilities. The utilisation of technology is creating better potential for people to participate in the implementation of their own services and care as well as its follow-up and related decision-making.

The reforms in the social and health care service structure currently going on in Finland are strongly altering the playing field of service provision, also with respect to its own interests.

Information that affects health and well-being in addition to the regular health services with devices used by consumers themselves, such as portable sensors and activity wristbands and services such as mobile phones connected with health and well-being, smart phones and tablets are equipped with mobile applications (mHealth apps), which are extensively available. Personally produced health and well-being data is revolutionising public health care from the perspective of patient, treatment staff and service providers. Finland is a pioneer in the electronification of public health care data.

Health technology is Finland's large top technology export sector, covering 47 per cent of the same.[58] As a field, health technology is highly diversified. Its sphere includes, e.g. various equipment intended for public health care professionals, such as digital x-ray machines, defibrillators, artificial cardiac valves,

[57] Capful Oy (2015). Chosen factors for change in the operational environment. PowerPoint presentation. 21/08/2015.
[58] The Federation of Finnish Technology Industries (FiHTA). Terveysteknologia [Health technology] publication, 2013.

knee and hip implants and precision lasers, etc.[59] The global eHealth[60] market is forecasted to grow to EUR 17.6 billion by the year 2017.

Engagement with the region, networks and the international dimension

Kymenlaakso's first-priority possibilities in health and well-being technology are based on the production of digital applications. Digital applications form the nucleus from the perspective of the workability of health and well-being sector-based practical solutions. User-oriented service solutions can be realised in them, as well as service modification and the participation of clients. From this perspective, an important backdrop is formed by the province's design- and social services-based training fields (KyUAS).

In Kymenlaakso, digital applications in the health and well-being sector are being produced by KyUAS / XUAS (Xamk) while Carea and Ratamo Centre are potential pilot organisers and adapters into practice. There are also companies developing social and health care sector ICT solutions in Kymenlaakso. Medi-IT Oy works with medical history systems and Hyvis-ICT Oy[61] is specialised in the digitalisation of welfare-based electronic services, the further development of the Hyvis portal, and the advancement of MyData (Taltioni[62]). The development of mobile applications[63] has also been initiated.

In KyUAS's Well-being and Business Services specialisation, research, development and innovation operations are being implemented quite actively in the form of project activity that is both national and international. International projects submitted for the Horizon 2020 funding programme application rounds include, e.g. One Heart[64] (coordinator from Spain, KyUAS as partner), PAX21Health[65] (coordinator from Spain, KyUAS as partner), Suitwalker[66] (coordinator from Germany, KyUAS as partner).

The starting point of the specialisation is research connected with well-being. In addition to traditional research and development methods, benefit is derived from the planning supporting user orientation, gamification and well-being, which is linked closely with KyUAS's design, game sector and expertise in the wood field.

The international partners in this specialisation are, e.g. St Petersburg State University and Finec University from Russia; TIBOR EDV-Consulting GmbH Thüringen Bildungszentrum Weimar and Trier University of Applied Sciences from Germany; the University of Scotland, Coventry University and Loughborough University from the United Kingdom; Lublin Catholic University and Siedlce University from Poland; and Everis S.L from Spain. Regional partners include LUT, Ekami, KSAO, Cursor, Kinno and cities in the region.

New ideas and possibilities

Support for health technology development, along with electronic services and the openness of information and its utilisation represent opportunities for the region.

Health technology innovations proceed from the needs of public health care. Among other things, the improvement of patient safety, the precision/speed of surgical operations, and transfer to same-day outpatient clinic surgery may be in the background of these requirements. The ageing of the populace in the industrial nations is also automatically increasing the potential for new health technology-related

[59] Holmalahti, J. (2015). Terveysteknologia Suomen kasvun veturina 25/05/2015 [Health technology as a driver of Finnish growth] (updated 29/05/2015). *https://www.valvira.fi/-/terveysteknologia-suomen-kasvun-veturina*. (Referenced 24/02/2016).
[60] eHealth (electronic public health care services) refers to the tools and services in the public health care sector that utilise information and communications technology and whose aim is to facilitate disease prevention as well as improve diagnosis, treatment, follow-up and the management of public health care.
[61] Hyvis-ICT Oy, an information technology company embracing eight hospital districts, is a subsidiary of Medi-IT Oy.
[62] In January 2016, Hyvis-ICT Oy purchased the Taltioni health data bank and the cooperative it has created. Taltioni Health Account is a citizen's personal electronic databank in which the user can safely store information connected with his/her health and well-being in one location. The information selected can, if desired, be shared with public health care professionals.
[63] The Päiki Pörriäinen game is the first public health care-based mobile game in Finland that is specifically targeted to children and parents. The Päiki Pörriäinen game describes a treatment day at the same-day outpatients' surgical clinic to families and children. By using the game, a child can wander through what happens during the treatment day stage-by-stage.
[64] One Heart = Cardiovascular disease big data project.
[65] PAX21Health = Hospital development living lab project.
[66] Suitwalker = Protective suit / cushions project.

innovations. Widespread national diseases, coronary diseases and diabetes will continue to be a significant target for innovation.[67]

The area of well-being technology, less competed for than health technology, represents digital solutions supporting well-being. The technological threshold for the field concerned is often not as high as in health technology. Innovative digital solutions connected with social welfare may be associated with, e.g.:

- support for families' well-being
- prevention of social exclusion, or
- the resolution of problems affecting special groups (the disabled, those released after hospital procedures, etc.)
- responding to service demand respective to the ageing populace.

The development of digital services connected with social welfare has been retarded by the relatively weak proportion of private services. In the future, the requirement may be associated with both the public and private sector. As an example, public research interests connected with the viability of the entire community are research studies in which the role of the social media is examined in the emergence of conflicts between various social groups (social position, races, religions). The applicability and availability of the data connected with research in the social services sector are enabling application development.

The growth in the amount of information regarding health and well-being is increasing at the same time that the consumer's need to get support for the interpretation of the data from electronic services. Good future electronic services will be able to create operational models that will combine previously splintered welfare information about the individual into an understandable format. Such change offers new possibilities for both social welfare and in services connected with health. Potential social and health care services which could be offered electronically are:

- access to view the results of laboratory/imaging research and the information explaining them
- access to view one's own medical history
- access to renew one's own prescriptions
- text message reminders regarding approaching appointments
- electronic booking for public health care.

Because game sector expertise in the province is strong and versatile (active game sector community: Playa Game Industry Hub and training in the field at KyUAS and KSAO), the provisions for the application of gamification are excellent. The merger of the game sector with the health and welfare field can create new possibilities at the interfaces along the lines of Games for Health gamification, i.e. features borrowed from games and technologies can be applied in the promotion of health. It is possible thereby to develop new methods to encourage participation, motivate, inspire and commit people to act in a goal-oriented manner in accordance with healthy life habits (e.g. to prevent social exclusion, increase physical exercise, improve nutrition).

Regional, national and international development work can be supported and promoted with innovation-positive public and private sector interaction. This can be concretised as, e.g.:

- the opening of public data to business enterprises
- Public Private Partnership and
- as innovative contracting procedures in the development of public services.

[67] Holmalahti, J. (2015). Terveysteknologia Suomen kasvun veturina 25/05/2015 [Health technology as a driver of Finnish growth] (updated 29/05/2015). *https://www.valvira.fi/-/terveysteknologia-suomen-kasvun-veturina*. (Referenced 24/02/2016.)

4. RIS3 strategy execution

4.1. Innovation platforms

Innovation platforms are needed for the activation and development of selected cutting-edge fields in innovation operations. They are pivotal procedures in the development of innovation ecosystems. In the case of Kymenlaakso with respect to innovation platforms-based activity, their networking ability both nationally and internationally is coming to the fore, so that enough critical mass will be obtained for operation. Typical features of innovation platforms are, for instance, openness, the participation of business enterprises, international networking and interface examination, as well as research and education operations (Fig. 7).

Research-oriented development environments are found in Kymenlaakso in addition to applied development work environments, entrepreneurial concentrations, start-up and corporate development environments, Living Lab environs, agent organisations and thematic as well as virtual networks.

Innovation platforms should be developed in the province in accordance with the above-mentioned principles for selected key features.

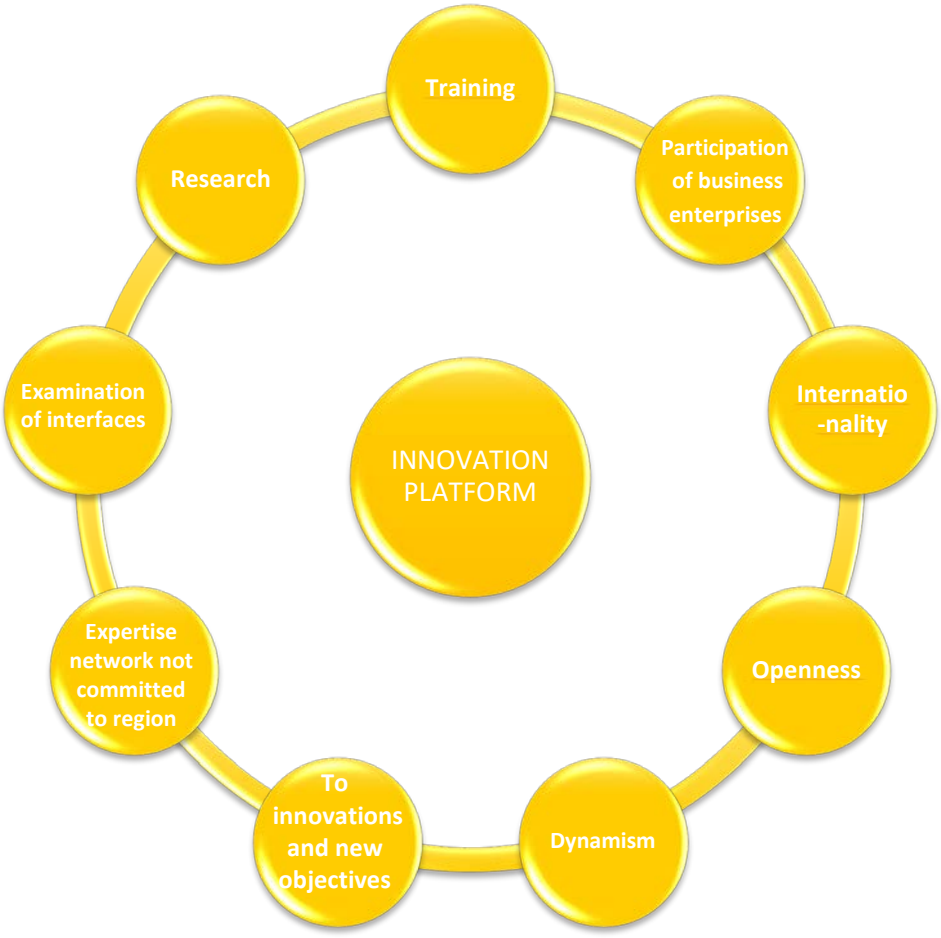

Figure 7. Basic characteristics of innovation platforms

Reference: Capful Oy (2015). Chosen factors for change in the operational environment. PowerPoint presentation. 21/08/2015.

Logistics:
safety and smart logistics

Bio-economics:
from resource-effective and low-carbon bio- and circular economy, new products and entrepreneurial activity

Digitalisation:
cybersecurity and gamification as well as
digital applications in logistics, bioeconomics and tourism, in addition to health & well-being.

The foundation of innovation platforms-based activity is already existent platforms in good operation. These should be developed, made more comprehensive and internationalised, as well as support given to the development of their innovation activity.

If required, new innovation platforms should also be generated to respond to new rising sectors and strengths, since the objective of smart specialisation strategies is to promote experimental activity in both current and new fields. If required, selected key features should be sharpened and/or re-modified on the basis of, for example, the experiences derived from the experiences, the competition situation, or market demand.

Currently functional and developing platforms include, e.g.:

- BioSampo Training and Research Centre
- Playa Game Industry Hub
- Digital packages production concentration
- 3D Navetta
- Smart Port (Kantasatama)
- Kouvola RRT (Rail Road Terminal).

For example, NELI's Smart City Environment and reactive traffic preliminary report project presents the establishment of three innovation platforms:
1. International commerce, creative economy and tourist services innovation platform
2. Public administration and regional interaction development innovation platform
3. Logistics and mass transport innovation platform

4.2. Key Enabling Technologies (KET)

Key Enabling Technologies (KET) refer to cross-cutting, expertise-intensive technologies that have an important role in promoting industrial competitiveness. In Kymenlaakso, there is research activity and expertise in material technology (paper and cellulose industry units) and information technology divisions (game cluster and university of applied sciences). In the area of technologies that enable the role of the province, there is orchestration particularly in their utilisation and results-applied research for the region. There are also thematic groups and projects in the EU's smart specialisation in various action platforms, which are concentrating on these technologies.

From the perspective of the province, nanotechnology, micro- and nanoelectronics and developed materials (connected with
wood fibre) as well as industrial biotechnology are technologies that are important to follow and apply and which are in an important role in the development work of smart specialisation in various fields.

4.3. International cooperation

The implementation of smart specialisation is highly international in its points of departure. Within the context of the EU, there are forums which can be used in the preparation and execution of the strategy effort. Smart specialisation is involved in the development in most forums, particularly the S3 forum and RIS3 mirror group. Within the context of ERRIN, a smart specialisation working group is also working, in which the active regions from various parts of Europe engage in cooperation: at the moment, especially as connected with implementation. The Committee of the Regions functions vigorously in Brussels as a background organisation in RIS3 work. For example, in the annual Open Days event, smart specialisation is covered in many occasions and seminars. WIRE (Week of Innovative Regions in Europe), still connected with the development of the regions, is an annually organised event by the country hosting the Presidency of the Council of the EU which handles smart specialisation. From the perspective of Kymenlaakso, it is very important to build this European cooperation on a long-term basis with respect to the various actors, and link cross-border projects (ENI) to it with Russia as well. Horizon 2020 and the Interreg programmes offer possibilities to build this cooperation in international joint projects.

4.3.1. S3 Forum

The Commission supports the EU's member states and regional RIS3 strategy work with an S3 forum (Smart Specialisation S3 Platform), in which the regions can profile and position themselves within the European RIS3 frame of reference as well as find partnership areas for themselves. The European Union's various funding programmes (e.g. Interreg Europe, Horizon 2020, Erasmus+) also support the international dimension of smart specialisation via project-funding and networking. The Forum offers advice, guidance and examples of best practices and reciprocal learning tools for peer groups and specialists. It also arranges, e.g. seminars, training and peer-to-peer assessments for operators developing smart specialisation-based research and innovation strategies.[68]

4.3.2. Other cooperation and its utilisation

Vanguard Initiative
The Vanguard Initiative refers to practical procedures between regions, through which growth is sought by means of new technologies and innovations from harmonising specialisation strategies, strategic roadmaps and joint internationalisation objectives. It provides a good point of comparison for the execution of Kymenlaakso's smart specialisation strategy as well as a model by which strategic partnerships can be correspondingly developed.

Open innovation
Open innovation is a new way of thinking according to which enterprises/organisations should utilise, in addition to their internal information, external information, ideas and technologies much more effectively in their own business operations and innovation processes. According to the open innovation concept, it is not the case that good ideas come only from within the company. Similarly, not all ideas need to be further developed in one's own enterprise: rather, concepts can be commercialised along other channels.[69]

The organisation's interface with regard to innovations has become permeable – from closed innovation to an active interchange of innovation ecosystems. The main idea behind open innovation is the distribution and utilisation of global information. The Triple Helix model is advanced towards the Quadruple Helix model, in which users are also pivotally involved with companies, the public sector and the educational/research sector in innovation activity.

Dublin Declaration on Innovation
In Dublin in 2013, the Dublin Declaration of Innovation was made, in which the open innovation approach based on the Quadruple Helix model was set as the objective of European innovation activity. In this model, opinion leaders in innovation activity are regarded to be not only business enterprises, universities of applied science and public administration, but also citizens, organisations and foundations. A European innovation union is thereby being developed, by which economic growth and the creation of jobs are being sought. Europe needs pioneer regions for this implementation. From the perspective of Kymenlaakso, this offers the possibility for active international operations and project work and, conversely, challenges the region in its innovation activity development to more actively seek new formats within the open innovation framework.

4.4. Implementation, follow-up and assessment

Kymenlaakso's RIS3 strategy guides the use of structural fund monies, and MYR[70] makes the decisions in accordance with their coordination into projects in accordance with the strategy. Execution of the strategy may contain various projects that implement the development of fields and key features com-

[68] http://s3platform.jrc.ec.europa.eu/home
[69] Chesbrough, H. (2003). "Open Innovation: The New Imperative for Creating and Profiting from Technology".
[70] MYR = Maakunnan yhteistyöryhmä (Provincial Cooperation Group).

pliant with the strategy, as well as innovation platforms-based activity. It is necessary to involve operators comprehensively so that in the future it will also be possible to make new, risk-inclusive openings. The development and utilisation potential for the province of key enabling technologies (KETs) should also be supported with finances and projects.

Ecosystem-based thinking should be regarded as a fundamental aspect of the implementation of Kymenlaakso's smart specialisation strategy. The creation of innovations requires new types of local environments – change-sensitive innovation ecosystems that function on a networked basis and interactively including actively operating innovation platforms. The innovation ecosystem joins the region's actors with processes that are creating something new. In particular, the province's individual citizens and enterprises should be able to get involved in the operations.

The development of innovation platforms should be oriented towards selected RIS3 key features. However, the innovation platform does not necessarily have to be a physical/concrete environment. Working can also be based on networked operations in which, via the active mutual interaction processes of the network operators, regional challenges are resolved and new learning occurs.

In the practical realisation of the smart specialisation strategy, enabling an encounter between various people and concepts and building up a sense of community by, for example, arranging workshops and working groups, conducting electronic surveys for comprehensive stakeholders, and raising the team spirit of the community and "doing things together", in addition to providing the feeling of inclusion and the opportunity to exert influence on the development of the province.

Business enterprises and company-orientation must be effectively engaged in the development of Kymenlaakso's RDI environment so that the larger regional influence of operations is assured. From the enterprise perspective, the implementation measures of the RIS3 strategy can be conceived as separately defining and targeting large businesses as well as SMEs and start-ups. The same procedures do not suit everyone equally well, so the expectations and roles with regard to various entrepreneurial target groups should be separately assessed and, after that, specified in accordance with their implementation functions.

Smart, sustainable and participatory growth along with the operations of innovation platforms and the innovation ecosystem is the sum of many different actors and functions (Fig. 8).

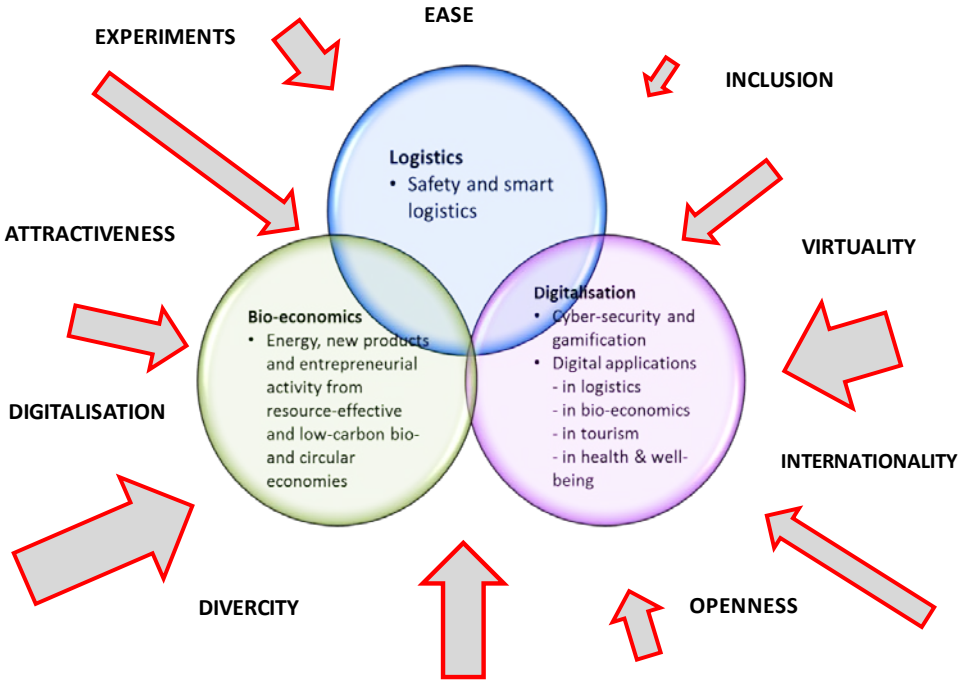

Figure 8. Kymenlaakso's innovation activity-based game field

The implementation of the RIS3 strategy is closely connected with the selection of the appropriate performance indicators and their use in the monitoring of procedures and possible modification requirements. The use of indicators promotes the systematic character of assessment, supports the continuous learning process, and provides the opportunity for an exchange of experiences with RIS3 strategies in other regions.

Selected indicators are monitored in the assessment of strategy which best describe the effectiveness of the province's smart specialisation RIS3 strategy. It is a good idea to perform assessment annually, so that the needed changes can be made with sufficient speed and flexibility. Indicators for Kymenlaakso which can be selected as the most appropriate are, for example:

- total number of new/start-up companies reflecting strategy-based key features
- total number of enterprises' RDI activities
- the new/renewed products/services brought to the enterprises' markets, or their share of turnover
- total number of companies' patents
- employment as a whole / per sector
- total amount of export as a whole / per sector
- total number of innovation platforms/networks
- total number of companies functioning in connection with innovation platforms/networks
- amount of cooperation between enterprises and high-level educational institutions (joint projects)
- magnetism, i.e. the total number of top experts attracted to the region (persons, companies)
- total amount of RDI funding obtained from all international funding sources in euros
- total amount of RDI funding obtained from the EU's concentrated funding programmes in euros
- total number of RDI projects compliant with key strategy points that have obtained structural funding
- total amount of funding granted for RDI projects compliant with key strategy points as based on funding and financier.

A specific person in charge and expert group from the region's actors on a key strategy point basis is to be assigned to the execution and follow-up of Kymenlaakso's RIS3 strategy. These RIS3 monitoring groups will report to the provincial level. The task of the RIS3 monitoring groups is to support the operations of the financiers and regional actors. Smart specialisation as a whole can also have its own steering group – Kymenlaakso's RIS3 steering group – which will coordinate the actions of the RIS3 monitoring groups with joint measures such as national and international networking and project cooperation, as well as by participating in the activities of S3 forum and ERRIN smart specialisation working groups (Fig. 9).

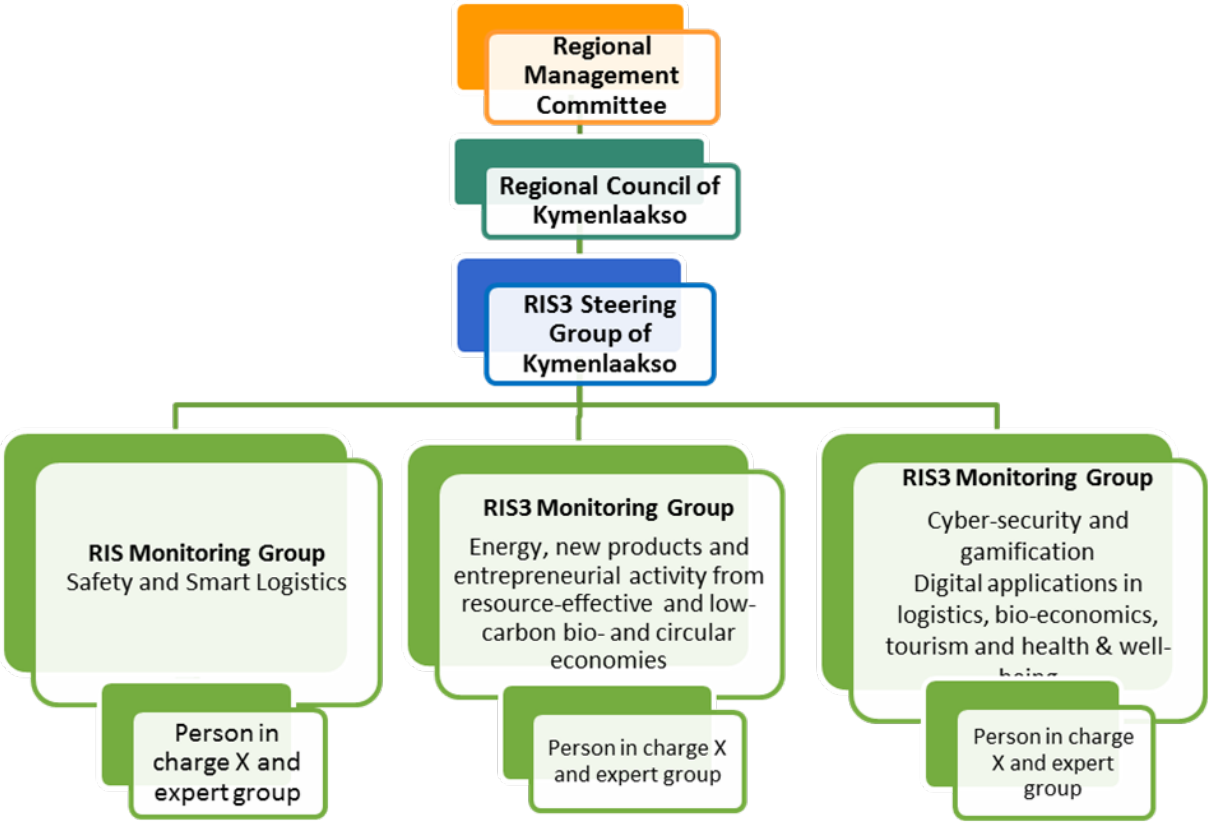

Figure 9. Kymenlaakso's RIS3 strategy implementation organisation

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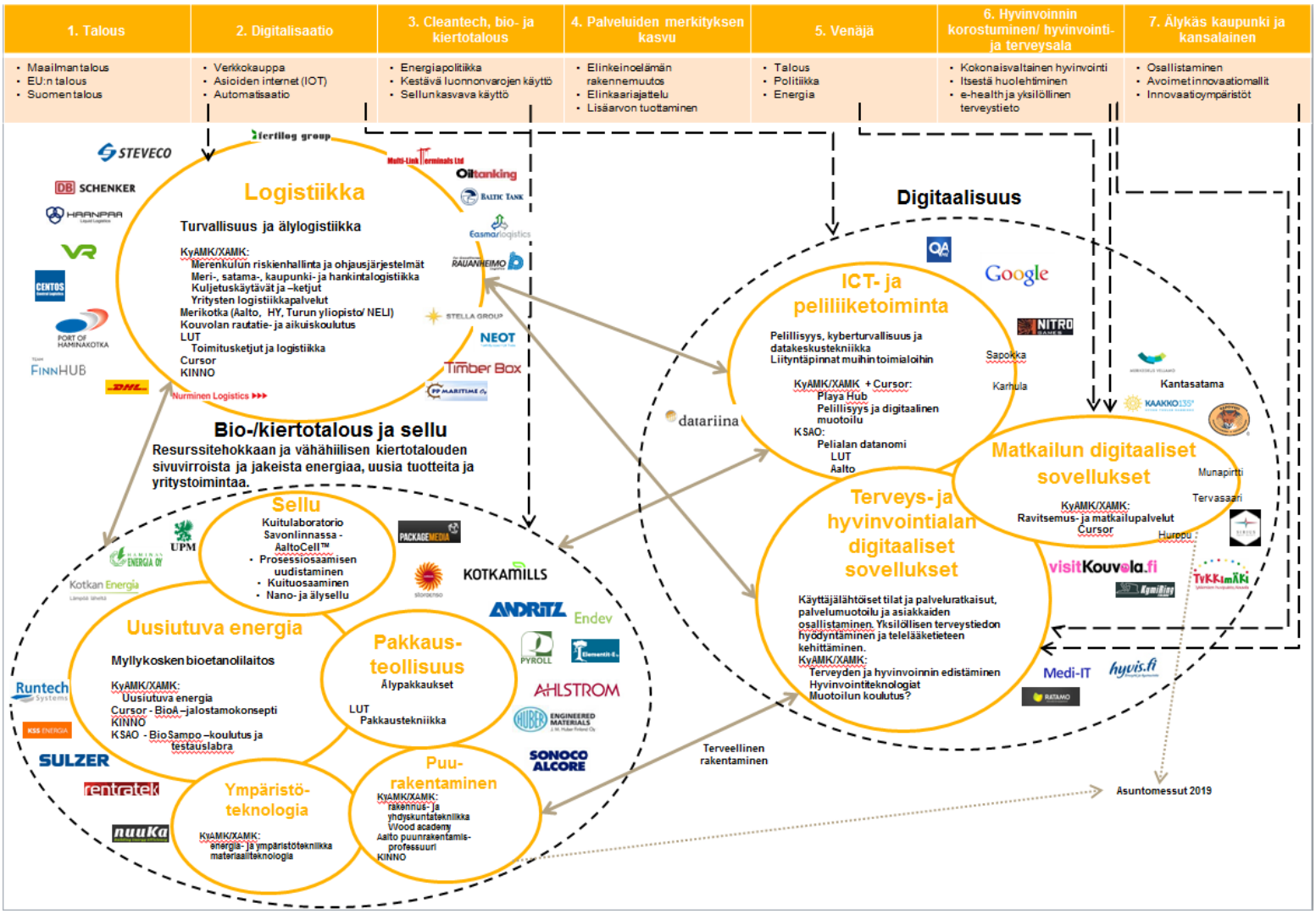
Annex 1: Research and development operations: expenditure on a provincial basis in 2011 and 2012

Province	R&D expenditure 2011		R&D expenditure 2012	
	M EUR	%	M EUR	%
Total	7,163.8	100.0	6,831.9	100.0
Uusimaa	3,102.4	43.3	2,962.2	43.4
Southwest Finland	746.8	10.4	725.5	10.6
Satakunta	109.0	1.5	108.5	1.6
Kanta-Häme	84.5	1.2	85.6	1.3
Pirkanmaa	1,073.5	15.0	932.7	13.7
Päijät-Häme	65.4	0.9	70.1	1.0
Kymenlaakso	26.7	0.4	23.4	0.3
South Karelia	89.1	1.2	112.1	1.6
South Savo	39.4	0.6	42.0	0.6
North Savo	150.1	2.1	156.2	2.3
North Karelia	87.6	1.2	86.4	1.3
Central Finland	211.9	3.0	226.5	3.3
South Ostrobothnia	46.3	0.6	49.8	0.7
Ostrobothnia	195.2	2.7	198.1	2.9
Central Ostrobothnia	22.0	0.3	23.0	0.3
North Ostrobothnia	1,008.6	14.1	931.5	13.6
Kainuu	25.4	0.4	26.3	0.4
Lappi	74.1	1.0	67.1	1.0
Åland	5.7	0.1	5.0	0.1

Annex 2. Kymenlaakso's RIS3 strategy process

EVENT/CONTENT	DATE	PARTICIPANTS
Planning meeting / Content of strategy process	22/04/2015	Kyamk & Capful Oy
Planning meeting / progress of strategy process	18/05/2015	Kyamk & Capful Oy
Steering group's 1st meeting: progress of process	19/05/2015	
Project group's planning meeting / kick-off event	25/05/2015	Kyamk & Capful Oy
Project group's planning meeting / kick-off event	10/06/2015	Kyamk & Capful Oy
Steering group's 1st meeting	10/06/2015	
Kick-off event & workshop / survey of potential growth sectors	16/06/2015	Representatives from various organisations/enterprises in province: 48 people
Workshop materials: work process continued	Summer 2015	Project group
Establishment of consultation groups for continuation of work process	August 2015	Logistics Cellulose / bio-economics ICT Tourism Health & well-being Action-platform thinking
Action-platform thinking: meeting of consultation group	24/08/2015	Kyamk & Ekami & companies
Project group meeting	25/08/2015	Kyamk & Capful Oy & Aalto University
Cellulose / Meeting of bioeconomics consultation group	25/08/2015	KyUAS Cursor KSAO companies
Tourism consultation group meeting	28/08/2015	Kyamk & Cursor & Mamk & companies
Logistics consultation group meeting	28/08/2015	KyUAS & companies
ICT consultation group meeting	02/09/2015	KyUAS & Cursor & companies
Health & well-being consultation group meeting	03/09/2015	KyUAS & Carea & companies

Steering group's 2nd meeting / selection of growth sectors as starting point for key strategy features	04/09/2015	
Crystallisation of key RIS3 strategy features	Autumn 2015	Project & consultation groups
Steering group's 3rd meeting / Selection of key RIS3 strategy features	09/10/2015	
Polishing of key RIS3 strategy features	October-November 2015	Steering group, project group Aalto University
Strategy-based written review	December 2015 – February 2016	KyUAS
Webropol survey / Testing of selected key RIS3 strategy features	January 2016	Questionnaires sent: 243 / Replies: 37 (13 companies)
AIK03 meeting / Kymenlaakso RIS3 strategy presentation	09/02/2016	
MYR meeting / Kymenlaakso RIS3 strategy presentation	10/02/2016	
Steering group	04/03/2016	
MYR meeting / strategy approval	23/03/2016	

Annex 3. System description