REPUBLIKA SLOVENIJA
SLUŽBA VLADE REPUBLIKE SLOVENIJE ZA RAZVOJ
IN EVROPSKO KOHEZIJSKO POLITIKO

Naložba v vašo prihodnost
OPERACIJO DELNO FINANCIRA EVROPSKA UNIJA
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Smart Specialisation Strategy of the Republic of Slovenia

Second draft

UNOFFICIAL COURTESY TRANSLATION

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LIST OF ABBREVIATIONS

AJPES	Agency of the Republic of Slovenia for Public Legal Records and Related Services
SRA	Slovenian Research Agency
GDP	Gross domestic product
VA	Value added
EC	European Commission
ERA	European Research area
ESFRI	European Strategy Forum on Research Infrastructures
FTE	Full time equivalent
EU	European Union
GEM	Global Entrepreneurship Monitor
CCI	Chamber of Commerce and Industry of Slovenia
ICT	Information and communications technology
PRO	Public Research organisations
KET	Key enabling technologies
SME	Small and medium-sized enterprises
OECD	Organisation for Economic Cooperation and Development
CCSB	Chamber of Craft and Small Business
PAU	Priority area of application
RISS	Research and innovation strategy of Slovenia 2011-2020
RDA	Research and development activity
RTDI	Research, technological development and innovation
RDP	Regional development programme
RS	Republic of Slovenia
NACE	Statistical Classification of Economic Activities
SPIRIT	Public Agency of the Republic of Slovenia for the Promotion of Entrepreneurship, Innovation, Development, Investment and Tourism
S3	Smart Specialisation Strategy
SORS	Statistical Office of the Republic of Slovenia
TDI	Foreign direct investments
TRL	Technology readiness level
IMAD	Institute of Macroeconomic Analysis and Development of the Republic of Slovenia
VEM	One-stop shop service
MFF	Multiannual financial framework
WEF	World Economic Forum
WTTC	World Travel & Tourism Council

Introduction

The Smart Specialisation Strategy constitutes a different approach to determining policy of the Member States in research, development and innovation to promote efficient and effective investments of funds in areas that have the greatest value added and contribute most to the objectives of sustainable inclusive growth and development. The need for complementarity at the EU level is the key aspect so as to avoid »specialisation« of too many areas in the same field. On the other hand, specialisation of the states and regions in their clearly defined areas enables the achievement of critical mass, which promotes better performance of economy at the level of individual regions and states as well as at the EU level.

Smart specialisation is a strategy for strengthening the competitiveness of economy, innovation capacity and the diversification of the existing industry as well as the growth of new and booming industries and companies respectively. Smart specialisation is also one of the ex-ante conditionalities to access the Structural Funds in research and development.

The process of the smart specialisation preparation requires a clear identification of the strengths and weaknesses of the state or region, as well as good governance and a common vision of stakeholders. The „process of entrepreneurial discovery" which mainly focuses on the search for new opportunities by joining the most important players from companies, knowledge institutions to the state and the non-governmental sector to act together, is fundamental to identify the niche markets and opportunities.

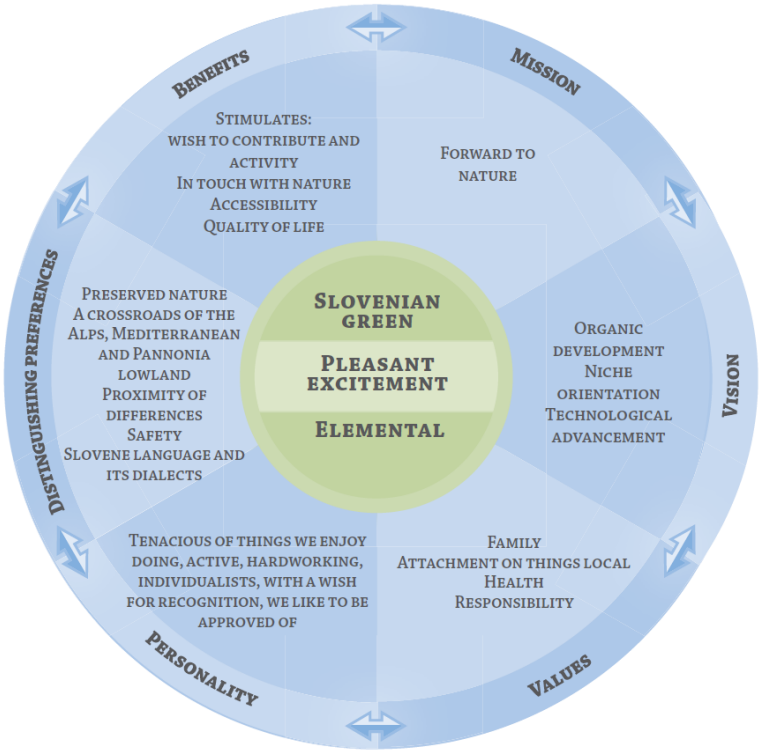
Smart specialisation is a platform for establishing consensus on the focus of development investments in the areas where Slovenia has the critical mass of knowledge, capacities and competences and where there is innovation potential for development recovery of Slovenia. It is a process that is the basis to ensure balanced and development priority-oriented functioning of policies in practice and monitoring of their implementation.

Investments should lead not only in the development of new or technologically more demanding products and services but to development of comprehensive solutions bringing higher value added and/or solutions to address key societal challenges. In parallel with this, the culture of creativity, entrepreneurship and innovation will be strengthened both in society and in the economy.

1. Vision and strategic objectives of the S3

The common denominator of the Slovenes and Slovenia is the "I feel Slovenia" brand which summarises the vision, mission, values, personality, benefits and research advantages of Slovenia (see Figure 1). It summarises the elements that are common to all fields, i.e. the civil sphere, state, economy, tourism, culture and art, science and sports. A combination of all these elements represents the Slovene experience, which makes Slovenia special. This experience has been partly already put into reality and partly it represents common desires concerning the development of Slovenia in the future (The Brand of Slovenia, Brand Book, 2007:7) and therefore also serves as the basis for the S3.

Figure 1: Elements of the Slovenia brand



Source: The Brand of Slovenia, Brand Book, 2007.

In the S3, Slovenia wishes to build on its natural assets, focus on its specifics and support the achieved broader public consensus with regard to the **vision** of the **green Slovenia, which should be**:

Clean and healthy and as such attractive for life and work;
Circular, since it will base its development on the principles of circular economy;
Serene because Slovenia is serene / calm ,
whereas with a shift to the innovative society it is also becoming serene / bright,
making Slovenia inspiring and open,
open to new ideas, talents and for experimentation,
which is enabled and encouraged by our
tolerance and safe environment.

The S3 cannot ensure the attainment of all objectives contained in the Green Slovenia vision; however, it can support stakeholders and processes who can, based on the implementation of the policies, offer their products and services on global markets with additional enthusiasm of the global Slovene image and with more ambition. Innovation has to be ranked at the top of political priorities of the Republic of Slovenia so as to realise this vision.

The strategic objectives of the S3 are therefore:

I. To develop and position Slovenia as an attractive ecological country of innovation, focused on the development of medium- and high-tech and comprehensive solutions in clearly and strategically defined niche areas where Slovenia has capacities and competences to compete on the global market.

II. To establish state of the art, responsive, dynamic, strategically-guided, inclusive and globallly connected research, innovative and entrepreneurial eco-system.

The overview of key strengths, opportunities and threats (SWOT analysis) is based on a more detailed analysis of the situation and policies in Annex I and is as follows:

Strengths	Weaknesses
- Relatively good scientific quality of research and quality research infrastructure; - A high share of investment in research mainly by companies; - Quality of human resources and increase in the number of researchers, especially in the private sector; - Experience gained on the integration of the knowledge triangle at the EU level (the projects of the Framework Programme and participation in the ESFRI initiatives); - A relatively high share of students enrolled in tertiary education and a growing number of students of technical studies; - Export-oriented economy, - Biodiversity, natural resources (wood, soil, water, energy) and other potentials for the transition to green economy (knowledge, innovation, past investments, competences) as well as cultural wealth. - Social awareness on damaging effects of corruption and conflicts of interest.	- Weak interaction between universities and research organisations, non-systematic knowledge transfer and insufficient attention paid to the needs on the market; - A lack of focus of investments and research and innovation activities; - An evaluation system of scientific achievements and non-established business models of mixed ownership of intellectual rights; - A lack of openness to foreign students, researchers and professors; - Weak innovation activities in companies, underexploited potential of knowledge-based capital (patents, brands, models); - Too weak integration of Slovene companies into global value chains, poor international engagement of SMEs and relatively low presence of FDI; - Insufficient capacities of broadband infrastructure and unused ICT potential in education.

Threats	Opportunities
- Delays in structural reforms in the fields such as the remuneration system in knowledge institutions, a reform of the monitoring system of the effects of the R&D incentives; - Excessive diversification of RTDI investments from private and public sources; - Slow strengthening of intangible capital; - Over-dependence of research institutions on public funds, focus on non-market projects and an insufficiently developed platform for the promotion of technology transfer; - Talent flight (especially of the young ones); - Low level of early entrepreneurial activities and the continuation of low survival rates of newly established enterprises; - Further decline in the share of innovation active enterprises in market services; - Digital divide.	- Development of a clear governance structure in the area of RTDI; - Efficient and effective use of research infrastructure and developed knowledge/competences through the synergies within the knowledge triangle; - Adjustment of the supportive environment and instruments to the fields with clear market potential; - Acquisition and strengthening of entrepreneurial knowledge and competences; - Establishment of a supportive environment favourable to the establishment, start-up and growth of companies; - Promotion of internationalisation, cross-border connections and the inflow of foreign investments; - Mobility of students, professors and researchers. - Early introduction and effective implementation of measures focusing on the transition to a sustainable society, effective resource management; - Integration of all social innovations (technological and non-technological) into comprehensive solutions.

The achievement of the two strategic objectives of the S3, taking into consideration the SWOT analysis, requires particular emphasis to be put on the following priority areas over the medium term:

1. Knowledge transfer and application

With the implementation of long-standing measures, Slovenia has achieved a relatively good scientific quality of research and quality research infrastructure. There is a high share of investments in research in companies and established cooperation with knowledge institutions within joint RTDI projects. The data on the use of this knowledge reflect a different picture and for this reason a shift from focusing merely on scientific excellence to socially relevant excellent research and the transfer and use of this knowledge represent the key orientation of the S3. Only thus it will be possible to attain the key objective of the Research and Innovation Strategy of Slovenia (RISS) which is focused on greater prosperity, quality of life and more quality jobs. The creation of a broad range of knowledge is of course important and the Republic of Slovenia will further support it at least to the same extent, however, it will simply not be able to afford it without promoting the innovation wave in the medium term. The emphasis on socially relevant knowledge will bring dynamics to the structure and operation of knowledge institutions, which will provide additional impetus, motivation and perspective to promising researchers and developers to develop their potentials in Slovenia (and on this basis new potentials will be attracted from abroad).

2. Entrepreneurship, creativity and talent

The promotion of creative use of knowledge and entrepreneurship especially among young people remains a major challenge despite the efforts already made. There is a risk of losing human and development potential together with accelerated talent flight (in particular of young people). Entrepreneurship, creativity, development and the promotion of talents are essential for Slovenia to establish itself as a successful, attractive and innovative country of prosperity. In addition to the ecosystem for the establishment, start-up and growth of companies, the S3 will also strongly emphasise entrepreneurship, creativity and development of talents in the education system and the creation of open learning environments. Additional weight will be given to the areas such as design at all levels, the promotion of social innovation and similar which will be used as the basis to attain the objective of the open society of innovation also in the medium to longer term.

3. Internationalisation

For Slovenia being a small country, the openness of the markets of goods, capital, people and ideas is the development platform without which high standard cannot be achieved. At the same time, strategic approach is necessary to avoid globalisation-related risks: this means a shift from the logic of preventing outflow to the creation of new value together with the world, open outwards and inwards. Slovenia has to connect with each other and in particular with the best players in order to establish itself in international value chains and networks based on medium- and high-tech and comprehensive solutions on the niche global markets. Internationalisation requires comprehensive support mechanisms through industrial policy, entrepreneurship and the attraction of foreign investments as well as in generating conditions for creating the networks of knowledge creation, transfer and application and in promoting the mobility of students, teachers in higher education institutions, researchers and other staff in knowledge institutions and within the education system.

This strategy serves as the basis for defining the

Concept of smart specialisation

The S3 comprehensively addresses a broader range of development policies related to innovation, in particular the policy of promoting research and innovation, industrial policy, entrepreneurship as well as some parts of the education system, rural development policy and international relations.

In addition to the use of Structural Funds (for which an approved S3 is necessary for the absorption of these funds, the so called ex-ante conditionality) the S3 also addresses the measures financed from national public funds.

The S3 builds on processes and experience gained so far, and at the same time the analysis of strengths, weaknesses, opportunities and threats clearly indicates the processes where new approaches and measures are needed.

The S3 is structured in *two pillars*:

1. The first one refers to the entrepreneurial and innovation ecosystem which, by its nature, should primarily be horizontal whereas its mission is to generate and promote new ideas to be developed through an entrepreneurial initiative by thus ensuring entrepreneurial growth and development.
2. The second pillar of the S3 refers to value chains and networks where niche products and services are being identified and where critical mass is created for the global breakthrough on the basis of connecting excellent competences and potentials, which engages various stakeholders, disciplines and areas in the global context. Here, concentration is of key importance because scattered potentials in global competition cannot lead to success.

Both pillars are intertwined and complement each other. With the generation of ideas by capable individuals and companies within the first pillar the existing and newly emerging value chains are fed and dynamics is brought through innovation. On the other hand, the dynamics of value chains and networks needs the support of the companies of all types and kinds and this process itself also creates new companies, initiatives, ideas and business opportunities.

Owing to limited critical mass that Slovenia has in individual areas and owing to a clear complementarities between the stakeholders in all areas[1] it is clear that it would not make sense to divide the strategy into regional components. On the contrary, in line with the established international dimension of S3 priorities, the activities for successful specialisation will be conducted complementary to and in cooperation with the neighbouring regions and within macro-regional and inter-regional context. Thus, the potential for global market penetration will strengthen. On the other hand, there are important regional initiatives which will be addressed explicitly within the promotion of entrepreneurship, within the so called regional entrepreneurial programmes, however, in the horizontal pillar of the strategy as the determination of value chains and networks at the level of regions is not in the interests of anyone, least of all in the interests of companies and knowledge institutions from less-favoured areas. In view of the above, and in particular the fact that the allocation of financial resources from the Structural Funds will be defined at the level of the cohesion regions, it means that the potentials which need to be strategically planned, coordinated and developed at the national level will be financed from separate envelopes. Therefore Eastern Slovenia, considered as the less developed region, will receive considerably more financial support.

The S3 does not address only the cities and related areas, but also the innovation potentials of rural areas – the S3 is therefore not only a strategy of urban areas but an innovation strategy of Slovenia as a whole.

From the implementation system perspective it is important to promote experimenting with predictable consequences. A dual approach will be used where in addition to the so called main programmes a possibility of financing pilot projects with clearly defined benchmarks will also be encouraged. In this way, a greater degree of experimentation will be achieved and consequently a higher level of flexibility in managing development policies will be reached in conjunction with a clearer and more transparent transition to more stable financing.

[1] By their nature, all 48 written entrepreneurial initiatives were national and therefore integrated stakeholders throughout Slovenia.

The S3 is based on the model of „open and responsible innovation“ including social innovation. Critical reflection on various aspects and consequences of the processes of increasing (market) competitiveness and market specialisation for individuals and different social groups is a necessary element of the smart specialisation process. The establishment and penetrability of new technologies rest not only on purely economic parameters and circumstances but also on a number of soft factors. Therefore, the S3 places great emphasis on non-technological and social aspects at various levels (of an individual, social groups, organisations…) e.g. in terms of identification, recognition and evaluation of future societal needs, joint co-decision and similar.

The performance of the S3 will be measured:

At the strategic level including the context indicators:

1. Improved innovation performance measured by a Summary Innovation Index from the Innovation Union Scoreboard: the objective is to raise the Index to the average level of five most successful innovation followers (LU, NL, BE, UK, IE, AT), which means from the current 0.51 (EC, 2014) to 0.62 (ibid.) by 2020;
2. A share of employees in knowledge-intensive activities among all employees (EC, 2014: 14.1%);
3. A share of innovation active enterprises. In a three-year period (2008–2010), Slovenia decreased the share of innovation active enterprises to 49.4, which is a percentage point less than in the 2006–2008 period (IMAD, 2014b);
4. R&D expenditure of the business sector (SORS: 1.99% in 2012)
5. Number of researchers and technical staff in the business sector in FTE (SORS, 2012: 4618 and 3895 respectively);
6. Number of green jobs (jobs within the environmental goods and services sector in Slovenia); source SORS.

In respect of the knowledge transfer and use

7. Revenues deriving from the intellectual property rights (licences and patents) from abroad: According to the Commission's figures, 2014, Slovenia increased the volume of these revenues from 0.04% of GDP in 2007 to 0.19% of GDP in 2012, which is still considerably below the EU average of 0.59% of GDP;
8. A share of SMEs which, in the field of innovation, cooperate with other companies and/or PRO: According to the Commission's figures, 2014, this share accounted for 13.6% in 2010, which is higher than the EU average (11.7%), however, by 2020, Slovenia will strive to bring it to the level of the average of the five most successful innovation followers equalling 17.9%.
9. A number of patents by PROs commercialised within one year after a patent has been granted (Source: System for monitoring the funds of the MFF and S3 2014–2020);
10. A number of established spin-out companies per employee in knowledge institutions, the number of employees working in spin-out companies and their generated revenues (Source: System for monitoring the funds of the MFF and S3 2014–2020);
11. Eco-innovation index, source Resource Efficiency Scoreboard (2012; SI = 115, EU-27 = 100).

In respect of entrepreneurship, creativity and talent

12. A share of SMEs which have introduced a product or process innovation: According to the Commission's figures, 2014, this share equalled 32.6% in 2011, which is below the EU average (38.4). Slovenia will strive to bring it at least to the level of the average of the five most successful innovation followers equalling 42.2%.
13. A number of fast-growing companies with regard to their revenues (SORS, 2012: 1039);
14. Total early-stage entrepreneurial activity – TEA-index (IMAD, 2012: 5.4%);
15. Improved assessment of the business environment according to GEM;
16. Improved competences of primary and secondary school pupils for a problem-solving test within the PISA survey (OECD);
17. A share of primary and secondary school pupils and students engaged into projects contributing to knowledge transfer and application (Source: System for monitoring the funds of the MFF and S3 2014–2020);

In respect of internationalisation:

18. A share of high-tech intensive products in the export of goods: According to the data of IMAD, 2014b, this share amounted to 21.5% in 2012, and by 2020 Slovenia will strive to bring it at to the level of the EU-15 average equalling 27.6;
19. A share of the export of knowledge-intensive services in total export: According to the Commission's figures, 2014, this share equalled 21.4% in 2011, and by 2020 Slovenia will strive to halve the gap to the EU average totalling 45.3% - the objective is to raise this share to at least one third;
20. Financial resources for RTDI from foreign business sector (EUR 49.3 million), national sector (EUR 14.3 million) and higher education sector (EUR 15.9 million) according to the data provided by the SORS;
21. A number of foreign owned companies investing in R&D and the volume of their R&D expenditure; SORS. Volume of investments in R&D from 2008 to 2012 increased from EUR 120 million to EUR 161 million;
22. Ability to attract talent – evaluation within the Global Competitiveness Index following the WEF methodology: in 2013/2014 Slovenia was ranked 120th among 148 countries[2]. In this regard, we will also monitor:
    - A share of researchers with foreign citizenship of all researchers (SORS) and
    - A share of foreign students – outside the EU – among the students at the doctoral level (EC, 2014: 6.54% in 2011).

Additionally, specific indicators at a more detailed level will be developed within development partnerships for each of the priority areas including the monitoring at the level of individual (groups) of companies. This includes the indicators such as:

- Value added per employee and profitability of companies;
- Increased export of key product groups of the S3;
- Volume of investments in R&D, the new production facilities and marketing;
- Implemented pilot projects by objective and the indicators of the priority areas;
- Number of the recipients of scholarships in the priority areas;

[2] http://www.weforum.org/issues/competitiveness-0/gci2012-data-platform/

as well as indicators such as:

- Extent of land used for organic farming (hectares of agricultural land; SORS) and
- Scope (increase of) self-sufficiency (source: SORS, Agricultural Institute of Slovenia - Report on the state of agriculture, agri-food sectors, forestry and fisheries).

2. Pillar I: Entrepreneurial – Innovation ecosystem

Effective functioning of the entrepreneurial-innovation ecosystem can be ensured by strictly adhering to the following elements (Kos, 2014):

1) Consistent, related and tailored support in **all phases of the growth** of a company, i.e. from the pre-seed and start-up phase to the growth and maturity phase, and
2) **Comprehensive support services** which should, irrespective of the phase, contain the four key elements, namely:
   - Financial resources (subsidies, equity and debt financing – public and private),
   - Content support (training programmes, mentoring, coaching, training courses),
   - Single promotion of the programmes (including the attraction of talents from Slovenia), transparent public selection of participants of the programmes, monitoring and promotion of those engaged in the programme and thus effective control of the public money used,
   - Adequate infrastructure (space) which is of no particular concern in Slovenia as this aspect has received sufficient attention so far.

Table 1 shows the basic concept and logic of the entrepreneurial-innovation ecosystem in various phases of growth of a company and related support services.

Table 1: Basic concept and logic of the entrepreneurial-innovation ecosystem

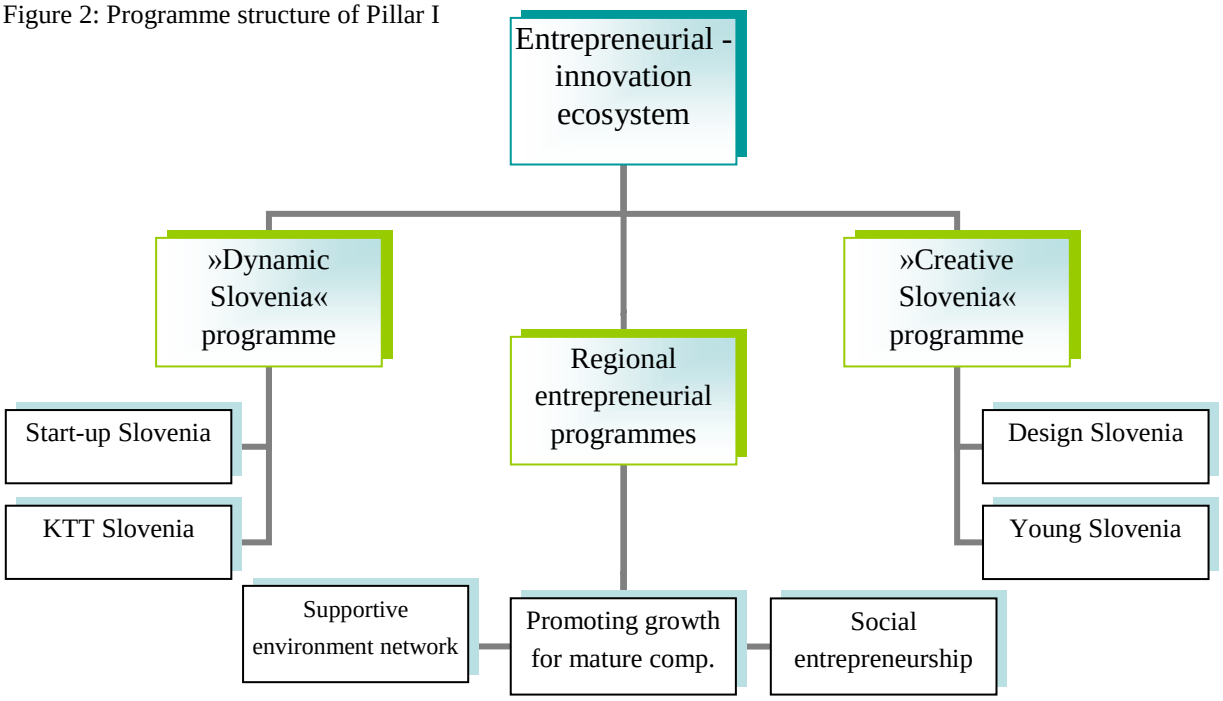
Phase	1. Pre-seed	2. Seed/start-up	3. Growth	4. Maturity
Situation	Promotion of entrepreneurship, a set of ideas, comparison of ideas, business plan, MVP PROBLEM-SOLUTION FIT	Established company, pilot projects, prototype, first customers, MVP PRODUCT-MARKET FIT	(Fast) growth of a company, process of entering foreign markets GROWTH MANAGEMENT	The company is stabilised on the market, growth has finished INNOVATE OR DIE
Business environment	knowledge institution, technology transfer office, Coworking, regional potential	University or entrepreneurial incubators with the programmes of idea accelerators or own premises	Technology parks with the programmes of entrepreneurial accelerators or own premises in conjunction with clusters, platforms, networks etc.	Technology parks or own premises
Public funds	Financing the development of ideas, scholarships for entrepreneurs promotional events, training, mentoring, coaching, special programmes (e.g. Start-up weekends)	Subsidies for the start-up of companies - P2, seed capital (convertible loans) € 50,000, micro loans, links with private investors (being established)	Venture capital companies, seed capital €200.000, guarantees of the S3 with favourable interest rate for bank loans, loans granted by SID bank, financing SRRS, financing by the Eko Fund	Banks, loans provided by SID bank, guarantees of the S3 for bank loans with subsidised interest rate

Investors	Founders, friends, family, naïve people (4F)	4F, business angels (PA), banks	Venture capital funds, banks	Private funds, loan finances, stock exchange, banks
Size of investments	€ 5,000 – € 50,000	€ 50,000€– €1 million	€ 1 million–€ 5 million	€ 3 million–€ 50 million

Source: adapted from Kos, 2014

These are the bases of the structure of Pillar I of the S3: it consists of two national programmes and a regional one which are further divided into sub-programmes. The national programmes are implemented uniformly at the level of the entire country and support globally oriented enterprises with the ambition of fast growth. On the other hand, there is a large part of also innovative companies operating at the regional level that also require tailored supportive environment taking into account the specifics and institutions of a concrete environment.

Figure 2: Programme structure of Pillar I



Source: SVRK

2.1. »Dynamic Slovenia« programme

2.1.1. Start-up Slovenia

In knowledge society, innovation and creativity are the engine of the economy at all levels and in all types of organisations. Due to a high risk associated with the introduction of new products, services or processes, innovation is usually commercialised via isolated formal forms such as start-up companies. Big companies search for knowledge and innovative products in new start-up companies following the principle of open innovation.

Start-up and spin-off companies mainly emerging in the areas where knowledge with high value added is concentrated and where interdisciplinary groups are formed (mainly in knowledge institutions, creative centres etc.), namely where suitable entrepreneurial and creative dynamics has been established, are an important segment of innovative companies.

A start-up company is a newly established enterprise whose purpose it is to develop a new, usually innovative product or service in uncertain circumstances. If a company evolves from the existing company, knowledge institution or any other organisation, it is a *spin-off* or *spin-out* company.

Start-up supportive environment consists mainly of the following entities:

- Technology parks which provide adequate infrastructure in the largest and most developed centres and are directly related to the potential of research and educational establishments and the economy;
- University incubators responsible for the promotion of entrepreneurship in university centres among students, researchers and university staff specialised in transfer of knowledge from university research potential to economy;
- Programme of entrepreneurial accelerators bringing together the offer of seed capital (equity financing in the start-up phase) related to the initiatives such as Start-up Initiative *(Start:up Geek House and Go:Global Slovenia)*. Seed capital provided through the Slovene Enterprise Fund is mainly intended for young technological companies with a growth and job creation potential. The companies will acquire up to EUR 250,000 to support faster market penetration, more intensive development of projects and access to adequate financial resources.
- Venture capital funds and companies also combine the offer of venture capital with the services provided by managers, and connect the function of supportive environment with the function of the provision of adequate financial resources for the companies' growth.

The **objective** of Slovenia in this field by 2020 is to become a regional hub for start-up entrepreneurs, which will be supported by

Main measures of the Start-up Slovenia programme:

Measure	Description
Entrepreneurial hubs, supportive environment at universities and PROs respectively, start-up co-working premises, start-up ecosystem, management and support	Start-up co-working premises intended for ambitious, innovative and entrepreneurial talents with knowledge, high value added designing a new entrepreneurial venture on the global market and located in the supportive environment providing consultancy (e.g. legal, intellectual property etc.)
Promotional workshops and start-up weekends	Organization of educational-motivational events across Slovenia with a view to promote and particularly prepare start-up entrepreneurs for starting up businesses. They get acquainted with the uniform and comprehensive offer of the start-up ecosystem. The concept of putting business ideas into practice over a weekend whereas their activities are focused primarily on creative and innovative ideas.
Establishment of a platform for early testing and financing of projects	Prior to the entry on the market, solutions must be tested, which is impossible in terms of legal and formal aspects before the establishment of a company.
Venture capital	The provision of instruments which will enable domestic and foreign funds / venture capital companies (VCCs) to invest in start-up companies in Slovenia and in local venture capital funds. In addition to capital also the transfer of knowledge between foreign and local and regional funds and companies (i. e. 'smart money').
Angel and seed investments and mass financing in Slovenia	Preparation of instruments which will considerably increase the quantity and quality of investments during the early stages of the start-up companies development. The public part of capital investments can be repaid by entrepreneurs after a certain period at the fixed interest rate determined in advance.
Active attraction of foreign founders of start-up companies and mentors to Slovenia	To attract foreign entrepreneurs to settle in Slovenia and thus increase the recognisability of Slovenia as a regional hub for start-up entrepreneurs Active attraction of foreign entrepreneurs to Slovenia and a single entry point with all information on the advantages of Slovenia for foreign start-up entrepreneurs
Programme for global growth of start-up companies and the support which start-up companies need in foreign support ecosystems	Mentoring and international networking, support to integrate in foreign ecosystems, for example entrepreneurial accelerators or incubators

The performance of the "Start-up Slovenia" programme will among other things be measured by:

- The number of newly established companies,
- The survival rate of start-up companies after three years,
- The number of companies investing in domestic and foreign venture capital funds,
- The number of global companies.

2.1.2. Knowledge and technology transfer (KTT Slovenia)

In accordance with the Resolution on Research and Innovation Strategy of Slovenia 2011-2020, knowledge transfer is defined as one of the strategic missions of PROs. In order to attain this objective, it is necessary to enhance the interaction between the education, science and economy and accelerate the transfer of the results of scientific research to economy via contractual cooperation, the sale and licensing of intellectual property and the establishment of new companies.

Knowledge and commercialisation of novelties from the PRI, centres of excellence and elsewhere offer a tremendous opportunity which Slovenia has failed to seize, but it can exceed this situation by more coordinated and efficient functioning of the supportive environment for technology transfer and other (e.g. start-up) programmes.

Knowledge transfer from the knowledge institutions to commercial utilisation in the economy involves three different sets of activities (see Stres, 2014):

i. Contractual cooperation. There are various forms of cooperation between companies and PROs that are based on cooperation agreements. The results of contractual activities vary depending on the scope and complexity of work and co-activity of the company in the contract implementation: (a) consultancy, (b) contractual research and (c) contractual research cooperation.

ii. Licensing/sales of intellectual property. This includes marketing of the intellectual property to business partners or own spin-off companies based on a licensing contract or the sale of intellectual property.

iii. Creation of spin-off companies where, in order to utilise the knowledge newly generated by the PROs, researchers together with the PRO found a spin-off company on their own or in co-ownership with third parties (spin-out company).

As seen from above, the effectiveness of the implementation of the above activities requires adequate protection and active management of the intellectual property rights.

Within the "Knowledge and technologiy transfer" sub-programme the following main measures are envisaged:

Measure	Description
Creation of a uniform national system of technology and knowledge transfer	A uniform national system of technology transfer is established for all knowledge institutions to support knowledge transfer and the development of adequate highly qualified staff necessary for this activity and thus adequate critical mass of capacities will be created for successful knowledge transfer from ROs to companies and vice versa.
Support to the intellectual property licensing and protection	Integrated support is provided to new inventions: (1) support to the presentation of new inventions; (2) on the basis of the strategy for intellectual property marketing, researchers and research groups are granted support to protect their intellectual property; (3) intellectual property marketing (licensing, establishment of spin-off companies, search for development partners). The support is also provided to prepare non-disclosure agreements (NDA), agreements on the adoption and marketing of technologies and similar.

Support to development and contractual cooperation	The objectives in this field relate to the identification of: (1) commercial partnerships (distribution, transport, franchise, joint ventures, subcontracting); (2) development partnerships (licensing cooperation, joint ventures, cooperation in production, and commercial cooperation with technical assistance); (3) project groups. Mutual thematic and targeted visits with regard to the content to companies and knowledge institutions are organised, (non)technological problems and solutions are identified in order to link up experts in the field of supply and demand.
Promotion of the creation of spin-off companies	The measure covers support activities such as: verification of the intellectual property status, regulation of ownership relationships, development and verification of business models, preparation of business models, regulation of relationships concerning infrastructure, regulation of relationships between the founders and the newly established spin-off company respectively and knowledge institution, support to verify market potential on international markets through the promotion of technologies and searching for partners through international networks, conferences, business events and other marketing channels to look for partnerships and investors and the support in looking for the sources of financing.
Promotion and education concerning the transfer of knowledge and technologies and the importance of the intellectual property system and its entrepreneurial role	The measure includes training courses (in particular for young) researchers, students about entrepreneurship, marketing and intellectual property. Similarly, workshops will be carried out at faculties/departments/laboratories and knowledge institutions. Raising awareness and education of researchers as well as financial institutions (mainly commercial banks and Slovene institutional investors) are organised about a modern system of intellectual property rights and its role. The support is provided to competitions in terms of the selection of the best researcher in the opinion of the economy, the prize of the International Technology Transfer Conference for the most innovative project of a PRO for the economy and similar initiatives.

The performance of the "Knowledge and Technology Transfer" sub-programme will be measured by:

- a number of patents granted with a complete test, and brands and models in knowledge institutions,
- a share of supported patent applications which have led to the commercialisation of a patent in knowledge institutions,
- a share of revenues from the sale of intellectual property and licence agreements in total revenues of a PRO,
- a share of revenues from research-development agreements concluded between a PRO and an economic entity in total revenues of a PRO,
- a number of newly established („spin-out") companies.

2.2. »Creative Slovenia« programme

2.2.1. Young Slovenia

Staff is crucial for a knowledge- and innovation-based society. In relation to the EU average, Slovenia allocates an above-average share of public expenditure on education, but on the demand side there is growing dissatisfaction with the competences of the youth required for work. Despite the knowledge, competences and skills which young people exhibit also in the internationally comparable context, their achievements are comparatively much worse in terms of competences needed for creative problem solving and similar (see for example OECD, 2014a). And these are skills that are crucial not only for employers but for the development in the broader sense of the term. If Slovenia seeks to establish itself as an advanced innovative country, it needs to immediately increase its investments in the youth so that it can be on an equal footing with the best performing innovative EU countries in terms of the volume of expenditure per participant. During the next period it is crucial to pay more attention to the promotion of creativity, innovation and entrepreneurship of young people, the development of talents and of human resources quality in general.

The field of education policy as a whole is not a part of the Smart Specialisation Strategy. However, some key aspects which will be considered as priorities need to be underlined.

Measure	**Description**
Identification of potentials of young people and the development of their competences	Currently, there is no system in the higher education area for identifying talents and identifying/measuring potentials of students. As a result, measurements are not carried out except in the event of granting scholarships for targeted development. In addition to the introduction of the system for developing talents at all levels, also incentives to support innovative projects at different levels of education will be introduced, especially to support groups of students and their mentors who deliver notable results in international environments. Taking part in international competitions, development projects, solving topical „problems“ in economy and non-economy and similar projects will also be supported (e.g. international olympics, competitions etc).
Measures to promote entrepreneurship and creativity at all levels of education	The following activities will be supported to promote entrepreneurship, innovation and creativity, namely not only to promote pilot projects but to introduce systemic solutions to: - transform and supplement study programmes, especially at technical faculties, with contents and subjects that develop competences of students in the field of innovation, creativity and entrepreneurship and transfer knowledge and experience into practice. - ensure open learning environments, train employees at all levels of education to use the strategies, models and approaches which promote innovation, creativity and entrepreneurship. Within the latter, it is for example necessary to address modern methodologies of entrepreneurship taught at the best global universities, e.g. the so called »lean« entrepreneurship. - promote the integration of visiting domestic and foreign

	experts from practice to the pedagogical process; - promote participation of primary and secondary school pupils and students in solving real problems – project work[3]; - accelerate ideas and promote the opportunities for testing them and implement concrete ideas (product, service) during education – e.g. through the provision of new services, testing new ways of providing services, the establishment of centres to promote innovation and creativity (e.g. „students' laboratories" for developing students' ideas and their transfer to practice, the implementation of various workshops, for example focusing on design); - establish a system of „internship".

This only involves horizontal measures whereas the key measures in the field of human resources which will deal with the priority areas of application of the S3 will be presented in Section 3.3.2.1.

The performance of the »Young Slovenia« sub-programme will be measured by:

- a number of study programmes addressing entrepreneurship,
- a number of visiting domestic and foreign experts from practice engaged in pedagogical processes,
- a number of implemented projects (project work),
- a number of schools which have introduced open innovative learning environments,
- a number of practitioners involved in the programmes for the use of strategies, models, methods and approaches that promote innovation, creativity and entrepreneurship,
- a number of young people involved in programmes linking schools with the environment,
- a share of study programmes containing innovative approaches

2.2.2. Design Slovenia

Bringing together creative industries and other companies is an important driver for innovation – in the broadest sense it can be understood as a bridge between creativity and innovation. Similarly to RD, design is a way of directing creativity into commercialisation. During the entrepreneurial discovery it was recognised as extremely important while creative industries also empirically show the unused potential (see Annex III).

It is important to point out that design is an important source of innovation and increased value added also in those economic branches where RD investments are relatively low, for example in furniture or textile industry, and as such it serves as an important tool in restructuring companies and traditional industries.

[3] The examples of the existing instruments are Demola, Creative path to practical knowledge, POPRI POdjetje za PRIhodnost, Entrepreneurial Solutions of Problems Project – With creativity and innovation to entrepreneurship, Knowledge for future etc.

Design supports companies' non-price competitiveness through the differentiation of products or services on the basis of their function, aesthetics, durability, reliability etc. It also makes it easier for companies to build recognisable image, market, strengthen brand loyalty, optimise production processes and thus reduce production costs.

Two packages of measures are envisaged within the "Design Slovenia" sub-programme:

Measure	Description
Promotion of design management	- Promotion of design and awareness-raising of the public (exhibitions, publications, branding…), - Training and consultancy provided to companies and designers, - Training of staff in companies and in the public sector (e.g. competence centre for design management – to expand the model to all companies with the emphasis on the training of managers), - Promotion of the implementation of projects of service design in the public sector.
Bringing together the creative industries and other companies	- Support for first integration of design projects in companies, - Support to bring together creative staff in companies within major projects, which will be implemented within the support provided to the priority areas of application – e.g. within the measure for »Strengthening cooperation in value chains« or for the »Internationalisation of economy« (See Section 5.2.1). - Costs of design are included in the R&D tax incentive.

The performance of the „Design Slovenia" sub-programme will be measured by:

- volume of entrepreneurial investments in design,
- a share of companies which have introduced one or more non-technological innovations,

The activities of the »Creative Slovenia« programme will additionally encourage organisations, young researchers, students, teachers, professors, laboratories, companies and various groups of users:

- to adopt **open innovation** as a constant process which is crucial for creativity being the basis for innovations;
- for companies to get faster to better (high-tech) products which will at the same time reflect a higher level of integration of comprehensive solutions;
- to accelerate the emergence of new industries (also the creative ones) in Slovenia as a response to the problems encountered by the traditional industrial branches on the one hand, and as a result of high potentials of enabling technologies (ICT, management technologies etc.) on the other side with a relatively high critical mass behind (young people, educational and research institutions etc.).

2.3. Regional entrepreneurial programmes

In promoting entrepreneurship at the regional level, the function of supportive (entrepreneurial and innovative) environment is even more pronounced as its basic function is to grant adequate support to entrepreneurs, the existing and future ones) in the phase up to the registration of a company as well as in later phases. Regardless of the horizontal nature of this type of activities, certain specialisation in particular areas which receive greater attention takes place within the institutions forming supportive environment. These areas depend on regional specific characteristics and the experience gained so far by support institutions.

Development potentials and comparative advantages at the regional level, in particular in terms of their importance for growth and job creation, were defined within the regional development planning and partnership dialogue. Thus defined regional priorities represent guidance to focus on the content of the measures presented in the continuation by the institutions of the supportive environment. The development specialisations summarised in Annex II are based on the first draft of regional development programmes and will be complemented after the final versions of the regional development programmes have been aligned in a direct dialogue with the stakeholders at the regional level.

Over the past 15 years, an extensive network of support institutions whose functioning is still not sufficient was set up in Slovenia. The main value added of the **supportive environment network** is the provision of regional coverage with the simultaneous territorial proximity for the target groups. With respect to support services, the supportive environment entities are particularly important in terms of:

- Promotion of entrepreneurship (adjusted according to a target group and the potential of the area),
- Development and management of the entrepreneurial infrastructure,
- Provision of information to entrepreneurs and
- Basic entrepreneurial consultancy.

In this context, the following entities are relevant which will be *optimised* spatially and in terms of the services they provide:

- VEM entry points provide free of charge support services intended for potential entrepreneurs and companies at all stages of development at locations across Slovenia: comprehensive treatment of potential entrepreneurs and companies, e-VEM services (registration, changes of status and deletion of companies), information provision and basic consultancy services, implementation of informative and promotion workshops.
- Entrepreneurial incubators (including technology parks when having this role) deal with all phases of the development of a company. Their target group is innovative teams in the region which build different types of companies, from low- to high-tech ones. The incubators adjust their services in reaction to the potentials of the regions where they operate. Their activities are also supported with schemes such as »Into the world of entrepreneurship with an entrepreneurial spirit« which offers support to a group of younger unemployed persons with higher education. They are provided with professional assistance and additional training necessary to develop entrepreneurial ideas into an operating company.

In addition to the already presented support services of the first set, greater priority will be given to the **promotion of growth of mature companies** having the innovation potential of growth and development (second set of the programme) in the next period. One of the major problems of SMEs which they often struggle with is the development-management transition from a „family“ or „local“ company to a medium-sized or even big company with a fast growth and development potential. Usually, the main problems are (1) poor internal entrepreneurial climate, (2) inadequately designed processes and organisation of operations, (3) inadequate development-research processes for the development of new products, or their neglect, (4) lack of knowledge concerning the global growth potential on the side of the owners and management, (6) lack of financial resources and (6) upturns of the areas that used to provide many short-term opportunities.

Most often, entrepreneurs do not see the new paradigm of globally oriented companies which results in their growth and development stagnation (Kos, 2014). On the one hand, these companies have accumulated a lot of knowledge, successful products and well-established operations and intellectual property respectively whereas on the other hand, their ambition concerning growth is insufficient due to a shortage of knowledge and social capital. This category may also include the companies which could simply increase their value added with the development of new products, services or processes.

Measures intended to activate the existing SMEs with lower growth dynamics outside value chains and networks, are:

Measure	Description
Dissemination of modern methodology of product development	The most dynamic global companies apply the so called »lean« methods of developing new products and services where final customers are included in addition to product development already at the beginning of designing new product. The methodology is considerably more effective than the classical product methodologies. Rapid dissemination of these approaches ensures greater competitiveness of foreign companies whereas Slovene companies significantly lag behind.
Development of internal entrepreneurship in companies	The main condition for a company ready to grow is internal entrepreneurship which is poorly developed in Slovenia as indicated by analyses. For this reason, a part of support of the programme will be intended for the management in order to learn how to generate the internal climate and development culture to foster internal entrepreneurship, as well as for the employees to change their view of the role they have in the company (active contribution to growth and development).
Preparation of a company for international growth	Preparation of companies for international growth will involve consultancy and internal education and training for the preparation of analyses and an international growth plan as well as assistance and consultancy concerning the preparation of adequate documentation, sales materials and the process of getting familiar with culture etc.
Platform for sharing knowledge (open innovation)	An example of good practice of innovation promotion is also the so called »open innovation« platform by means of which companies can exchange their knowledge, experience and technology and connect on the basis of interests. Such concepts are an important trend established in developed entrepreneurial centres being advanced (and considerably more open) forms of technological platforms and clusters.

Working visits to companies	The organisation of working visits to foreign entrepreneurial hubs will be supported. The service will cover the organisation of comprehensive visits (a step further from delegations) which include getting to know potential buyers, subcontractors as well as local environment (legislation, procedures to enter the market etc.).

The third set of regional entrepreneurial programmes is in the area of **social entrepreneurship**. There are fewer employment opportunities in Slovenia and the problem of lost jobs and increasing unemployment cannot only be addresses by promoting growth in the so called classical profit-oriented part of economy. The promotion of socially entrepreneurial activities can be an important additional generator of integration resulting in job creation.

In Slovenia, the development of the sectors of social economy and social entrepreneurship are still well below the EU average. The comparison of a share of those employed in social economy in the EU and in Slovenia shows unutilised development and employment potentials in Slovenia.

Key challenges in the field of socially innovative companies are the following:

- It is hard to obtain financial resources; due to the restrictions on the redistribution of profits or on the employment of vulnerable groups, creditors and investors have concerns believing that these companies pose a higher risk and are less profitable;
- Investors are not informed or are not sufficiently aware;
- Systems to access financial resources are too rigid;
- Lack of recognition or understanding of social entrepreneurship in the society in all target groups;
- No clear ways and uniform methods of measuring social impacts – effects that companies have with their operations, products and services;

Future activities to promote social enterprises will focus on:

- Location, integration and joint information provision of all existing stakeholders active in the field of social innovation in the regions;
- Promotion of already established models of social cohesion or cooperatives;
- Preparation of the legislative and supportive environment for the transfer of the ownership of companies to employees in a form of workers' cooperatives;
- Increasing quality of support services for social innovation by specialising the stakeholders.

The performance of the »Regional entrepreneurial programmes« will be measured by:

- a number of new export-oriented companies,
- a number of socially innovative companies,
- a number of companies engaged in the workshops for growth and development,
- quality of the business and professional infrastructure (going up the GEM scale).

3. Pillar II: Value chains and networks

3.1. Priority areas of application

When defining the priority areas of application of the S3, special emphasis was placed on the preparation of sound empirical basis. The most important of these are the studies by Burger in Kotnik, 2014 and FIDEA, 2014, prepared especially for the needs of the S3 preparation. With both of them, particular attention was devoted to the international dimension of the competitiveness of individual industries and product groups respectively, which until then had been one of the key shortcomings of the S3 preparation. A sectoral analysis was carried out focusing on technological specialisation, the analysis of export comparative advantages, attractiveness of individual areas for foreign investments and a dynamic analysis of performance in terms of productivity growth and export performance. In addition, the structure of individual industries to the level of an individual company was analysed thus obtaining a better insight into the potentials of well-performing companies also within less successful sectors. The second study assessed the unutilised export potential at the level of products, again compared to the best performing EU Member States for each of the product groups. A detailed presentation of the methodology and findings of both studies is given in Annex III, while main conclusions and recommendations are as follows.

The data, irrespective of whether technological or export comparative advantages are used at the level of individual products, or the volume of cooperation between science and economy, suggests stable package of what key economic industries in Slovenia are (the sequence does not reflect the priority):

- Chemical industry
- Pharmacy and medical equipment
- Manufacture of basic metals and fabricated metal products
- Electronic and electrical industry
- ICT
- Mechanical engineering
- Automotive and nautical industry.

According to the data the dynamic parts of some less visible sectors are also of interest:

- Textiles
- Wood and wood-processing industry
- Recycling
- Creative industries
- Logistics
- Construction and construction of houses

Although tourism was not specifically addressed in empirical analyses, it should be added to this second group. According to the data of the WTTC, tourism in Slovenia in 2012 directly generated EUR 1,276 million, which is 3.5% of GDP, whereas total contribution of the travel industry and tourism generated EUR 4,648 million representing 12.8% of GDP – total GDP resulting from tourist consumption in 2012. At the same time, tourism is a very important export activity covering more than 8% of total export in the balance of payments of Slovenia and more than 40% of the export of services. In 2012, inflows generated by the export of

travel (consumption by foreign tourists in Slovenia) equalled EUR 2,005 million, which is 39.4% of total export of services in 2012 and 8.7% of total export of goods and services in 2012. In the period 2005 – 2012, the inflows from the export of travel increased by 38.7%, international arrivals by 35.5% and over-night stays by 23.5%. In other words, Slovenia is a tourist destination and is planning to remain such also in the future. Slovenia should thus promote the establishment of sustainable, responsible and high quality tourism, including natural and cultural heritage-related products. According to SORS[4] about 30% of foreign tourists visit Slovenia due to the well-preserved nature, while 27% of European travellers say that cultural heritage is a key factor in choosing their tourist destination.

Further to identified industries and areas important to Slovenia based on the international benchmarking, another intensive round of entrepreneurial discovery for the S3 preparation was held to determine business opportunities with the greatest potentials. The process is presented in detail in Annex IV, but for illustrative purposes it may be mentioned that more than 1,500 participants were involved in this process.

The assumption was that the priority areas of application need to represent the interlinking of several industries and sectors respectively and should be based on several technological domains. The purpose was to establish in what areas in Slovenia potentials and technologies can be merged to develop profiled and comprehensive solutions to make it easier to integrate into global value chains and networks and thus generate a higher value added. stakeholders needed to demonstrate their ability to sell a service or product to a buyer on global markets. This requires a clear business plan and the existing global competences and competitiveness as well as the attainment of the critical mass in order to successfully fill the defined niche on the global market. Critical mass was understood in terms of the availability of necessary staff, knowledge and capital, sufficient capacity for the product development and marketing (including the research and a clear and closed financial construction), which requires to link up the stakeholders on the market.

In addition to direct consultations, also written initiatives received in the period from April to May 2014, were the key instrument of the entrepreneurial discovery process. On this basis, priority areas of application were defined in such a way that they are not just backed by the analysis, SWOT and other empirical bases, but also and especially by the process of entrepreneurial discovery as well as by the S3 strategic objectives and vision. Figure 3 presents the structure of the priorities of the S3.

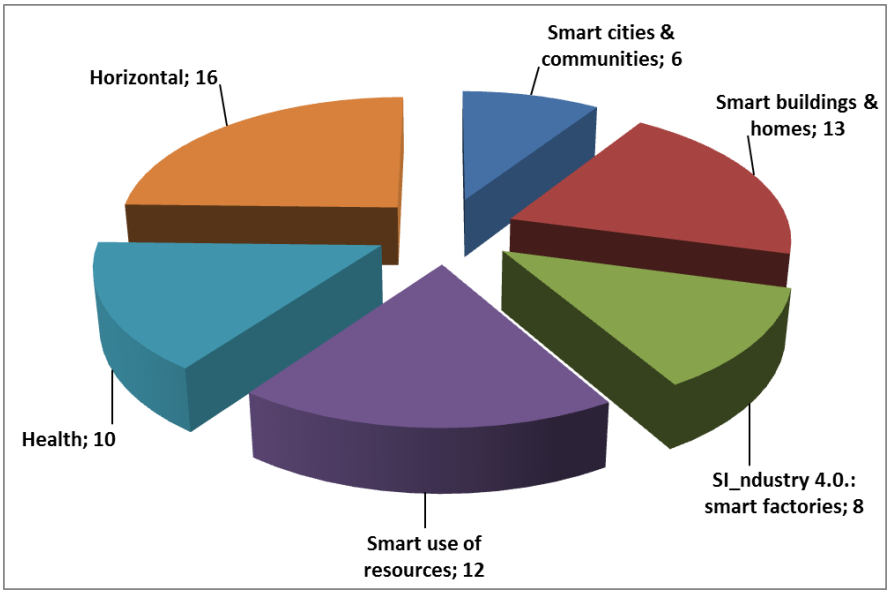
[4] Foreign HOLIDAYMAKERS by month of interview, type of tourist accommodation, type of municipality, country of residence and MOTIVES TO SPEND THEIR HOLIDAY IN SLOVENIA, Slovenia, 2012, http://www.stat.si/tema_ekonomsko_turizem_anketa_2012.asp
http://ec.europa.eu/public_opinion/flash/fl_328_en.pdf

Figure 3: Structure of the priority areas of the S3 within Pillar II

Source: GODC

As can be seen from Figure 4, the written initiatives anchor the selected priority areas of application presented in the continuation in a balanced manner with concrete business opportunities where rather numerous consortiums of stakeholders take place targeting realistic business opportunities on the selected markets, which is crucial to the process of entrepreneurial discovery and to the reliability of the selection of the priority areas .

Figure 4: Structure of written initiatives



Source: GODC

Selected areas however should not in itself constitute exclusive criterion for granting development support to companies, knowledge institutions or other organisations. The support should remain open for newly established connections and business models with global potentials and competences, the instruments to promote horizontal and vertical integration adjusted to different phases of the market development and knowledge.

3.1.1. SI_ndustry 4.0: Smart Factories

Global production is increasingly characterised by custom-designed solutions contained in products and related services requiring extremely flexible organisation. The production processes and products need to match the most demanding technical and environmental standards. One of the key elements in the process, from knowledge production, development to manufacture and marketing, is enabled by the information and communication technologies. It not only supports the integration and optimisation of working processes and machines in individual factories but also the integration and optimisation of the processes of the entire production chains irrespective of the location.

The industry of the future will be customised, adaptable to changes, resource efficient and internally and externally integrated. In Germany, the process of the introduction of these changes and of the adaptations to them has been called Industry 4.0. Using similar terms, the same content has been addressed by other industrially advanced European countries with which Slovenia already enjoys extensive cooperation. The Slovenian industry has to join these value chains rapidly and proactively as a partner, which means that the competences of its chains are to be strengthened and connected in such a way that sufficient critical mass will be attained in the selected areas. In a cooperative manner, more integrated solutions can be offered to the leading companies and Slovenia can be presented as a competent link of the value chain – a development partner who is capable of fast absorption of new technologies and business models owing to the existing global competences.

Strengthened investments, in particular by SMEs, are a necessary condition to upgrade to a higher development, technological and business level, to offer more complex products and services which follow the development requirements and trends of final producers and markets respectively. In business terms, priority SI_ndustry 4.0: Smart Factories requires efficient models of the access to products and services from solution providers, a comprehensive package of development and maintenance of products also through the participation of external stakeholders in relation to open innovation. From the technical and technological perspective, the SI-ndustry 4.0: Smart Factories means the introduction of the systems of remote management, the establishment of virtual technological production systems, introduction of sensor systems enabling remote monitoring and management, modularity of products and solutions and the use of intelligent materials and systems, which reduces maintenance needs.

This priority therefore stems from the need to join the efforts of the Slovenian industry due to external factors, due to transformation of industry markets in the EU and beyond. At the same time, it builds on the existing comparative advantages. Currently, Slovenia clearly displays export comparative advantages in product groups such as “Machinery and mechanical appliances, electrical equipment” (section XVI – see FIDEA, 2014). These are the areas where Slovenia on the average generated EUR 5.7 billion of export annually in the 2011-2013 period. The estimated potential in the event of closing the pricing gap existing when compared to the best performers exceeds additional EUR 5 billion of export per year (ibid.).

Additional development incentives including the active role of the state are necessary as the data already reflect gradual technological falling-behind compared to the leaders (see Burger, Kotnik, 2014). In the NACE industries ranging from C25 to C28[5], Slovenia typically achieves export comparative advantages, especially in the fields of energy, resource and environmental efficiency whereas on the technological side, except in some areas (e.g. metal products), high risks of lagging behind the best performers can already be observed.

Products, services and systems of the SI_ndustry 4.0: Smart factories priority area of application are developed on the cross-section of technologies from the following domains:

- Smart machinery with mechanical engineering, tools and devices,
- Mechatronic systems with electric motors, drives, controls, sensors and robotics,
- Management and organisation technology including ICT and logistics[6].

Development of these areas will be based on the simultaneous development of applied solutions on the basis of »key enabling technologies«, i.e. KETs. Additionally, high-performing network infrastructure of electronic communications (it also applies to other PAUs) will also need to enable high-speed Internet access.

In the above domains, Slovenia has well developed capacities and competences, namely the technologies and developed marketing channels which have already been supported by public development support schemes[7].

Objectives of priority SI_ndustry 4.0: Smart Factories:

- Increased value added per employee via more demanding products and services,
- Higher energy and resouce efficiency in production and
- Increased market shares of Slovenian partners in global value chains.

Even though this priority addresses different industries, in terms of monitoring at the macro level special attention will be paid to the following NACE industries: C25 Manufacture of fabricated metal products, except machinery and equipment, C26 Manufacture of computer, electronic and optical products, C27 Manufacture of electrical equipment and C28 Manufacture of other machinery and equipment. These are the areas where increased investments in development and renewal of production and in marketing are expected, which will be monitored on the basis of the data provided by the AJPES.

[5] C25 Manufacture of fabricated metal products, except machinery and equipment, C26 Manufacture of computer, electronic and optical products, C27 Manufacture of electrical equipment and C28 Manufacture of other machinery and equipment.

[6] To give a flavour, let us list some more concrete areas: management of individual processes, machinery and equipment; planning, management, control and optimising production lines or entire production, management of the plants and control of the product quality, support to logistics processes.

[7] E.g. Toolmakers Cluster of Slovenia TCS, competence centres STV, Class, OpComm, Si.Eva Development Centre, Nela Development Centre for electrical and electronics industry Nela and similar.

3.1.2. Smart buildings and homes

According to analysts[8], the global smart home market is to total approximately USD 71 billion by 2018, which in the medium term since 2013 represents a 200-percent growth (approximately USD 33 million). According to the forecasts of analysts, this market is not expected to be managed by an individual manufacturer or a global supplier, which is an opportunity for niche based marketing strategy.

Slovenian companies operating in the field of buildings and home come from various industries, from the construction business and furnishing and materials to the products manufactured in the wood, textile and metal industries, production of coatings, insulation materials, electro technical protective, installation and other management equipment and similar. Development potencial of this priority, given difficulties and weaknesses of parts of particular, especially traditional, industries, needs to be backed up on a more detailed level in order to be able to identify those areas with clear market potential.

Data show that the manufacturers of houses (product group 9406) when compared to the best-performing EU states achieve competitive prices and export equalling EUR 150 million annually. Similar situation can be observed in the textile industry where Slovenian companies producing artificial and synthetic filaments achieve prices comparable to the most successful countries and annual export amounting to EUR 200 million. This is also confirmed by the OECD data on strengthening export comparative advantages at the level of the three-digit NACE activities, namely for made-up textile articles. At the level of individual companies, these trends are mirrored in the value added corresponding to twice the average value added per employee in Slovenia.

Slovene furniture and furnishing industry has serious problems because of low value added and decreasing export competitiveness. At the same time, the fact that there are some well-performing companies where these trends are reversed should be taken into consideration. With 1,184,526 hectares of forests covering 58.4% of the surface of the country, Slovenia is one of the most forested countries in Europe and wood indisputably is a natural asset that should be utilised. The annual increment in Slovenia is more than 9 million m^3 of wood, renewable raw material. Slovenia is active exporter of wood, but currently it mainly exports various forms of raw wood (in the amount of approximately EUR 400 million per year). The key industry here is the wood-processing industry; in terms of current competitiveness policy support activities focus on promotion of R&D, promotion of forest-wood chains with the objective of enhancing competitiveness, use of wood and wood products, efficient and innovative marketing, new jobs and the growth of added value per employee in forestry and the wood-processing industry. Examples of good practice show that in an adequately arranged value chain the value of a cubic meter (m^3) of wood from forest to a sold finished wood product or a building on the market can increase a hundredfold or even more when wood is used in a high-tech product.

In the field of home equipment and appliances, capacities and potentials are highly concentrated, which also reflects itself in stable export comparative advantages (see for example C27 Manufacture of electrical equipment in Burger, Kotnik, 2014) and some non-utilised technological and market opportunities related for example to ageing of the population and the urbanisation of Europe and other parts of the world. In the case of materials, Slovenia enjoys considerable comparative advantages in export and technological

[8]See e.g .assessments at http://www.juniperresearch.com/shop/products/report/pdf/contents/4504SHE12_TOC3.pdf and at http://venturebeat.com/2014/02/11/study-the-smart-home-industry-will-double-in-size-by-2018-reaching-71b/.

terms – see for example C20 Manufacture of chemicals and chemical products or C24 Manufacture of metals (ibid.). Even though smart buildings and homes address number of industries, the presented data do reflect the critical mass and potential of the Slovenian industry in this field.

This is further reinforced by the extent of clustering and capacity development activieies in this field so far[9] bringing together a considerable number of Slovenian export-oriented companies with more than 30 research departments.

Demand in the future will require superior design and *integrated smart solutions* in accordance with the *forthcoming needs* (such as integrated and holistic energy refurbishment of buildings, connections/interfaces between a smart building and a smart grid) and the re-use of adequate construction waste and renewable and health-friendly materials.

Products, services and systems of the Smart Buildings and Homes priority area of application are developed on cross-section of technologies from the following domains:

- Smart grids in buildings, production management systems for managing energy consumption in buildings, integrated systems of building management and smart home appliances (e.g. white goods),
- Home of the future, meaning solutions for individual target groups for active and healthy life style and comfortable and top quality living.

The development of solutions within the first domain, i.e. smart buildings, includes the systems for ventilation, heating, lighting, insulation and cooling, the systems of control and sustainable management of the exchange of substances and energy products (air, water, electricity, waste water, gas, heat) with the use of smart materials and on the bases of the "Internet of things" concept.

The development of solutions within the second domain, home of the future, targets clearly determined niche groups of buyers (e.g. with high specific requests, mobile families, young people, ageing population, population in a precarious social position and similar) and their requests/needs emerging in the course of rapid development of products (furnishing and appliances) and services as well as applications for the home[10].

[9] Two technological networks function on the cross-sectional domains of smart buildings (TM TPV – for process management, TM ICT – information and communications technologies), competence centres (CC Sure – energy; CC STV – automation; CC Tigr – sustainable construction business; CC OpComm – Internet of Things, CC Class – cloud computing and CC BRIN – healthy life) and centres of excellence in the field of new materials and bio and chemical technology (CE NIN, CE Polimat, CE Namaste, CE NOT, CE Vesolje), development centres of the Slovenian economy (DC MASPOS – transmission systems, DC SI-EVA – automotive industry, three DC in wood industry (INTECH-LES, DC 31 and DA CE KOGO), DC NELA, DC ICT, DC IKTS Žalec, DC ENEM, DC JESENICE, DC SIMIT, DC NMPT, Slovenian Construction Cluster, Technological network STV, ACS (Automotive Cluster of Slovenia), Wood Industry Cluster, Toolmakers Cluster of Slovenia, Technological Network ICT.

[10] Solutions for the home can also refer to the equipment of sailing boats where the same concepts are applied. In this field, Slovenia has significant comparative advantages (see activity C301 Building of ships and boats) being complemented in a broader geographical area (Italy), which was stressed during the Peer Review meeting in Portorož.

Objectives of priority Smart buildings and homes:

- Installation of at least 5 demonstration pilot projects on various user markets with innovative approaches reducing the gap between the planned and actual characteristics of buildings by applying new construction processes, materials and integrated solutions aiming at decreasing the consumption of energy and materials throughout the lifetime of the facility.
- Recovery of the construction industry with a novel way of connecting SMEs, namely through clustering and by systemic and joint provision of engineering solutions in the area of sustainable construction and smart home also having a potential for the emergence of new specialised SMEs. These processes will be encouraged by innovative public procurement.

The areas have high potentials for the emergence of new *niche, highly specialised* micro, small- and medium-size enterprises taking into account that the majority of the existing building stock in Slovenia needs improved energy efficiency and that there are wide possibilities to re-use construction waste. The public sector can play an additional and important role through innovative and green public procurement.

3.1.3. Smart cities and communities

Slovene cities, acting as the employment centres for 94% of all the employed inhabitants, and representing 70% of the living space for the Slovene inhabitants with a post-secondary or higher education, dictate the future economic, social and environmental development. Slovenia will have to tackle a substantial investment cycle in the areas addressed by smart cities and communities. This cycle needs to be used not only for the establishment of services but also as a platform for the innovation breakthrough, therefore the development of new solutions which the stakeholders can market on the global markets. These are mainly investments in transport, energy, health care, safety, public services, creative industries and tourism which are defined in the Operational Programme for the Implementation of the European Cohesion Policy of Slovenia 2014-2020. Only within the cohesion policy, public tenders amounting to approximately EUR 330 million will be implemented in these areas in the next nine years.

In the area related to smart cities and communities Slovenia has already developed considerable competitive competences and capacities offering opportunities to join pilot projects[11]. These will be crucial as, taking into account intense competition, only those will succeed on global markets who can offer integrated solutions tested in practice with integrating standards, regulations and innovative business models, therefore from the initial planning to financial engineering. For this reason, access to new markets[12] will to a great extent depend on the established demonstration projects in Slovenia or with partners abroad.

[11] An important part of Slovene competence centres function in this field (Sure, TIGRigr, OpComm, Class, STV) as well as centres of excellence (NOT, Vesolje; Namaste), development centres of the Slovenian economy (DC Energetika Pomurje, DC transmission systems, DC automotive ind., DC electronics, DC Lower Sava, DC Šaleška, DC Gorenjska, DC Savinjska) and other forms of consortium-like integrations of the RTDI players (Techn. network STV, ACS Cluster, Toolmakers Cluster of Slovenia, Slovenian Construction Cluster), which indicates huge development potential.

[12] Potential value of only the market of platform services will increase in the next medium term from USD 60 billion to USD 160 billion (see www.forrester.com).

The priority area of Smart cities and communities involves product lines of many players, which applies primarily to the manufacture of electric and electronic components and equipment, ICT systems and the components and systems for district heating and the HVAC systems. Annually, Slovenia exports electric machines and equipment in the amount of EUR 3 billion, which could increase by EUR 1.7 billion or 57% if the productivity rose to the level of the leading producers in Europe (calculation based on Fidea, 2014). Exceptional potential can also be identified in product groups linked to the measurement technique and devices (groups 9021 to 9033) where the value of export could increase from the current EUR 300 million per year to EUR 650 million (ibid.). The "Manufacture of communication equipment" industry (C263 according to NACE) also displays technological and export comparative advantages. The situation is similar with "Data processing" and related activities and with web portal functioning (see Burger, Kotnik, 2014).

Products, services and systems of the Smart Cities and Communities priority area of application are developed on cross-section of technologies from the following domains:

- Smart grids including the micro smart grids and local energy self-sufficiency relating to the development of energy efficient systems with the services for the end user, electric components and converters, advanced measurement infrastructure with smart meters, installation and protective techniques;
- Sustainable mobility and accessibility relating to the services and business solutions for public passenger transport, green city logistics, innovative solutions for efficient planning, supply and functioning of transport systems, infrastructure and business models for clean vehicles, eMobility and solutions to reduce the needs for mobility;
- Smart public platform cloud services including the applications for joint data collection, integration and use (crowdsourcing, big and open data) and technological solutions and products in the field of measurement systems and equipment for data capture and use.

The S3 aims to implement at least three pilot (micro smart grid) projects with the demonstration of technologies for the sets of product lines selected in advance on the basis of the following criteria:

- which are closest to commercialisation (TRL 5 and higher),
- have a known customer (the existence of the final buyer),
- where there is the greatest need for investments (smart grids, energy, mobility, public services) and
- where the potential of the entry to foreign markets is substantiated by the business success of the players and related to directly integrated components of integrated solutions and established partnerships with global players.

Demonstration projects in the field of smart communities and cities will require a preparation of an action plan and the elaboration of business models of partnerships which will involve the public sector, municipality, R&D institutions and SMEs. In some cases, demonstration projects can be complemented with other PAU (e.g. in the case of spatial data in the context of the spatial planning, construction of facilities and the management of real estate). The implementation of the vision of smart cities and communities also addresses "soft" objectives linked to the quality of living and working and a high level of the need for social innovation, innovative forms of cooperation in the community, and the development of completely new services for which the need on the markets (in communities) is only being created.

3.1.4. Smart use of resources

Global trends regarding natural resources show a sharp rise in prices accompanied by rather high price volatility of some key raw materials, which is the result of increasing demand as well as higher costs of the exploitation of natural resources due to the increasing difficulty of gaining access to them. The pressures on access to natural resources are further increased by the growth of the global population and in this context mainly the growth of the segment of the middle class consumers.[13]

Consequently, economic systems of linear economies have to transform to circular ones and thus provide the conditions for as long and as quality as possible circulation of raw materials in the system. This requires thorough changes which include the elimination of a concept of waste and the design of products and the longest possible period of circulation of products in use, their cascading use and the provision of materials which are as clean as possible and unpolluted and possible to re-use. To establish such a system, also the innovation at the level of business models and the establishment of adequate systems of the so called reverse logistics are essential. Furthermore, the circular economy has to be based on efficient energy use and the use of renewable energy sources whereas the solutions should be searched for in imitating nature and natural systems. Systemic thinking should support all these efforts.

The transition from linear to circular economy pertains to all sectors of the economy; according to currently available data the greatest potential positive effects can be observed in complex medium-long lifespan products. The potentially interesting product categories are: food (including the circulation of nutrients in agricultural holdings), wood, packaging, textile, electrical and electronic equipment, light vehicles, buildings. At the level of enterprises, the positive effects of the transition to circular economy are shown for example in savings related to the purchase of raw materials and energy, control over the fluctuation of prices and increased reliability of the raw material supply, development of new products and services, establishment of reverse logistics systems, development of new business models.[14] Such a paradigm shift could also contribute significantly to the promotion of innovation, which is also important from the perspective of SMEs, which could thus reduce the risks related to rising prices of raw materials, dependence on imports[15], also the so-called external operating costs of companies could be reduced due to lower costs related to waste disposal, while local resource use could also be strengthened. In addition to environmental protection and efficient use of resources the challenges in agriculture and food self-sufficiency also relate to climate change and risk management.

While numerous products and infrastructure are made of the so called technological materials (technical nutrients), a shift to circular economy also requires the closing of the so called biological material flows (biological nutrients). The use and development of the latter ensure long-term sustainability of their use and balance between the interests of the utilisation of the resources for industrial and dietary purposes. An important role is also played by the cascade use of resources with great development potential hidden in conjunction with renewable natural resources since this enables the maximisation of the utilization of biological materials mainly as the resources for the manufacture of new chemicals and/or materials and nutrients in the agricultural system, as well as the energy source. It is estimated that by 2020, the

[13] http://www.ellenmacarthurfoundation.org/business/reports/ce2012
[14] Analysis of trends and potentials for Slovenia's transition to circular economy, EIR, 2014,
[15] Innovating for sustainable growth: a bioeconomy strategy for Europe, European Commission, 2012

market of this type of products will equal EUR 200 billion[16]. In the period from 2014 to 2030, this field is to create 1 million jobs[17], mainly in rural areas. Furthermore, the use of fossil fuels can be reduced.[18] The development of new chemicals which either replace the existing toxic substances or contribute to a simpler decomposition of individual components at the end of their useful lives is of extreme importance for the transition to the circular economy. The development of adequate chemicals and/or materials is also important to reduce the risks to health of the users of products. The development of green chemicals has been recognised as one of the key development promoters.[19]

The overview of R&D, innovative and economic activities in Slovenia points to a great potential, the concentration of knowledge and industrial applications in this field, in particular in chemical industry, aeronautics, automotive industry, the industry of household appliances, tool industry, wood industry and in the fields of health care, construction business, agriculture, energy and environmental management. The strength and potential of this area is among others demonstrated by the competitiveness of chemical industry which is the leading one in Slovenia with regard to the revealed comparative advantages of finished products, as well as in recycling where revealed comparative advantages are identified with intermediate goods as well as in the competitiveness of the Slovenian tool making (Burger, Kotnik, 2014). It is estimated that at least 70% of the Slovenian export industry is related to chemical industry whereby innovations in this industry have an immediate effect on the partners in the entire chain. The implementation of the model of industrial symbiosis also offers a development opportunity to a number of traditional industries, with paper industry being one of them[20], as well as the wood and textile industries, agriculture, food-processing industry and services (waste biomass, foodstuffs). In recent years, Slovenia has undertaken substantial effort in supporting R&D in the area of sustainable energy-use; there is therefore great potencial for transfer of knowledge in the economy[21].

Experience to date shows that smart use of resources in the transition to the circular economy requires close links between various sectors of the industry, from production to users, and their cooperation, and special attention needs to be placed on the role played in this process by the design of products and/or services and business models. The system builds on the transformation of the existing value chains and the establishment of new ones, the concepts of producing, storing and using energy, the concept of bio-refineries and the utilisation of local biomass (wood, algae, waste food etc.) for the production of various constituents of biochemicals, materials, products, new polymers for new industrial applications and similar. This requires investments in R&D and in particular innovation and the establishment of new value chains or transformation of the existing ones (e.g. by replacing primary resources with secondary ones or by introducing new, more efficient production processes). One of the key elements of the transition to the renewable sources is enabling the testing of new concepts in a

[16] The Future of Industrial Biorefineries, World Economic Forum, 2010
[17] Next generation ethanol and biochemicals: what's in it for Europe?, Bloomberg New Energy Finance, 2010
[18] Strategic Innovation and Research Agenda (SIRA), Biobased Industries Consortium, 2012-2013
[19] Towards green chemicals, the role of Clusters. DG Enterprise and Industry
[20] "Production of paper and paper products« so far has not been mentioned but it shows revealed export comparative advantages and technological gaps (Burger, Kotnik, 2014).
[21] Slovenia has already supported the development of knowledge in the areas related to efficient energy use and new materials as the adequate basis for further work and the development of solutions promoting the transition to the circular economy, in particular with various development instruments such as centres of excellence (Namaste, PoliMaT, NOT), competence centres (Sure) and development centres of the Slovenian economy (DC NELA, DC SIMIT, DC eNeM, DCE, DC ZEL-EN, DC INTECH-LES, DA CE KOGO, DC PREKO and similar).

real environment which will be connecting diffuse sources into a systemically efficient energy use, and all the stakeholders of bio-designed processes into the circular economy.

Smallness of the country, the vicinity of development institutions, buyers and suppliers and strong environmental awareness of the society are competitive advantages of Slovenia in this field. The OECD also pointed out the progress made in this area (see Better policies series: Slovenia 2014, OECD) and it also stressed the necessity to increase the dynamics of investments which will ensure not only the development of skills and competencies but also the integration in global value chains.

Products, services and systems of the Smart Use of Resources priority area of application are developed on the cross-section of technologies from the following domains:

- Development of new materials, products, applications and services supporting smart use of resources in the circular economy (technological and biological materials);
- Development of systems for preventing waste generation, systems for quality recycling (upcycling) and re-use and efficient use of resources including water;
- Development of technologies, components and systems for efficient energy use and for the acquisition of alternative fuels;
- Development and production of components and systems for utilising renewable energy sources (energy conversion, distribution and storage).

Efforts will also be made to achieve the following objectives:

- New, green jobs,
- More companies which will be active in the areas related to smart use of resources in the transition to the circular economy and which use renewable energy sources,
- New companies, value chains based on bio resources,
- Increasing market shares of Slovene partners in global value chains,
- Increased material productivity of Slovenia, reducing CO_2 emissions.

The priority area of application “Smart Use of Resources” is directly linked to the reorganisation of the Slovenian industry within the PAU SIndustry 4.0: Smart Factories and the area of smart grids and decentralised energy systems.

3.1.5. Health

The priority area of application "Health" consists of two sets that complement each other, namely: a) vertical related to medicine in the narrower sense, and b) horizontal related to the quality of life and health in a broader sense, which represents one of the key comparative advantages of Slovenia but which needs to be developed and be actively marketed to generate new value.

In the field of medicine, therefore the first set, the "Manufacture of pharmaceutical raw materials and preparations" is standing out in the structure of economic branches in terms of revealed export as well as technological comparative advantages that are dynamically strengthened (See Burger, Kotnik, 2014). This branch generates 25% of total gross expenditure for R&D and is at the top of the areas where the most intensive cooperation has been established between public research organisations and the private sector (SRA, 2013). Slovenia does not have comparative advantages only in the field of pharmacy, which is an extremely concentrated branch (where two big companies stand out with their role employing 7000 people in Slovenia), but also in the "Manufacture of medical and dental instruments and supplies". This is the area dominated by small companies where value added per employee is considerably lower than in pharmaceutical branch; however, this is a very dynamic area with great potentials. In the manufacture of medical and dental instruments and supplies, Slovene businesses are very active with international integration, e.g. within the 7th EU Framework Programme and in the last four-year period, export and productivity growth per employee can be observed and increased export and technological comparative advantages (Burger, Kotnik, 2014). This shows a great development potential already reflected in developed knowledge institutions based on partnership and cooperation[22]. The fact that this is a promising area is further emphasised by the estimate of non-realised export potential in accordance with which the volume of export of only the segment of optical, measuring, medical or surgical instruments and apparatus (Section 90) could almost triple compared to the current EUR 465 million of the average annual export (FIDEA, 2014).

In the EU, the costs of health care of older people account for almost half of all healthcare costs, which, when taking into consideration the projection of increased life expectancy, means that by 2025 these costs will have almost doubled. Medical and care staff will no longer be able to meet the increasing demand in a fair and efficient manner. These facts are one of the main driving factors for the development of new services in e-health and m-health and the development of related technologies (also for the needs of customers from abroad). According to the data of recently published economic analyses, a 56% global growth of the m-health market is expected in the next five years which will thus become the fastest growing industrial branch of the 21st century. The latter has been confirmed by the guidelines contained in the Action plan 2012-2020 of the European Commission for e-health.[23] The current development of telemedical services is focused on biosensors, data transfer to the central capture and the standardisation of communication protocols. The use of tele-consultations is on the increase.

Slovene players in RTDI have already mastered the technological part of the development via their participation in the projects of the 7th Framework Programme, which enables further development steps for the transfer of already developed technological solutions (in particular

[22] CO CIPKeBIP, CO BIK, CO EnFist, KC BMT, KC BRIN in RC Farma GRS, RC In Medico.
[23] Personalising Health And Care, EC, http://ec.europa.eu/research/participants/portal/desktop/en/opportunities/h2020/calls/h2020-phc-2015-single-stage.html, 2014

of sensors for the capture of bio-parameters) in the environment of the users of telemedicinal services, which is a niche to Slovenian companies.

Products, services and systems priority area of application relating to Medicine are developed on the cross-section of technologies from the following domains:

- Biomedicine and translational medicine where Slovenia has comparative advantages especially in the field of new substances, supply of medicinal products, testing, production technologies, artificial organs and medical devices;
- Smart healthcare (including the services provided at a distance and emergency call) aiming to set up modern and safe environment for residents and visitors.

In the second set, the potentials of the pharmacy and medicine are complemented by the domains related to the ***quality of life*** in the broader sense, which is directly linked to a successful brand of Green Slovenia. The quality of life summarised by the S3 represents a **comparative advantage** which already now actively **attracts knowledge, talents and also companies**, in particular their development departments **from abroad,** and in the future it could attract even more. The quality of life in conjunction with upgraded entrepreneurial and innovative ecosystem will be one ob the brands Slovenia will actively develop and promote in the period until 2025.

Clean water, air, unpolluted surface area of cultivated land as well as bio-diverse ecosystems, which provide numerous ecosystem services for quality and healthy lifestyle are the necessary condition based on which new value is not generated on its own. **New value will be created via a comprehensive strategic approach to the development and promotion of Slovenia** which needs to be based on strengthened and mobilised social capital in the direction of the Slovenian, and S3, vision. The "Health" priority area of application is specific as it requires the "specialisation" and "mobilisation" of masses when it comes to creating the climate, business environment and atmosphere for creation of new value. To implement this policy, a broader intergenerational structure of a major part of the population will be addressed, especially by taking into consideration the potential of social innovation.

These elements are various aspects of otherwise uniform perception of the "quality", vision, on the account of which **Slovenia is to become an attractive place for healthy living, innovative creation, rest and relaxation** as well as for prevention and reconvalescence. According to comprehensive offer involving medicine, spas and wellness centres, Slovenia still has clearly untapped potentials.

There is great potential in the production of high-quality and safe food and farming, namely for the development of new technologies, with the challenge also being related to the development of primary food production in relation to the food-processing industry, logistics and environmental aspects as well as the development of new business models for marketing. In this context, the technologies, which support the production of higher quality food, higher value-added products, including products from fisheries, and the creation of short food supply chains, prove important. Development and specialisation of agriculture, food-processing industry, fisheries and forestry, and the challenges faced by micro, small and medium-sized enterprises in rural areas, require an adequate level of competence in the technological, economic environment and many other areas as well as enhanced ability to obtain and exchange knowledge and information, including the spread of best production practices in agriculture and forestry.

In this priority area of application, Slovenia will tackle the key aspects for the achievement of the above objective, this aspects that are not addressed by other priorities and programmes.

Specific domains of this part of priority area of application are as follows:

- Clean environment which complements the environmental aspects of other PAUs: sustainable projects aiming to preserve and market clean environment, especially water and air, and preserving biodiversity as an important factor of Slovenia's recognisability;

- Top quality (high-quality and safe) food: food security, organic food and self-sufficiency in order to establish short chains of innovative marketing channels or supply chains of food and the support to new technologies and techniques of organic food production and processing;

- Development of innovative products and services and integrated solutions based on efficient integration (networking) of providers and producers (smart networks and value chains) based on local products and services including the promotion (particularly ecological, spa and cultural) tourism and strengthening of social capital for the activation of Slovenia.

The complementarity of various aspects of the attractiveness and quality of life in the function of economic development, i.e. from infrastructural, staff, spatial, structural, institutional and marketing elements, is presented in Section 3.3.2.2 Recognisability and attractiveness of SI economy and business environment.

The Health priority area of application will be supported by a mixture of several financial instruments, national ones and the funds of the EU Structural Funds and the Rural Development Programme. The latter contains relevant Community led local development measures as well as within the Cooperation measure, e.g. with regard to the development of short supply chains and local markets and promotional activities at the local level linked to the development of short supply chains and local markets, as well as the measure Knowledge Transfer and Organic Farming. Study circles which are implemented in the framework of the ESF are also relevant in this regard.

In the context of national measures, the measure of promoting locally grown and processed food is of great relevance as it aims to raise consumer awareness about the benefits of locally grown food consumption. To this end and in addition to budgetary resources we will establish within the next few years a system of collecting voluntary contributions from food growers and processors to promote locally grown food and products which are included in the new quality scheme "selected quality".

3.2. International complementarity of priorities

Within macro-regional connections

Slovenia is at the crossroads of macro-regional strategies of the EU – the EU Strategy for the Adriatic and Ionian Region - EUSAIR, EU Strategy for the Danube Region- EUSDR and the EU Strategy for the Alpine Region - EUSAR.

Within the EU macro-regional strategies, the following areas are priority for Slovenia:

- Research, technological development and innovation in accordance with the priority areas of application of the Smart Specialisation strategy;
- Water management, environmental risks and biodiversity preservation;
- Environmental protection and the promotion of efficient use of resources;
- Improved mobility and multimodality – road, railway and air connections.

Particular attention will be devoted mainly to:

- Joint development and use of research infrastructure,
- Joint RTDI projects in the field of macroregional strategies and within a single European Research Area (ERA),
- Strengthened joint participation in the EU major strategic projects,
- Clustering at the macroregional level through the achieved critical mass in key areas,
- Promotion of international mobility of researchers and developers.

The concrete examples of good practice under way show that they are not only about principle policies. The examples in research infrastructure are AIDA (Advanced European Infrastructure for Detectors at Accelerators), SPRIT (Support of public and industrial research using ion beam technology), Bio-NMR (Biological NMR infrastructures), EVA (European Virus Archive), C-ERIC and similar projects, which are as a rule identified under the national strategy Research infrastructure development plan.

Within macroeconomic cooperation, Slovenia will strengthen integration of partnerships in tourism with, for example, the implementation of specialised product stock exchanges in Slovenia concerning individual areas of the existing and future macro-regions.

Within cross-border connections

Links with the neighbouring regions and the complementary development of capacities are necessary for Slovenia considering its small size – see e.g. OECD, 2014b. The existing programmes of cross-border cooperation have already encouraged the cooperation in research, development and innovation which means that foundations to build on already exist. Within the cross-border programme between Slovenia and Italy in the period 2007–2013, the CITIUS Project was supported which importantly contributed to the development of the Centre for Microscopy and Spectroscopy at the University of Nova Gorica, namely in close cooperation with Sincrotron in Trieste due to which the entire area is more competitive and attractive at the European level.

Irrespective of the above, there are still significant potentials for the cooperation in RTDI and will be addressed in more detail within the partnership cooperation with the neighbouring countries and regions in the preparation of cross-border programmes for the period 2014–2020 and in the preparation and implementation of smart specialisation strategies. Preliminary assessment of potentials shows the complementarities that merit particular focus in this process.

In the Region of Friuli-Venezia Giulia, there are seven industrial areas[24] specialised in the manufacture of furniture, knives, foodstuffs, digital technologies, the production of chairs, coffee and thermo-electrical components. The branches that are only being asserted are in particular a) domestic automation, b) biotechnology and health, c) agrifood and d) ICT. The last four areas in particular show considerable potential for mutual cooperation and complementarity, which needs to be considered and analysed with the next steps of strategic planning of cross-border programmes and the S3 implementation. Friuli-Venezia Giulia is also strong in nautics, which is complemented by the C301 area "Building of ships and boats" where Slovenia is also extremely strong in terms of technology and export (see Burger, Kotnik, 2014).

Some concrete projects of cooperation such as in the field of advanced (bio)polymeric materials and technologies, the characterisation and development of innovative solar cells, the production of protein anti-bodies for the purposes of diagnosing and the development of drugs in oncology research and similar have proven to be very promising.

In Austrian neighbouring regions of Carinthia, Styria and the Province of Burgenland there are 12 clusters, namely:

a) In Styria, clusters function in automotive industry, design, energy and environment, food, human resources, logistics, materials and wood and furniture respectively.
b) In Carinthia, there are clusters in ICT and mechatronics.
c) In the Province of Burgenland, there are clusters in ICT and plastics.

On the basis of the defined priority areas of application, cooperation is in particular interesting in automotive industry, design, energy and environment, food, materials, wood and furniture, ICT and mechatronics. Great potentials are also in close cooperation between two strong universities in natural science and technique – the University of Maribor and the Technical University of Graz – who perform complementary research in many areas. The integration of potentials in the field of polymers is already in preparation on the Maribor–Graz axis regarding education, innovative activities and the transfer of knowledge to industry. This will also result in job creation.

50 clusters have been established on the Croatian side. Some of these are relatively small. The areas where Croatia spends most for RD are more interesting – these are the fields of mechatronics, life sciences, biomedicine and health and biotechnology; however, ICT, telecommunications, agriculture, chemistry and healthcare are also important (taken from the presentation of RH delivered at the Peer Review event in Portorož, 15 May 2014). In the process of its smart specialisation preparation, Croatia also specified the priority areas of its

[24] When defining international complementarity, the experience of Slovenia gained through the participation of the SPIRIT Agency in the Clustrat Project is crucial as important information on development activities in Central Europe was obtained.

further activities, namely: a) health, b) sustainable energy and environment, c) mechanics and d) biotechnology and biochemistry. The overview of the priority areas and primarily the Croatian horizontal priorities and their comparison with the Slovenian priority areas of application show that in further steps concerning the cooperation and complementarity particular attention should be paid to the following areas: spa, green and gastro tourism, advanced production technologies and industrial biotechnology.

3.3. Pillar II policy-mix

Effective implementation of measures within pillar II requires coordinated application of RTDI funding instruments, namely those which are part of stable (horizontal) funding under the national budget, as well as measures which receive structural funds support and funding under other national and international financial instruments.

The basic measures are mainly financed through the Slovenian Research Agency, which provides the core funding for the national research potential. The key purpose of the funding is to develop scientific excellence within a broad field of research (funding all scientific disciplines with the objective of ensuring a sufficient corpus of internationally comparable knowledge and the provision of nationally significant research, especially in the field of humanities and social sciences). The Slovenian Research Agency thus provides stable funding of research organisations, fundamental research in all fields as well as ensuring the functioning of infrastructure centres. Focus is also placed on funding the development of scientific personnel, which ensures the development of new promising fields and fields that do not demonstrate a direct and immediate economic impact.

This category also includes funding of research in the context of establishing the European Research Area (especially the ERA-net projects), the objective of which is, according to the national research policy (which may be broader than the priority areas of the Smart Specialisation Strategy), integration/convergence of national research programmes in various thematic or horizontal fields.

On the other hand, in order to support the priority areas of application, a comprehensive package of measures which are to be coordinated and should complement each other needs to be provided. This package must:

- follow various phases of the development of a product, service, technology and process;
- address different types of projects depending on the size;
- take into consideration the type and specificity of stakeholders to which it refers (e.g. the size of a company);
- address demand and supply.

A package of measures deals with individual domains of development policies whereby:

i. The measures in the fields of RTDI are focused exclusively on the S3 and support all priority areas of application at the same time;

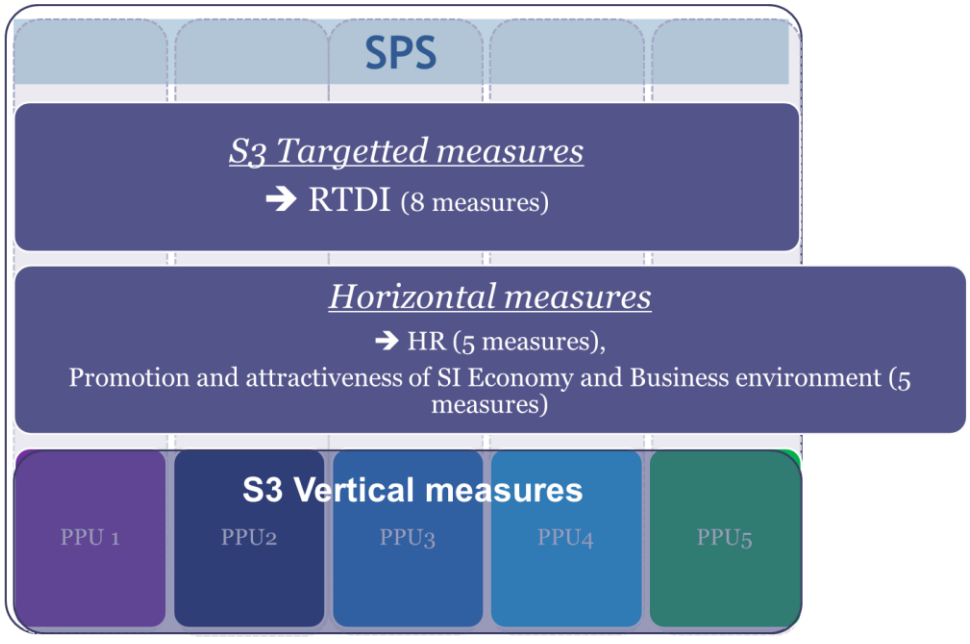
ii. The RTDI measures are complemented by horizontal measures in the fields of human resources, the promotion and attractiveness of the SI economy and business environment. These are horizontal measures offering support to all priority areas of application while also potentially addressing areas outside the S3. The establishment of competence centres can also be adequate outside the S3, e.g. in paper industry. The same applies to international mobility of higher education teachers. Such mobility is important for a quality study process in the fields relevant to the S3 but at the same time this measure cannot be limited and is not reasonable to be limited exclusively to the S3 priority areas of application. This differentiation is also reflected in thematic objectives and funds from which the horizontal measures will be financed.

iii. The third set contains vertical measures specific to each of the priority areas of application.

The first pillar emphasises, in particular, new companies and micro and small enterprises and to a certain extent also medium-sized companies, whereas the second pillar focuses on value chains and networks thus stressing all types of companies. This, of course, does not imply that the companies should receive the same support, but it means that to be successful within value chains and networks, coordinated efforts of big and small players on the market is necessary. It should nevertheless be noted that the presented package of instruments primarily aims to boost growth (also and in particular) of medium-sized companies which, where appropriate supportive environment is granted, can become global players, which will be crucial for Slovenia.

The concept of a package of measures is presented in Figure 5.

Figure 5: Concept of a package of measures



3.3.1. Focused RTDI measures in the S3

Measures for RTDI are structures according to:

- target size of projects,
- level of technological readiness (TRL) and the vicinity of the market respectively,
- project initiator (science, economy …) and according to
- type of support: research / infrastructure / human resources.

Levels of co-financing and a form of support, i.e. the structure of grants and refundable funds, whereby the stress will mainly be on the latter, especially with major projects, will depend on these characteristics. The key measures are "Strengthening cooperation within value chains" and "Company support scheme for internationalisation", which are followed by other focused measures addressing the specific relevant aspects for which public support is justified.

1. ***Strengthening cooperation within value chains*** *(major, consortium RTDI projects; ~TRL4-9)*

This is the key and financially most demanding measure to support the priority areas of application of the S3. It will promote the preparation and implementation of joint research-innovation projects of economic entities and knowledge institutions aiming to link knowledge and competences for the development of new products, services and processes and the use of new technologies in the priority areas of application. The activities will be focused on the technological development and end products / services with a demonstrated market potential at the international level. The purpose of the cooperation promotion is the development of new products with high value added and greater competitiveness of (economic) partners in value chains.

Support will be provided to bigger, ambitiously designed projects connecting players demonstrating clearly defined priorities and objectives focused not only on the end product / service on the market, but also on a long-term common vision and strong international involvement. The projects will be designed to disseminate the development potential to both cohesion regions, with the complementary development of potentials in the Eastern cohesion region, including the research infrastructure, being crucial for building capacities.

The measure will support joint projects (with the expected duration of 5 years and more and the mid-term evaluation) of consortiums demonstrating market potential in global networks and value chains, the concentration of knowledge and competences, scientific and technological excellence, commitment and the capacity to invest in all phases of developing knowledge to the market and sustainability of projects (also after the period of cofinancing). The projects will also need to contribute to strengthening of the material and energy efficiency and to the circular economy. In terms of instruments, the possibility of the use of more innovative forms of support such as public-private partnership will be explored.

The measure will support the phases of development, indicatively at the TRL 4-9 level including pilot and demonstration presentations of new solutions. It will help complement various sources of funds and this is also important in terms of attracting foreign direct investments and fostering links with foreign partners in the fields of research and development.

2. Company support scheme for internationalisation (~TRL9+)

Groups of interest related companies (e.g. consortiums) will be supported as well as individual companies or institutes to link to global centres of knowledge (technologies) and innovations, which will provide the access to top expertise, experts and engineers, to complementary technologies, and in particular the access to new markets and market links. Projects such as the technological bridge to promote demo and pilot projects for innovation, the development of strategic partnerships and joint investments will be supported.

The support (financial and in a form of support services) will be provided based on the "one-stop shop" principle and will ensure comprehensive assistance to internationalisation in the priority areas of application, namely from the necessary RTDI activities, including technological investments to consultations, support for participation in fairs, provision of information on the markets, the implementation of market surveys and acquisition of local agents on new markets, hedging and similar. The form of support will depend on the nature of the project, level of risk and expected returns and can either be a grant or returnable funds or a combination of both. To the greatest possible extent, a mixture of various financial instruments will be encouraged. Internationalisation will be supported by economic diplomacy where necessary and justified.

3. Applied projects' scheme (smaller projects from science ➔ economy; ~TRL4)

The support will be provided to pervasive R&Dt projects demonstrating a potential for the transfer of results to economy with the aim of creating new innovative, technological and entrepreneurial solutions. The pilot phase will support a small number of projects for a period of 1 to 2 years upgrading applied projects which are co-financed by the Slovenian Research Agency (SRA). This pilot measure is a shift from co-financing research projects from the national funds (basic research) to the funding from the Structural Funds.

These will be smaller projects selected annually by the SRA as the best completed applied projects. Further cofunding of the projects in the priority areas of application and with demonstrated potential for innovation / technological breakthrough in the future will directly support a transition from the phase of research to the pre-commercial phase, on the path to commercialisation (indicatively TRL 4). In the interest of commercialization, also the preparations for the establishment of a company will be promoted, and this includes the support to the assessment of the technological and commercial feasibility (an analysis of the potential market), the protection of intellectual property rights and the preparation of business models.

4. Research-innovation voucher (smaller projects from economy ➔ science; ~TRL6-9)

The measure is intended to strengthen cooperation between the economy and the research sphere in addressing concrete, short-term challenges. It focuses on the incentives for small and medium-sized enterprises which, in order to carry out their own research and technological development, need the support / assistance of research organisations. The measure is complementary to the SME instrument within the Horizon 2020 and will be implemented in a coordinated way with the measure supporting contractual cooperation within the »KTT Slovenia« sub-programme (Section 2.1.2).

The research-innovation voucher will support cofinancing of research necessary for greater competitiveness of the economy. Companies will obtain the missing expertise for more comprehensive and faster development by hiring research organisations. Such cooperation between the companies and research organisations aims at stronger integration of scientific

research in companies, matching scientific work with the needs of the economy and additional investments in research activities. The voucher will also support the transfer of innovation to its utilisation in the economy and its commercialisation, which means the development of value chains, solving problems in industry related to the introduction of new technologies, support to the implementation of control and checking compliance of raw materials, materials and processes, support to the procedures necessary for accreditation, standardisation of new products/technologies and similar.

These are smaller projects demonstrating market potential and a possibility of fast transfer of knowledge to finished products and services.

5. Scientific excellence in the international context *(global science ➔ SI science)*

The measure is intended to integrate Slovene partners in international networks of excellence, namely through complementary provision of infrastructural conditions, the promotion of research and the attraction of top experts from the priority areas of smart specialisation to Slovenia. Instruments for financing excellent researchers will be formed in order for them to follow promising pioneering researches with a high risk level. The instruments will complement transnational highly competitive tenders (e.g. tenders by the European Research Council) where researchers were evaluated well were not selected to be financed. The instrument will focus on attracting the most successful researchers to Slovenia (regardless of their country of origin) with emphasis being put on establishing a link with the S3 priority areas (from the view-point of relation to the already-established research infrastructure as well as the sources of funding of research work).

The support will be provided to the activities for the establishment of the European research Area (ERA), the Union of Innovations, the Horizon 2020 and other partnerships whereby synergies of carious sources of financing will be achieved. Especially the integration of the Horizon 2020 instruments will generate adequate involvement in the EU research area and consequently the synergy effects between the EU and the structural funds. Particular attention will be paid to the instruments for spreading cooperation in the Horizon 2020 (e.g. teaming) where consortiums within the S3 priority areas which will be successful in public tender of directorates general of the European Commission will be supported.

6. Companies and knowledge institutions in international environment *(global economy ➔ SI companies and knowledge institutions)*

The measure aims to link the European and international instruments with the structural funds in the areas which the Smart Specialisation strategy defines as the priority ones. The objective of this cooperation is to attract foreign interested industry to cooperate with Slovene partners, i.e. research and academic institutions and companies.

This measure will support RTDI projects of international consortiums and partnerships within initiatives and programmes such as EIT - European Institute of Innovation, Articles 185 and 187 of the PDEU, ERA-net, Eureka, ESA and other public-private partnerships.

This will bring on board stakeholders in the knowledge triangle (university education – research – economy) where a number of activities are intertwined throughout the innovation process. Support will also be provided to the projects which (1) will successfully take part in consortiums at the international level and within the EU instruments, (2) will be in accordance with the S3 and (3) where the state will recognise their excellence and value added.

7. Research infrastructure

The development of research infrastructure in line with the ESFRI plan and the national document Plan of the Development of Research Infrastructure means the establishment of the main centres or partner facilities enabling functional integration of the Slovenian infrastructure in international infrastructure. Such integration can only be financed with the resources from the Structural Funds in the priority areas of application of the S3. The integration of the economy to use this research infrastructure will be an important aspect in its development as this will encourage more rapid economic growth and direct links with research organisations.

8. Developers, young researchers and engineering staff

The projects supported within the measures 1 »Strengthening the cooperation in value chains«, 2 »Encouraging companies to penetrate foreign markets«, 6 »Research-innovation voucher« and 6 »Involvement of companies and knowledge institutions in international environment« mean concretisation of smart specialisation in the interest of economy and in accordance with the comparative advantages of Slovenia. Support provided to strengthen the development capacities of the participating institutions based on concrete, selected and verified projects will be an additional impetus to the efforts in these areas Specifically, it is to attract (in particular young) researchers, also from abroad, to the selected areas, the flow of researchers between various sectors (including the option to move to economy for a certain period of time and partial employment, and flow from the economy to knowledge institutions). Thus, this measure will additionally contribute to strengthen the research and development potential of knowledge institutions and innovation-oriented economic entities in the priority area of application.

3.3.2. Horizontal measures

3.3.2.1. Human resources

For the enforcement of smart specialisation **the following challenges are crucial in the field of human resources**:

1. the provision of enough professionally qualified staff responding to the needs of economy;
2. contribution to increase value added by promoting the establishment of new organisational and business models in working with human resources in companies;
3. awareness-raising and integration of social partners with a view to identifying their role in supporting these processes.

This should duly take into account the active population ageing and the need to adjust working processes to older labour force and the reconciliation of professional and family life. In the 2007–13 financial perspective, some mechanisms / projects were developed and implemented (e.g. competence centres, regional scholarship schemes, cofinancing of the projects of project partners and similar) which are to be continued and upgraded, in quantitative and qualitative terms. In this context, there is a need for new approaches, mainly to provide the services of lifelong career guidance for the employees (especially for those with no education, the elderly and those involved in the process of restructuring or dismissal) and to provide adequate forms / contents of training for these target groups of the employees.

The horizontal measures of the S3 **in the field of employment policy** will aim to:

- provide qualified labour force in line with the needs of the economy with the emphasis on the priority areas of application of smart specialisation,
- introduce new organisational and business forms in human resources management,
- achieve a greater impact and synergy of social partners in smart specialisation,
- adapt working processes to ageing labour force,
- better balance the professional and family life and provide safe and healthy working environment.

Among the measures of horizontal nature which will pay special attention to the priority areas of application of the S3 the following ones should be exposed:

1. *Competence centres for HR development:*

- Identification of the competences necessary for individual priority areas of application of the S3;
- Preparation and implementation of training programmes, including the strengthening of engineering staff, to acquire the necessary new competences;
- Networking of companies in individual priority areas of application and the transfer of knowledge and good experience in human resources management, the promotion of innovation, internationalisation and design thinking (renewal of business models).

The activities carried out in competence centres for staff development will be implemented complementary to the activities performed by the foundations for the improvement of employability. These aim at eliminating structural imbalances on the regional or branch labour market in close cooperation of social partners in the programme councils of the foundations (the Labour Market Regulation Act is the basis) by providing the services of lifelong career orientation and the programmes of education and training for the employees especially those involved in the process of restructuring or dismissal.

The renewal of business models will also promote the introduction of more flexible and family-friendly workplaces through projects such as „family-friendly company" which contribute to better productivity and enhances the potential for female part of the population via the reconciliation of professional and family life.

2. *Scholarships:*

- Cofinancing regional scholarship schemes supporting the schooling of scarce human resources to bridge shortfalls in staff especially in small and medium-sized companies;
- Granting scholarships for shortage and specialised occupations in line with the scholarship policies, regulations and schemes (the cooperation of social partners is in preparation).

The scholarship policy within both schemes will support the priority areas of application.

3. Support to the projects of social partners

Social partners (can) have an important role in motivating the employees to acquire new skills and competences, introduce novelties in human resources management in companies, adapt companies to older labour force, emphasise the importance of occupational safety, reduce absenteeism and similar. This kind of consensus between social partners or going „hand in hand" is in particular important for the priority areas of application and for this reason; Slovenia will strongly encourage such activities.

In addition to the measures presented in section 2.2.1 "Young Slovenia", the measures in the field of the **education policy** will aim to eliminate the shortage of qualified, especially technical and engineering staff in the priority areas of application. This will contribute to:

- extend the scope of training in the priority areas from secondary school on;
- take into account the development needs of economy in developing the content of programmes including the strengthening of interdisciplinarity in education, connecting various sciences and programmes and developing entrepreneurial education centres.

In relation to the objective of internationalisation, the promotion of international mobility of researchers, higher education teachers and students in the priority areas of application will be stressed. The internationalisation of higher education including the education of highly educated experts, researchers and managers in the international open environment is the main condition for the internationalisation of other sectors. In doing so, priority will be given to the measures such as the promotion of mobility of Slovene students and higher education teachers and colleagues abroad and of the foreign ones in Slovenia, the possibility of the implementation of the pedagogical process in foreign languages, the increase in the number of international research projects and joint study programmes. The habilitation procedures will also need to be reviewed not only in terms of internationalisation but also in terms of the promotion of cooperation with the economy, therefore work in applied research. The mobility of domestic and foreign staff from the entrepreneurial and research spheres to the academic sphere, namely their integration in the pedagogical and research processes and/or entrepreneurial projects will also be encouraged. This will directly contribute not only to increase the quality of education but also to focus on the content adapted to the needs of the economy.

3.3.2.2. Promotion and attractiveness of SI economy and business environment

Internationalisation is one of the pillars of the Smart Specialisation Strategy contained in the majority of measures related to human resources and RTDI, in particular in the part opening Slovenia outwards. At the same time, the objective of internationalisation also refers to the internationalisation "inwards", therefore to attract talents, knowledge, new technologies, capital and companies from abroad to Slovenia. Slovenia set some very ambitious objectives in this regard, namely Slovenia is to be classified among the 30 countries in the world most attractive to foreign direct investments and to be ranked first among the countries of Central and Eastern Europe according to the WEF methodology[25]. Slovenia would like to establish itself as a regional RD hub attracting competence centres and research centres of foreign companies with particular reference to the priority areas of application in the S3.

[25] World Economic Forum - the Global Competitiveness Report 2013 -2014

The attainment of so ambitiously set goals requires an integrated approach significantly exceeding the scope of the S3, whereby a clear picture of a comprehensive package is necessary for understanding, positioning and justifying the S3 measures. The key aspects of the attainment of the objectives related to internationalisation are:

- Implementation of structural reform especially in the area of labour market, the rule of law, tax legislation, which is not covered by the S3, but it should be noted that 100-percent relief for RD indicates a noteworthy comparative.
- Access to knowledge, staff and technologies, including the entire vertical of the system of education and the RTDI sphere ➔ the S3 in conjunction with the national strategic orientations.
- Encouraging and predictable business environment ➔ Pillar I of the S3, a programme of measures to remove administrative barriers and to simplify administrative procedures.
- Good governance of the state and security ➔ PAU 3
- Place to live and work ➔ PAU3 in conjunction with the national housing and land policy
- Basic infrastructure ➔ content of the national and cohesion strategic documents
- Accessibility ➔ PAU 3.
- High quality of life and social capital ➔ PAU5

A clear identification of the areas on which Slovenia will focus in the next 15-year period and ambitious objectives in the field of internationalisation in the priority areas further require:

- Supporting and strengthening diplomacy abroad, which supports the internationalisation in the priority areas;
- Promotion of Slovenia as a location for foreign direct investments, especially RD and in the priority areas where Slovenia is to offer the critical mass of resources (staff, knowledge, technology, companies …), which, in conjunction with other measures, will make Slovenia more attractive;
- Integrated support to Slovene companies entering foreign markets and doing business there, and the provision of support and assistance to the existing and potential foreign investors investing in Slovenia.
- Mechanisms for the implementation of the necessary support institutional reforms, e.g. in the case of visa regime and similar;
- Strengthening international visibility of Slovenia as a clean, healthy, attractive and inspiring destination with top tourist offer and quality of life.

3.3.3. Vertical measures of the S3

Vertical measures will address specific obstacles, needs and opportunities of each of the priority area of application. It must be remembered that the measures presented so far form the main package of support; however, they do not suffice for the development breakthrough in an individual area. This part of the package will comprise other necessary and specific measures which among other things can refer to the necessary amendments of legislation, specific support mechanisms and the provision of support provided for in technical assistance.

The determination of such measures must be based on close cooperation between the stakeholders in an individual area, therefore l within further steps *development partnerships for each of the priority areas of application* will be established. (confer Section 4)

Such partnerships are especially important for the implementation of *demonstration projects* which have multi-faceted effects as they:

- enable the testing of new solutions for direct application in practice and thus accelerated transfer of knowledge and technologies;
- enable the evaluation of actual effects of the new solutions and the formation of new standards and the legislative framework with regard to the defined social objectives;
- and with the demonstration of use they contribute to the promotion and expansion of the market for new solutions and thus represent a testing ground for learning and further development of technologies.

Their implementation requires a clear determination of roles and planning of the process from the legislative and administrative procedures to financial engineering and validation of services for the end user. The immediate establishment of development partnerships will enable predictable planning and scope of the implementation of projects within individual priority areas of application.

4. Management, monitoring and evaluation of the S3

The management, monitoring and evaluation of the S3 in Slovenia will be based on the following **principles**:

1. *Principle of robustness and long-term sustainability of the S3 ecosystem*

A robust system means: clearly guided, predictable and stable in the long run. This principle assumes that the defined orientations will be consistently implemented except where the S3 will be systematically upgraded with the planned processes.

2. *Flexibility Principle*

On the other hand, the S3 needs to provide the necessary flexible and adaptable strategic basis as it also contains relatively detailed definitions, e.g. a set of measures. It is essential for the upgrades to be based on verified facts and data, therefore on the basis of a system of monitoring and evaluating. For the sake of predictability, this section also envisages the deadlines for comprehensive evaluations.

3. *Principle of results orientation and complementarity*

"Metrics" will be crucial for the decision-making process, i.e. the definition of such objectives and indicators that in practice it will be possible to ex post objectively establish the performance of the measures and supplement them (or abolish) adequately. In this context special attention will be paid to the definition of packages of instruments which will comprehensively address the defined challenges and opportunities respectively that will mutually complement each other.

4. *Principle of competition and fairness and the avoidance of conflicts of interests*

The instruments of implementation will be impartial and the selection will typically be left to competitive struggle without favouring any individual player. In the entire procedure of planning, management, selection, monitoring and evaluation, consistency of monitoring, control and management will be ensured taking into consideration potential conflicts of interest.

5. *Principle of phasing and scheme flexibility*

Support schemes will be planned in line with the action plans which will adapt to the progress made in individual phases in accordance with the performance indicators. The logic of pilot projects and schemes will also be considered and when the set objectives have been attained, they can be upgraded to the main measures.

6. *Principle of the public and stakeholder participation and of social innovation*

When defining the priorities, selecting the implementing instruments and monitoring, the principle of public participation is crucial for consistent achievement of effects in the umbrella vision (Section 3.) relying on relative consensus of the population.

Structure of the S3 management

The S3 is the key strategic document of the Government of the RS in the field of innovation on the basis of which it will direct its activities. The service in charge of development is responsible for the preparation of the document, the coordination of implementation, monitoring, evaluation and potential updates. This service closely cooperates with the ministries which are the holders of individual development policies. A working group will be established for the implementation of the S3 so that close and operational cooperation is fostered. The working group will be run by the service responsible for development. The group will consist of state secretaries of the ministries to which the S3 relates.

At the strategic level, the process of a partnership dialogue between the Government and key stakeholders will be run through the Science and Technology Council composed of the representatives of the universities, institutes, economy and social partners. However, also other groups will be able to join it, especially the representatives of the non-governmental sector. Full support to the Council and Government will be granted by the agencies responsible for research and technological development.

As presented in Section 3.3.3., entrepreneurial discovery and integration will continue based on the development partnerships established for each of the priority areas of application, and at the same time the necessary specific measures will be defined in detail. The vertical of cooperation, from the service responsible for development through the ministries, the Science and Technology Council, research and technological agency to the stakeholders in concrete priority areas of application, will serve as the basis for coordinated action in accordance with

the achieved relative consensus concerning the priorities of the RS. In this process, the implementing institutions with concrete experience not only in the implementation but also in the determination of such measures will be active.

Monitoring the implementation of the S3 is the responsibility of the service in charge of development, and from the institutional perspective, it will be carried out within the arrangements set up for monitoring the Operational Programme of the Implementation of the Cohesion policy. At the operational level, it includes a description of the system for monitoring and the information system, responsibilities of individual bodies regarding data collection and the provision of resources for monitoring, data collection, processing and storage as well as the deadlines for data collection and submission.

At the same time, Slovenia will proactively link, at the strategic level, with international stakeholders who can contribute to quality implementation of the S3. It has already been agreed that Slovenia will be one of the testing regions in the SmartSpec Project which is financed from the Seventh Framework Programme and in which the leading Eueopean experts in smart specialisation take part. In addition, the cooperation with the OECD will be considerably strengthened, especially with the Committee for Scientific and Technological Policy and also with others to ensure strict evaluation.

Evaluation of the S3 will be a part of the Plan of the evaluation for the Cohesion Policy Operational Programme in Slovenia. In 2016, the cooperation with the stakeholders will be subject to a new round of talks on the potential review of the priority areas of application. An in-depth substantive evaluation of the implementation of the S3 will follow in 2017. Thus, the relevance, efficiency, effectiveness and sustainability of the measures will be verified against the set objectives. Real-time evaluations which will mainly focus on the process part of the implementation and the analysis of specific issues will be strengthened depending on the identified needs. The preparation of the substantive part of the evaluations will be aligned by adequate participants of the S3 implementation taking care of the information transfer and of the professional guidelines.

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6. Annex I: Innovation activity analysis

6.1. Economy and innovation

6.1.1. Microanalysis of economic growth factors

With its surface area measuring 20,273 km^2, Slovenia is a hub of ecosystems and regions with the influences of the Alps, the Dinara Massif, the Pannonian Plain and the Mediterranean. More than half of its land surface area is covered by forests, making Slovenia the third most forested country in the EU, after Finland and Sweden. From the view-point of the share of Natura 2000 sites, which reflect the high degree of biodiversity, Slovenia ranks at the top of the EU Member States. In addition to the global economic and financial circumstances its economic trends are largely impacted by the border location of all Slovenian development regions with rapid access to the neighbouring countries of Austria, Croatia, Italy and Hungary.

The economic crisis revealed the **structural weaknesses** of the Slovenian economy and relatively low level of competitiveness vis-à-vis the other EU Member States, low technological complexity of a part of the traditional industry and rigid business environment (administrative barriers, non-flexible labour market, high tax burden on labour). At the same time, it highlighted the strengths of technological companies, established in global value chains. According to the forecasts[26], the GDP is expected to grow 0.5% in 2014 after two years of decline (-1.1% in 2013), mainly as a result of increased exports, related to the economic growth in the main export partners and halting the decline in consumption[27].

Deterioration in competitiveness has been accentuated by growing **labour costs** per unit of product, low added value in the majority of activities and the lost Slovenia's share in the world market ever since the crisis outbreak. In 2011, deterioration in cost competitiveness came to a halt largely as a result of restrictive pay and labour costs policy in public sector.

The economic growth in the pre-crisis years was mainly based on favourable trends in the international community and easy **access to finance**. The overbearing dependency of the banks on foreign funding sources and their significant exposure to individual economic sectors caused massive liquidity pressures in the banking system. Due to the postponement of consolidation, and other attempts to save the banking sector and certain state-owned firms through capital injections, the conditions during the crisis severely deteriorated and Slovenia was hit almost hardest amongst all EU Member States. The abovementioned issues in the banking sector practically paralysed any financing of the economy, and, through the deteriorating perception of Slovenia in international financial markets further restricted access to finance that was indispensable for economic recovery. In 2014, Slovenia has reduced the uncertainty of investors following the stabilisation of its banking system and improving access to finance.

[26] The Spring Forecast of Economic Trends, IMAD, March 2014.

27 Domestic demand substantially decreased in 2012. The household consumption dropped by 4.8%, government spending by 1.3% and capital expenditure by 8.3%. Given the continuing negative trends in the labour market, restrictive pay and labour cost policy in public sector and further public spending rationalisation it is expected that the household and government demand will continue to decrease for a while. However, a drop in investments (1.6%) will be lower than in the previous four years mainly due to the planned government investments related to the accelerated absorption of the EU funds.

In November 2013, average net monthly salary[28] in Slovenia amounted to EUR 1,044.89 which is by 1% higher than in November 2012. Registered unemployment rate in Slovenia increased by 0.5% in December 2013 after two months with no change to 13.5%.[29] **Conditions in the labour market** further deteriorated in 2013**.**[30] According to the Europop projections **the working age population is estimated to start declining** as early as beyond 2015[31] and low productivity will have to be substantially increased so that the declining working age population will not have negative repercussions on the economic growth. Projections for Slovenia anticipate rapid population ageing[32], which calls for radical reforms of the healthcare, pension and long term care systems. The **risk of poverty** remains at a relatively low level in comparison with other European states, but it has started to increase rapidly, particularly among the unemployed, elderly and multiple-children households[33].

The number of citizens emigrating from Slovenia started to increase even before the beginning of the crisis and has remained relatively high since 2008[34]. In the first nine months of 2012, the emigration of citizens drastically increased, with emigrations (6,583) doubling in comparison with the same period in 2011, which is related to the deepening crisis and the resulting job scarcity in Slovenia. A large percentage of the citizens with tertiary education emigrating from Slovenia are aged between 25 and 39 years. Particularly worrying is the emigration of those with tertiary education, as their number is increasing (in 2011 it amounted to 919 and their share in the total number of emigrated citizens was 22.9%) and of youth (aged 30–34) with their share being the largest among the emigrants with tertiary education, namely as high as 25%. The citizens with tertiary education emigrating from Slovenia in 2011 most frequently left to the EU Member States (59.3%), in particular Germany, Austria and the United Kingdom.

Slovenia is struggling with **inappropriate production structure** with a relatively low share of technologically most advanced products when compared to the countries whose exports seem to be bouncing back more rapidly. Compared with the EU Member States, the Slovenian economy relies heavily on consumption of raw materials, notably on account of the structure of the manufacturing industry. This translates in low **material and energy productivity,** another factor of poor competitiveness. The fall in greenhouse gas emissions in 2009–2010 period was not due to structural changes as the emission intensity remains at high levels. In 2011, CO_2 emissions increased by 1.5% against 2010, mostly on account of land transport and energy supply, whereas emissions generated by manufacturing and households dropped.[35]

The value added export ratios show that Slovenia is lagging behind the more developed EU Member States mainly in the services value added embodied in exports. The weakening of export competitiveness since the crisis outbreak has been largely due to insufficient Slovenian corporate restructuring in the direction of technologically more complex products and emerging markets. The manufacturing sector has been lagging behind the average productivity at an unchanged rate since the beginning of the crisis (value added per employee

28 http://www.stat.si/novica_prikazi.aspx?ID=6014.

29 http://www.stat.si/novica_prikazi.aspx?id=6059.

30 Eurostat. In 2012, the employment rate of low-skilled individuals was 46.4% (men 40%, women 29.2%), whereas the EU 27 average accounted for 52.2% in 2012).

31 European Commission; Working Paper 3/2013; Jorg Peschner and Constatinos Fotakis; Growth Potential of EU Human Resources 2013, page 22, graph 10b: Starting years of decline of total population and working age population, convergence scenario.

32 http://ec.europa.eu/economy_finance/publications/european_economy/2011/pdf/ee-2011-4_en.pdf, page 196.

33 http://www.stat.si/novica_prikazi.aspx?ID=5743.

34 2013 Development Report, UMAR.

35 http://www.stat.si/novica_prikazi.aspx?id=5733.

has stood at around 60% of the EU average). The services content of gross Slovenian exports is less than one quarter (24%)[36]. Such export structure also results from a limited scope and **share of foreign investments** in Slovenia.

Slovenia's competitiveness is severely undermined by the **distrust of the rule of law**, which has been confirmed by the World Bank data[37]. In Slovenia, public trust in a just country governed by the rule of law and its institutions is at a low level and the widespread negative perception undermines healthy competition and hinders smooth social development.

6.1.2. Entrepreneurship

Small and medium-sized enterprises (SMEs) represent the majority, 99.8% of all registered enterprises. Their contribution to employment stands at 70.6% (against the 67.5% average in the EU) and the contribution to added value at 63% (against the 58.4% average in the EU). A vast majority of Slovenian companies originate from traditional industrial sectors, such as automotive, wood and electrical industries and find themselves positioned in the lower half of the global added value chains of foreign enterprises. Slovenia's position is relatively favourable concerning the vertical specialisation[38] of intermediate and end products, demonstrating the export orientation of Slovenian companies. Slovenia's comparative position is worse, however, in terms of Slovenia's export as a contribution to the export of another country, in which most of value added is generated. Therefore, the companies in Slovenia should enhance higher valued-added activities in the supply chain (design, logistics, marketing, after-sales services) or promote the provision of comprehensive solutions.

In 2012, entrepreneurial activity regained strength; however, Slovenia still counts among the lower half of the EU Member States in terms of creation of new enterprises. This shift could be attributed to self-employment subsidies, but due to an increased number of bankruptcies the situation is not considerably better. Analysis[39] of entrepreneurial activity by age groups shows that the situation in Slovenia is similar to the situation in other EU Member States, as the age group 35 to 44 years stands out among the active population. Slovenia is lagging behind in entrepreneurial activity of younger generations (aged 25–34), which is a reason for concern in that they show a downward trend in the share of entrepreneurs having a higher education qualification (39.2% in 2011).

Slovenia's economic activity dropped significantly in the 2008–2012 period with relatively low productivity affecting its competitive position. In terms of productivity, Slovenia's lagging behind the European average was the lowest in the 2004–2008 period. Since 2009, it has been increasing again. Productivity, measured by value added per employee in the manufacturing sector, has stood at around 60% of the EU average. In spite of the recent fluctuations, the share of technologically most advanced activities and products remains higher than in the pre-crisis period and above the EU average. Similar changes also occurred in the structure of export of goods, where the share of high-tech products rapidly increased in 2008 and 2009, whereas in the subsequent two years it slightly decreased again, but remained higher than before the crisis. The technological structure of export of goods is still lagging behind the EU average and deteriorating the competitiveness of Slovenia's export, with low productivity being typical of both the high-tech and low-tech products. In 2011, the share of

36 Development Report, UMAR, March 2014.

37 World Bank Governance Indicators 2011.

38 International Comparative Evidence on Global Value Chain; OECD, April 2012.

39 http://www.gemslovenia.org/news/ (Global Entrepreneurship Monitor).

high-tech products was by 6 percentage points lower and the share of low-tech and labour-intensive products by 4.5 percentage points higher than the EU average[40].

In terms of material productivity, 36% of SMEs[41] in Slovenia allocate more than 50% of theirs costs to purchases of raw materials, whereas 35% of them allocate 30–49% of their costs to such purposes. A survey shows that only a small number of Slovenian enterprises deal with the improvement of their material efficiency or that only a few of them plan/take actions such as: saving raw materials and water (less than a third) and that only about a third of them plan/take actions to reduce waste and to recycle, with the most frequent action being energy saving (41% of enterprises). Compared with the EU-27 average, Slovenia's enterprises are about half as active in enhancing resource use efficiency. Furthermore, the opportunities to improve economic competitiveness also lie in enhancing low material productivity of enterprises.

A better competitive position of some new Member States (e.g. Slovak Republic and Czech Republic) in comparison with Slovenia results from two important factors: foreign direct investments they received and inclusion into global value chains. The above mentioned countries have managed to attract more foreign direct investments in high value-added industries (the share of FDI in 2011: Hungary, Czech Republic, Slovak Republic almost 60% of GDP each, Slovenia just over 30%). As a result, they increased their exports in medium- and high-tech industries, whereas Slovenia's share of FDI was considerably lower and it managed to increase its exports mainly in medium-high technology industries. The importance of foreign direct investments is reflected primarily in more intensive research and innovation activity, opening up new market opportunities through a comprehensive development of products and services and multiplier effects on local economy and society, resulting in an increase in productivity and corporate restructuring.

In 2012, a detailed analysis[42] of sectors of economy was made, aimed at defining the areas with the greatest importance in economic structure in terms of employment, sales and export as well as valued added and the areas with the largest entrepreneurial and new economic activity. The sectors of economy identified were the most important for the Slovenian economy (the share in employment and value added), they recorded the fastest growth in the last decade (2002–2011) and were characterised by a substantial export-orientation.

The evaluation of entrepreneurship and competitiveness policy implementation in the 2004–2009 period showed that the recipients of subsides in all areas were carefully selected and above average in terms of their performance prior to and after receiving the subsidy. Nevertheless, the analysis revealed limited and mostly short-term results. The best results were in increased employment, salaries and sales and the modest results, however, primarily in increasing productivity and export capacity, which is due to the goals set in the preparation of operating programmes and individual measures. Furthermore, low efficiency of subsidies results from certain weaknesses in the Slovenian business environment and poor performance of institutions, where Slovenia is losing advantages compared to other countries.[43]

In 2012, 3,725 emerging enterprises, accounted for mere 2.8% of all enterprises, generated 36% of earnings before interest and taxes (EBIT), 22.7% of total operating income, 19% of total added value and provided jobs for 15.4% of total employees.

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40 2013 Development Report, UMAR, March 2013.

41 EUROBAROMETER survey from 2011.

42 Dr. Patricia Kotnik, University of Ljubljana, Faculty of Economics and Technological Agency of Slovenia 2012.

43 http://www.mgrt.gov.si/fileadmin/mgrt.gov.si/pageuploads/DPK/CRPi_2010/Koncno_porocilo_CRP_konkurencnost.pdf.

Since 2007 the Slovenian market shares have fallen both worldwide as well as within the EU.[44] Considering the EU average, Slovenian SMEs seem to be more internationalised; however, data suggest that most of the revenue generated in foreign markets comes from large enterprises, whereas micro enterprises, which account for as much as 90% of the Slovenian economy, generate merely 10% in international markets. Slovenia has been too focused on geographic markets which do not show signs of emerging markets. Most goods were exported in EU markets in 2012 (69.1% of total exports), whereas the export in other countries remained more or less at the same level[45]. The share of exports in GDP in 2012 accounted for 73% and the share of revenue in foreign markets represented 31.8% of total revenue (2011 data). In 2012, the share of export by SMEs accounted for 33.1%. In terms of export of services Slovenia mainly targets EU markets (72% of the total exports of services in 2011). The market share of the Slovenian export of services remained modest in these markets and grew smaller during the crisis (by 3.5%), with the exception of travel service providers that managed to increase their share in the EU market in the 2008-2011 period, even though the demand in the EU shrank in the given period.[46] The analysis of competitiveness and internationally-driven ambitions of early-stage entrepreneurs shows that as many as 32% of emerging and new entrepreneurs plan to shift their activity to international markets (more than 25% of customers abroad).[47]

Slovenia has not been attractive enough for **foreign direct investments** (FDI) so far. Firms having FDI accounted for 4.5% of total firms in the end of 2012, but managed to represent 19.8% of the capital, 23.2% of the assets and 21.7% of the employees in the total entrepreneurship activity. In particular, these firms were successful in terms of international trade where they accounted for 40% of the exports and 43.1% of the imports of the Slovenian entrepreneurship sector. Nevertheless, support to inward FDI should be enhanced, as the 2010-2012 period saw EUR 36.2 million spent for this purpose, of which 94.5% were intended for financial incentives. According to foreign investors, improved business environment conditions and reduction in administrative barriers would help significantly improve attractiveness of Slovenia's market for FDI.

6.2. Innovation activity in Slovenia

Certain empirical data shows that Slovenia is improving its innovation activity, particularly as regards enterprises investing in R&D activities, human resources, cooperation and scientific productivity, providing a good basis for further development of innovation activity in Slovenia.

6.2.1. Input indicators

6.2.1.1. Funding

In Slovenia, R&D as a percentage of GDP is increasing and nearing the Barcelona 3% target of GDP. According to the latest statistical data, Slovenia spent 2.6 percent of GDP for R&D in 2012. Over the last five years (from 2007 to 2012), the Slovenian share of gross domestic

44 http://www.umar.gov.si/fileadmin/user_upload/publikacije/pr/2013/POR_2013s.pdf.

45 Statistical Office of the Republic of Slovenia.

46 http://www.umar.gov.si/fileadmin/user_upload/publikacije/pr/2013/POR_2013s.pdf.

47 Unperceived Opportunities: GEM Slovenia 2012, 19 April 2013.

expenditure on R&D increased by nearly one percentage point, which is, in addition to Estonia, the highest increase among the OECD and EU countries. In that period Slovenia reached and exceeded the EU average and increased its advantage.

In 2012, the business sector expenditure on R&D amounted to almost 2 percent of GDP (1.99%), whereas the public sector expenditure on R&D has decreased since 2010, accounting for 0.64 percent of GDP in 2012. The business expenditure on R&D has nominally increased by more than 70 percent over the last five years, whereas it decreased by ten percent in the state sector. The business sector expenditure on R&D is mainly funded from the own sources of enterprises. The share of state investments in total R&D expenditure in business enterprises increased from 6 to 14% between 2008 and 2012 and the share of foreign funding for R&D grew from 4% in 2008 to 7% in 2012.

Data suggest that in the last three years the share of funds allocated by the corporate sector to its R&D activity has increased; however, their share of R&D activity funding in the public sector has decreased. In 2010, the Slovenian business sector invested in the state sector almost twice (4.1%) the average investment by business enterprises in the state sector in the EU-27 (2.1%). The share of investments by corporate sector in higher education was the same in 2010 in Slovenia as the EU average. In 2012, the share of R&D activity funding by corporate sector in the state and higher education sectors decreased to 1.6 in the state and to 1.9 percent in the higher education sector, despite the increase in the total funds directly allocated to R&D by the corporate sector.

According to statistical data the scope of cooperation with the business sector in the 2010-2012 period decreased in nominal terms most in the state sector, namely with the index of 58%. In the higher education sector the scope of cooperation with the business sector decreased considerably less in the same period, namely with the index of 93. It should be noted that in the state sector the public research institutes recorded a growth in the total income earned in the market (not only for R&D activity), namely with the index of 105.

If the cooperation between the public and business sectors is shown by the ratio between the number of researchers in full-time equivalents (FTE) and funds raised from the business sector, the scope of cooperation between the state and business sectors is larger than the scope of cooperation between the higher education and business sectors. In 2012, an average full-time researcher in the public sector acquired 5,500 euro from the business sector, whereas an average full-time researcher in the higher-education sector acquired 4,800 euro.

In the last four years, the government budget appropriations for R&D activity (GBAORD) decreased with the index of 77, namely from 0.69 percent of GDP in 2009 to 0.54 percent of GDP in 2012. The share of such funds in the total budget of the Republic of Slovenia also dropped from 1.42% in 2009 to 1.12% in 2012. If the European structural funds for R&D are added to them, the share of public sources of R&D funding (excluding FP7) in 2012 amounted to 0.91% of GDP.

6.2.1.2. Human resources

Like in terms of R&D investments, Slovenia has many advantages in human resources, recognised by external evaluators. Both recent European Commission reports on research and innovation performance in Slovenia indicate human resources as one its most important advantages. It is indicated in EC, 2013b that Slovenian already has a high level of new doctoral graduates, above the EU average, but is still catching up in terms of new graduates in science and engineering. Furthermore, it is indicated in the report that employment of

researchers by business enterprises and in knowledge-intensive activities is also at a high level, demonstrating rapid employability of highly skilled graduates. Slovenia is less attractive for foreign doctoral students.

The OECD, 2012b report also strongly highlights the advantages of human resources for the development of innovation activity in Slovenia, as evident from the majority of the Slovenian educational system indicators. It should be pointed out that Slovenia with 39% of its population having tertiary education (aged 30 to 34) has exceeded the EU average and has almost reached the EU 2020 target of at least 40% of the population having completed tertiary education.

In Slovenia, the absolute number of tertiary education graduates has been increasing, namely with the index of 120 in the last five-year period, or by 5 percentage points more than the EU average. A higher increase in graduates per one thousand inhabitants was recorded in the last five-year period, namely with the index of 128, whereas in the EU Member States the growth was attained with the index of 118. In the last two years Slovenia outpaced the EU in terms of the number of graduates in maths, science and technology per one thousand inhabitants, with 19 graduates compared to the EU average of 17 graduates. It is equally important to note that the share of graduates in maths, science and technology (25%) is increasing within the whole structure of the graduates, thus exceeding the EU average (23%).

Furthermore, Slovenia has exceeded the EU average in terms of the number of doctoral graduates per one thousand population aged between 25 and 34 years with 1.9 doctoral graduates (in 2008 1.3 doctoral graduates) compared to the EU average of 1.8. Over the past four years, the number of doctoral graduates in Slovenia has increased (in 2009, 466 doctoral graduates and in 2012, 569 doctoral graduates), whereas in 2012 a drop in the number of doctoral students was recorded from 4,098 (in 2011) to 3,604. According to statistical data, the share of foreign students among all doctoral students in Slovenia is increasing. The share of doctoral students from non-EU countries is lower. Slovenia attains one third (6.5%) of the EU-27 average of 20%.

The share of female and male researchers is increasing in Slovenia. In 2012, 12,514 researchers were employed or 8,884 individuals in full-time equivalent (FTE). More than half of individuals were employed in the business sector, less than one third in the higher education sector and 20 percent in the state sector. Their number has increased most in the business sector, namely with the index of 145 from 2008 to 2012. In that period, the number of researchers in the state sector decreased with the index of 87, whereas in the higher education sector it grew with the index of 117. In 2012, the number of researchers was lower by 1.5% than in the previous year with the largest drop recorded in the higher education sector (by 5%).

In the last five-year period, the number of female and male researchers (FTE) has increased by nearly 30 percent compared to only ten percent average growth in the EU. Furthermore, the share of female and male researchers among the working age population in Slovenia is higher than the EU average and has slightly increased over the last five years.

In Slovenia, the highest increase of female and male researchers (FTE) has been recorded in the business (50%) and higher education (34%) sectors, whereas their number in the state sector has lowered by 14% over the last five years. Statistical data show that in 2012 the number of female and male researchers, measured by individuals, started to decrease, with the highest drop of 5 percent recorded in the higher education sector. In terms of FTE, such trend was not yet apparent in 2012.

The number and share of female and male researchers in the business sector increased during the last year as a result of intensive public sector investments in the business sector R&D. A comprehensive system of incentive mechanisms to increase staff mobility between public research organisations and enterprises and to employ researchers has not yet been put in place. Slovenia has enhanced the inter-institutional mobility of researchers in the recent period within the framework of new instruments, co-funded by the European structural funds.

The OECD report on Slovenia's innovation activity highlights a small share of female and male researchers holding a doctorate in science, employed in the business sector, namely 15% of all employees holding a doctorate in R&D. In 2008, the share of individuals holding a doctorate in the business sector accounted for 8% of all employees holding a doctorate in R&D activity.

6.2.1.3. Infrastructure

The national strategy of the republic of Slovenia is based on the Plan of the Development of Research Infrastructure 2011-2020 (PDRI), namely with regard to the national priority areas and international priority projects in this field. The content of the PDRI complements the Research and Innovation Strategy of Slovenia 2011–2020 and represents an implementing document. On this basis, greater synergy and the avoidance of duplication as well as more efficient allocation of public funds are strived to be achieved. This provides the insight into the intentions of the state and monitoring of the implementation of the public policy and objectives in research infrastructure. The speed and scope of the attainment of objectives depends primarily on annual budgetary availability and fiscal situation in the country.

Over the past years, major investments were made in the national research infrastructure within the centres of excellence with the funding from the European Regional Development Fund whereas national funds were invested in upgrading the existing infrastructure in connection with the integration in international RI projects. Slovenia established the basis for increasing investments in research infrastructure with the active integration at the EU level within joint initiatives and the engagement in infrastructure connections.

SICRIS enables open access to research equipment as it has established a transparent overview of equipment available in the universities and individual public research institutes in Slovenia, which allows fast check of the available capacities and the establishment of a contact to access equipment.

Information communications infrastructure is one of the key strategic support building blocks of the European research and innovation policies. In order to preserve its involvement in international research, Slovenia needs to provide the funds for the development and maintenance of the necessary e-infrastructure which will enable it to make full advantage of emerging distributed forms of research activity (e-science) based on the international research networks enabled by the availability and quality of the European network infrastructure such as GEANT and e-scientific GRID network. Slovenia is involved in GEANT and e-scientific GRID-network through the activities of the ARNES public institute. The ministry in charge of the information society is preparing a new strategy of the development of broadband networks in Slovenia to support their comprehensive development.

6.2.2. Output indicators

Researchers, the tradition of the research and innovation culture, the existing research and IT infrastructure, individual parts of excellence in academic and industrial research, significantly increased number and quality of scientific papers and successful cooperation in the EU framework programmes contribute to an important advantage of our RTDI system.

Scientific results measured by a number of scientific papers per million population and international co-authorship of publications are high in Slovenia with regard to meeting international standards. Volume of co-authorship between the public and private sector is also big. Over the last few years, quantitative growth of scientific productivity is obvious, which indicates a solid scientific core of Slovene science. This is due to various factors, especially planned strengthening of international comparability and bibliometric indicators and criteria of evaluation and financing research work in Slovenia.

Nevertheless, the European Commission exposed our quality of research as one of our weaknesses. Slovenia has to improve the quality of scientific publications in order to perform better in terms of scientific publications within the 10% most cited scientific publications worldwide. Also the OECD report states poor visibility of our scientific results worldwide and consequently a low impact factor of Slovene publications. Slovenia has no highly cited researcher per million population, what they consider alarming since the number of highly cited researchers does not correlate with the size of the country.

The abovementioned report by the OECD mentions questionable connection between the promotion of the growth of quantitative bibliometric indicators and economic activity of the state. Technological output indicators show a completely different quantitative picture of knowledge commercialisation. The number of high-tech companies is relatively low and a share of export of high technology and services is insignificant. With regard to the number of patent applications per million population, Slovenia lags behind. Slovenia has an increasing number of PCT patent applications and has a high level of patent applications to the EPO in the field of health-related technologies. However, the levels of both total PCT and total EPO patent applications are below the EU average. Slovenian SMEs perform well in terms of (non-technological) marketing and organisational innovations and fairly well in introducing product or process innovations. However, Slovenia needs to improve its attractiveness for R&D investment by foreign firms as is illustrated by the fact that the share of business R&D expenditure financed from abroad is much lower than the EU average.

The OECD report establishes that the processes of establishing new companies and technology transfer in Slovenia are not dynamic or particularly strong. This can be a worrying fact as it shows weak capacity of the economy in turning research results into technological innovation. However, during this period some changes were made in knowledge transfer mainly enabled by financing from the European Structural Funds, namely within centres of excellence, competence centres and other forms of promoting knowledge transfer. Because of the latter, the volume and share of public financing of RDA in the business sector considerably increased. According to the OECD estimates, centres of excellence and competence centres are an important structural novelty strengthening links between various innovation players in Slovenia. Due to the introduction of 100-percent R&D tax allowance also the R&D expenditure of the business sector significantly increased in this period and reached almost 2% GDP in 2012.

6.2.3. Internationally comparable advantages and disadvantages

The existing analyses of international comparisons of the innovation input and output indicators mirror individual comparative advantages and disadvantages of innovation activity in Slovenia. According to the estimates by the European Commission[48] Slovenia's research and innovation system is performing well following the priorities of the European Research Area[49,] although Slovenia has not fully developed its innovation potential. Several indicators are close to or above the EU average and with positive trends. These include human resources, some aspects of innovation in business and R&D expenditure. Nevertheless, there are some weaknesses in the domains of knowledge commercialization, private and public sector internationalisation, and research quality.

The comparison of innovation activity indicators of Slovenia and the EU Member States ranks us in the group of »innovation followers« where we are slightly below the EU average (see EC, 2014). Of 25 indicators in the innovation activity matrix, Slovenia is above the average of the EU member states with a fifth of indicators. Slovenia is well above the EU average with the following innovation indicators: share of population who has successfully completed secondary and tertiary education, international co-authorship of scientific publications, R&D expenditure in the business sector, public-private scientific co-publications and innovation cooperation between companies.

Despite the strengthening of some of the factors of innovation capacity during the crisis (increased investment in R&D, strengthening human capital), the progress made in other areas is too slow (intellectual property, knowledge transfer to companies, effective use of information-communications technology in companies or the public sector) or Slovenia is even lagging behind (innovation activity) which results in below the average value added per employee. Whereas some measures of the innovation policy generated good results regarding the increased number of patents or scientific papers the others were less successful in applying new knowledge and the sale of new products and services on the domestic and foreign markets. Over the last years, investments in non-technological innovation considerably decreased.

Slovenia’s lagging behind in innovation activity reduces the competitiveness of products and services on external markets and means further stagnation of a share of export of high-tech products and knowledge-based services in total export. In most of the Member States including Slovenia, companies most frequently introduce technological and non-technological innovation (organisational and marketing) at the same time, which points at mutual conection of various types of innovation. Innovation activity in marketing services decreased over the last few years. A share of innovation active enterprises in marketing services decreased in the 2008–2010 period to 44.7. Given these trends in Slovenia, it is difficult to expect a higher export of services with value added to the global market (IMAD, 2013).

The EC data of 2014 show that regarding the overall assessment of eco innovation, Slovenia is above the EU-27 average but our results concerning environmental impacts due to eco innovation and investments in eco innovation are below the average. We achieve particularly poor results of eco innovation where only 58% of the EU-27 average is achieved. Given that environmental technologies and services are a fast growing niche, horizontal investments in this area will be of key importance to raise competitiveness.

[48] Research and Innovation performance in EU Member States and Associated countries, ibid, str. 246
[49] More in: European Research Area, Progress Report 2013, European Commission, Brussels, 2013

According to the index of economic impact of innovation, Slovenia underperforms its reference group and is clearly below the EU average. Slovenia displays a contrasted pattern of marked strengths and weaknesses. Slovenia is the best performer amongst its reference group for "patent applications per GDP", "share of the employment in knowledge-intensive activities" and "contribution of medium and high-tech product exports to the trade balance". However, these strengths are counterbalanced by equally marked weaknesses in the "share of knowledge intensive services in total export of services" and "sales of new to market and new to firm innovations as% of turnover of firms".

6.3. Innovation system in Slovenia

An international comparative analysis of national innovation systems revealed that in Slovenia the main obstacle to innovation activity and long-term economic growth is mainly the structural ratio between companies and industry respectively and the public sector as the source of scientific and technological knowledge. Inadequate structural ratios are seen at various levels, from inadequate legislative and financial to organisational framework of innovation activity. In Slovenia, there is no long-term innovation policy, which can also be observed in often obsolete forms of the organisation of public research and higher education institutes. To raise productivity in different sectors and types of companies, it is necessary to take into account a broader concept of innovation where non-technological innovations, the development of excellence of the scientific system and its connections with industry are extremely important. Based on the OECD estimates, the reform of the universities and public research organisations is necessary so that innovation can contribute more to economic development.

The OECD report on innovation activity in Slovenia establishes the appropriateness of Slovene strategic documents, especially the RISS Resolution and RNHE 2011 – 2020, to eliminate the established structural imbalances in the Slovene innovation system and, based on the analytical review of innovation indicators and policy, it proposes specific areas and measures necessary for efficient functioning of the entire innovation system in Slovenia which are taken into account in the Smart Specialisation Strategy.

6.3.1. Business sector

Slovenia has to strengthen the productivity of the economy with more intensive innovation activity. Therefore, it is necessary to increase RD and innovation activity in companies and improve framework conditions including the provision of continuous and extensive public support to the private sector.

Through public support, the promotion of innovation will be based on RD as well as non-RD activities, namely for technological and non-technological innovation. The OECD points at the fact that Slovenia has to avoid only narrow focus on »high technologies«. According to their estimates, also non-technological or »soft innovation« is adequate for Slovenia – especially among small and medium-sized companies.

Slovenia will further develop innovation activity in businesses with short-term measures for improving the existing technologies, knowledge, skills and innovative practices as well as with long-term measures for developing such an innovation system that will be able to create and apply new knowledge for innovation. The promotion of the cooperation between the

public and business sectors needs to improve also by developing intermediary institutions and instruments.

The elimination of administrative barriers to successful entrepreneurship, especially with start-ups, has a significant impact on the innovation in companies. The access to financial resources and adequate legislative framework which does not impede the financing of innovative projects in business sector are of crucial importance.

The number of women and men researchers, especially of those holding a PhD, and other staff in innovation activity in companies has to be increased. The instruments promoting greater mobility of research staff and higher employability of highly educated graduates in economy must be strengthened. The OECD draws attention to the necessity of additional education and qualifications for researchers in economy in line with the specific technological structure of Slovene companies. The development of ambitious proposals regarding the binary structure of the Slovene system of higher education contained in the Resolution RNHE 2011-2020 were evaluated positively.

Human innovation potential in economy is to be strengthened also through internationalisation where an ambitious national strategy needs to be designed. Slovene companies will have to open their innovation activities to international innovation networks. The OECD also draws attention to the insignificant inflow of foreign direct investments to Slovenia in general and in particular in RDA, which is disproportionate to the integration of our economy into international markets and is in particular not comparable to a high share of foreign direct investments in Central and Eastern Europe.

6.3.2. Universities and public research institutes

In Slovenia, the universities and public research institutes are strong players of the innovation system as established by numerous output and input indicators. According to the OECD, the universities and public research institutes are faced with the key structural problem of the obsolete model of PROs, which requires a comprehensive and speedy reform, namely in accordance with the two adopted national strategies, the RISS and the Resolution on National programme of higher education (RNHE) whose objective should be greater institutional autonomy with responsibility, critical mass and international openness with a modern career model. The said report finds that the strategic development of the universities and public research institutes is not in line with the existing strategies of the republic of Slovenia.

The Report on the implementation of the Resolution on research and innovation strategy of the Republic of Slovenia 2011-2020 establishes that the level of autonomy and responsibility of PROs has not changed in order to ensure their strategic development despite the fact that the realisation of the concept of autonomy and responsibility is crucial to carry out the reform of PROs and the innovation system in Slovenia as a whole.

The Report also notes that despite the commitments contained in the RISS and RNHE concerning greater autonomy of PROs, the latter receive conflict messages through financing provided by the SRA which has been strengthening financing of research groups through individual research holders instead of strengthening the institutional dimension. Inappropriate fragmentation of PROs to small groups which cover a broad range of activities, the fragmentation of public financing, the overlapping of individual instruments and the activities of fragmented players in the RDA system have been exposed.

According to an OECD estimate, 2012b, it is necessary to improve the role of the instruments of the SRA in the introduction of changes at the universities and in PROs and decrease the overlapping of the agencies in providing support to innovation processes in Slovenia. In this context, a thorough analysis of the effects of the public research innovation policy is needed whose results must reflect in the design of a better innovation policy in this area. The recommendations primarily refer to the improvement of the functioning of the universities and public institutes, their greater institutional autonomy, power and responsibility in the fields of management, financing and research, greater social responsibility for the transfer of scientific discoveries to the society, better cooperation between the public and business sectors, reduction of the fragmentation of the research development area, an increased share of institutional financing in total public funds of PROs and the arrangement of the labour status of the employees that will enable the development of an excellent research and development system.

The scope and share of the RDA cooperation of PROs with the business sector, national research institutes and higher education institutions fell over the past three years. The potential of application-driven orientation of scientific results is also indicated by the indicator of decreasing the share of funds of the business sector in financing PROs. The volume of these funds has been decreasing since 2010. According to the statistical data, the nominal volume of cooperation with the economy in the period from 2010 to 2012 decreased most in the government sector, namely index 58. In higher education, the volume of cooperation with the economy in the same period decreased much less, index 93. To that end, it is necessary to specify that public research institutes in the government sector show growth of all revenues generated on the market (not only related to RDA, namely index 105.

6.3.3. Management of the innovation system

Slovenia should increase the efficiency of the national innovation system and move closer to the current and future needs of the state. Therefore, it is necessary to improve the efficiency of the management of the system in all its dimensions, eliminate duplication and unclear relations between the ministries, agencies and research organisations and step up the cooperation and links between various players and the innovation system instruments.

There must be an increased focus on public support and financing of science, technology and innovation and the creation of critical mass, excellence and TD relevance, namely in line with the already adopted national strategic documents in this field and the OECD and European Commission recommendations on the achievement of the objectives of the European Research Area.

To improve the management of the innovation system within the realisation of the Smart Specialisation Strategy, Slovenia will have to implement the following objectives in accordance with the Resolution on the Research and Innovation strategy 2011-2020:

1. A uniform and efficient system of managing the scientific research (SR) and innovation system

- New regulation of the scientific research and technologically development activities and the changes or amendments to other legislation laying down the conditions for innovation activity in Slovenia;

- Establishment and strengthening of the horizontal and vertical cooperation, coordination and links between SR and the innovation system with all stakeholders and the public;
- Establishment mechanisms to reduce the concentration of power and avoid conflicts of interest;
- Clear visibility and openness of decision-making processes at all levels of the scientific research activity;
- Strengthened responsibility and ethics in scientific research.

2. Greater autonomy, responsibility and efficiency of the universities and public research institutes for the strategic development of Slovenia

- Definition and differentiation of missions and strategic roles of the universities and public research institutes
- Strengthening the management role and responsibilities of the management of the universities and public research institutes
- State deregulation of the internal operations of of the universities and public research institutes
- Arrangement of the labour status of researchers
- Establishment of a modern career model for researchers and younger staff
- Establishment of conditions to increase the number of researchers in the highest research positions and in managing and decision-making
- International public tenders for research posts in Slovenia
- Support the open access to research data and public research infrastructure
- Strengthening the foundation of the scientific e-infrastructure ensuring support to Slovene research community.

3. Reform of the public system of financing and evaluating scientific research activities

- Stop the downward trend in RDA public expenditure and achieve, in line with the already adopted commitments to achieve the allocation of 1% of GDP for RDA under the Barcelona objective at least by 2010
- Reduce and connect various instruments of financing SRA and thus effectively strengthen fragmented SR potentials in the areas important for the development of science and society in Slovenia
- Increase national critical mass of research with their involvement in the ERA and more intensive cross-border and international RD and innovation cooperation
- Establishment of the institutional public financing RDA within RO/universities replacing the current fragmented quazi-competitive financing
- Introduce external, international institutional evaluation of the quality of the RO/universities
- Strengthening project financing of RDA which will base on the issues which need to be resolved to boost the development of Slovene society, economy and culture
- Establishment of a system comparable to the European one for the assessment of applications and evaluation of the results and effects of the innovation activity in Slovenia.

6.4. Development policies of Slovenia in the field of innovation

6.4.1. Research-development and innovation policy

The research-development and innovation policy is defined in the Research and Innovation Strategy of Slovenia 2011–2020 (hereinafter the RISS). The objective of the Strategy is to establish a modern research and innovation system to ensure an efficient „knowledge triangle“ by bridging the gap between knowledge and market. The purpose of the RISS is for Slovenia to set up a responsive research and innovation system by 2020 which will be co-created by all stakeholders and which will be open to the world. This system will be firmly rooted in society and will be responding to the needs of the citizens and will be key to successfully meeting the grand societal challenges of the future such as: consequences of climate change, risk, lack and deterioration of the quality of natural resources (water, soil, air, energy and ecosystem services) and the conservation of biodiversity, health and aging.

One of the central objectives of the RISS is also the establishment of smart specialisation on the basis of which Slovenia will become excellent and competitive in international terms. The RISS as a long-term strategic document defines the method of forming and evaluating the areas of specialisation and not the areas themselves which are to be selected on the basis of a permanent and inclusive bottom-up process and justified by benchmarking the competences in individual areas that make a tangible contribution towards solving the key societal challenges. This is what the smart specialisation process whose result is the S3 is aiming at.

Table 2: Key objectives and measures of the RISS 2011–2020

Area of policy	**Key objectives and measures of the Research and Innovation Strategy of Slovenia – RISS**
Effective governance of the research and innovation system	- establishment of an effective governance system of research and innovation system, involving all stakeholders (a single advisory body of the Government, strengthening of the staff structure of the line ministries), - monitoring the implementation and evaluation of the effects of RISS.
Financing research and development	- achieving high investments in RDA – progress toward the objective of 3% GDP for RDA (support to basic research, projects (PRO) in cooperation with innovative economy, increased diversification of the sources of finance).
Quality research in the public sector	- well-performing public research sector adjusted to the requirements of time (more autonomy and responsibilities of the PROs), - excellent internationally recognised research (number of scientific papers and citation), - target-oriented and quality international cooperation, - high ethical standards within pubic RDA.
Establishment of competences and capacities to support RTDI	- strengthening human resources (increasing number of researchers in economy, number of PhDs, competences of staff …), - cooperation of PROs with the private sector and the transfer of knowledge to economy (technology transfer offices, regulation of intellectual property rights, attracting PROs to tackle social challenges), - increasing scientific and economic competitiveness of Slovenia: forming and

	evaluating the areas of specialisation (investments in development and strengthening development cores in the area of specialisation), - development of research infrastructure (construction of new and better research infrastructure and better utilisation of the existing research infrastructure, open access …), - development of entrepreneurial-innovation infrastructure (restructuring of the implementing bodies, networks of support entities, information provision …) - information infrastructure to support the innovation system, - promotion of science and culture of creativity, entrepreneurship and innovation.
Innovative economy	- Increase investments of the business sector in RDA (100% tax relief for RD, resources of the Structural Funds to promote RTDI), - more innovative newly-established companies (a comprehensive system of support for the newly-established companies), - faster growth of innovative companies (improved access to the sources of finance, support to the integration into international value chains, support to strategic RD projects), - strengthening of innovation capacities of companies (support to the preparation and introduction of new products and processes on the market, internationalisation).

6.4.2. Industrial policy

In 2013, Slovenia adopted the Slovenian Industrial Policy (hereinafter: the SIP) as a response to the financial and economic crisis in order to strengthen the healthy core of the industry and as a part of preparations to the next EU financial perspective 2014-2020. Given that 80% of all private investments in research and development is in industry, the latter is of key importance also in terms of development and innovation policies. The industry is the main user of innovation and at the same time it provides solutions to social challenges we have been faced with.

The vision of the Slovenian Industrial Policy is to improve the business environment, to support entrepreneurship and innovation, and to develop promising technological and industrial areas that correspond to social challenges, in order to create the conditions for the continuous restructuring of existing industries into energetically, materially, environmentally and socially effective industries of knowledge and innovation, leading to longer-lasting and better employment opportunities, as well as increased integration in international business. The main objective of the SIP is to increase productivity and the value added per employee respectively from 60% to 80% of the EU 27 average by 2020.

The purpose of the SIP is to set the priorities for the development of the industry and economy for the period until 2020. The SIP sets the policies that already contain a range of measures:

1. to increase the competitiveness in the business environment,
2. to strengthen entrepreneurship and the capacity for innovation of the economy,
3. to respond effectively to social challenges, as well as
4. activities for the long-term development of industry.

1. Improvement of the business environment

The basic condition for increasing investment in technological and economic development is the improvement of the business environment. This refers to the rule of law, the administrative environment, labour market and education system, tax environment, environmental, energy and spatial planning policies, comprehensive environment supporting business and innovation, access to financing, environment supporting creativity, entrepreneurship and innovation, effective management of state-owned enterprises, and social responsibility of companies

2. Strengthening entrepreneurship and innovation

Another important area is strengthening entrepreneurship and innovation, which is the key lever to expanding productivity, employment and the economy. The role of the government in this area is to improve the framework conditions for innovation and entrepreneurship by means of horizontal measures, which especially refers to the promotion of closer contacts between the public research and education sector and the economy, the promotion of development activities and technological investments in companies, the promotion of non-technological innovation, employing developers in companies, the mobility of highly skilled workers to the economy, and the encouragement of innovation in companies. Given the fact that innovative and growing companies contribute the most to achieving the objectives of higher value added per employee and at the same time to an increase in employment, special attention will be paid to the promotion of such companies.

3. Response to social challenges

The horizontal measures will not suffice for economic recovery and the achievement of development objectives. Therefore, it is necessary to find new sources of economic growth and economic development which are based on smart specialisation that takes into account previous investments and competences. New sources of growth are represented primarily by responses to social challenges, namely by introducing a new paradigm of development, which is based on the concepts of green growth (OECD), green economy (UNEP) as well as material efficiency and low-carbon society (EC), which are based on enhancing efficiency (energy, material, environmental and social) instead of increasing use of space, raw materials and energy. Therefore, the SIP defines priority areas based on the challenges, opportunities, existing competencies, capabilities and natural resources, in order to promote the development of technologies and their application in industrial sectors. Although the SIP defines the priority areas, they depend on the development of the smart specialisation process.

4. Activities for the long-term development of industry

SIP also defines activities for the long-term development of the industry and economy, which include the promotion of internationalisation and the use of the effects of globalisation to increase the involvement of the economy in international business flows, the promotion of industrial design, which focuses on strengthening brands, and encouraging the restructuring of companies at all stages of development, in order to make it easier to accommodate to the rapid changes we are witnessing in the world today.

Table 3: Key policies of the SIP

Area of policy	Orientations of the Slovenian Industrial Policy - the SIP
Efficient management of research and innovation system	- Coordinated implementation of the RISS and SIP.

Establishment of competences and capacities to support RTDI	- Adjustments of the systems of education and training to the needs in economy, - Promotion of RD in companies through the employment and training of researchers, mobility promotion, interdisciplinary groups, - Integrated entrepreneurial and innovative environment (reorganisation and responsible autonomy of the implementing institutions, upgrading of the supporting entities). - Promotion of entrepreneurship for young people, women, social entrepreneurs and micro-entrepreneurs, - Comprehensive promotion of creativity, entrepreneurship and innovation (CEI). - Inclusion of contents from the field of CEI to all levels of formal education.
Innovative economy	- Promotion of growth and development of companies with tax incentives for investments in RD, - Improved access to the sources of financing (debt and equity financing), - Support to the growth and development of companies, e.g. through dedicated vouchers to accelerate the access to financing, - Promotion of the establishment of companies and companies with a high growth potential, - Promotion of connections between companies, mainly of MSEs with knowledge institutions, - Promotion of development activities and technological investments in companies and the support to non-technological innovations, - Promotion of RD activities and investments in priority technological and industrial areas responding to social challenges, - Promotion of a shift to green economy through innovation and consideration of the so called green criteria, - Promotion of the internationalisation of operations and FDI, - Promotion of the use of industrial design in economy.

6.4.3. Policy of information society development

A policy of information society development in Slovenia will be defined in the Digital Slovenia 2020 Strategy currently being shaped. The Digital Slovenia 2020 Strategy will mainly address the horizontal aspects of the information society development, therefore the infrastructure (e-infrastructure, broadband connections, cloud, information security, cyber security), and accelerated use of ICT (open data, live laboratories, internet start-up companies, digital skills). The strategy of the development of services and applications has been and will be addressed by sectoral strategies.

The Digital Slovenia 2020 Strategy stems from the strategic objectives of hierarchically superior development documents and represents the renewal of the umbrella framework for promoting the development of information society in Slovenia specified in the si2010[50] Strategy and the response of Slovenia to the European Digital Agenda[51] (Digital Agenda for Europe – EDA[52]).

[50] Strategija razvoja informacijske družbe v Republiki Sloveniji , si2010
[51] European digital agenda – COM(2010)245
[52] http://ec.europa.eu/digital-agenda/

In line with the EDA guidelines, Slovenia should invest in digital growth and follow the strategic guidelines on the innovative and intensive use of ICT in all development areas. However, the experience shows that in introducing structural changes associated with the exploitation of development opportunities Slovenia is not radical enough and too slow. For this reason, Slovenia has been gradually losing its competitive advantages in the field of digital society. This situation results from significant under-investment in the development of digital society, a lack of coordination between stakeholders and lack of general awareness of the importance of ICT.

The vision of Slovenia in this field is to take advantage of the development opportunities presented by the ICT and the Internet, namely through accelerating the development of digital society, and to rank among modern and progressive societies. To realise the vision of development, the following development principles will be observed within the development measures:

- general digitisation,
- intensive and innovative use of ICT and the Internet in all segments of the society,
- high-quality broadband infrastructure and fast access to the Internet for everybody,
- development of the inclusive digital society.

Key objectives in the field of the information society development in Slovenia are:

- systematic and focused investments in the development of digital society,
- raising awareness of the importance of ICT for the development of all segments of society,
- establishment of adequate infrastructure,
- increased competitiveness of the Slovene ICT.

6.4.4. Policy of promoting entrepreneurship through supportive environment

The policy of promoting entrepreneurship through supportive environment is important as a contributor to unlock the innovation potential. It provides good framework conditions for entrepreneurship and innovation, promotes the openness of markets, competitive and dynamic entrepreneurship, the culture of healthy risk-taking (entrepreneurial efforts) and creative activities. It also stimulates the mobilisation of private financial resources for financing innovations by strengthening well-performing financial markets and it facilitates access to finance for new companies especially in the early stages of innovation. The role of the supportive environment also covers the dissemination of best practices, support services, consultancy and mentoring. In particular, it is important to promote innovation in small and medium-sized companies, especially in new and young start-ups.

The policy of promoting entrepreneurship is defined in the Supportive Environment for Entrepreneurship Act (hereinafter the ZPOP). As specified by the ZPOP, the basic document planning entrepreneurship and innovation is the strategy defining the industrial policy of Slovenia, therefore the Slovenian Industrial Policy - SIP (see point 2.2.2).

The ZPOP defines development incentives for entrepreneurship and innovation – all types of incentives, beneficiaries and criteria as well as the role of the supportive environment for entrepreneurship and innovation. It aims to establish comprehensive, connected, efficient and transparent supportive environment for entrepreneurship and innovation in Slovenia and ensure efficient method of supporting the operation and development of companies.

Comprehensive supportive environment includes:

- **Entrepreneurial supportive environment** whose key role is to provide basic information to newly established companies and regional/local presence; it consists of (i) national institutions, (ii) economic associations and VEM entry points („One-stop shop service"), (iii) regional development agencies, local communities and other stakeholders.
- **Innovative supportive environment** whose key role is to complement the physical infrastructure with target services and activities for operating companies in order to facilitate faster development and growth. It includes (i) university incubators, (ii) entrepreneurial incubators and (iii) technology parks, (iv) technology transfer offices, (v) other networks and integrations, e.g. EEN.
- **Financial supportive environment** comprises the following institutions: Slovene Enterprise Fund, SID – Slovene Export and Development Bank, Public Fund for Regional Development and Rural Development, Public Agency of the Republic of Slovenia for the Promotion of Entrepreneurship, Innovation, Development, Investment and Tourism**,** venture capital funds and other providers of finance.

Efficient supportive environment facilitates the development of entrepreneurship and innovation and provide better conditions and services for faster growth and development of companies.

6.4.5. Education system

One of important characteristics of modern societies and especially of the societies of the future is the role of knowledge, skills and competences. These are crucial factors for the generation of new value. This does not only involve a high level of knowledge which individuals need to master to successfully integrate into a complex and swiftly changing environment, but also the competences necessary for the 21st century (OECD, 2013). The competences enabling creative and entrepreneurial use of the acquired knowledge is one of the competences needed for successful integration in society and into the labour market whereas strengthening of already acquired knowledge is one of the key objectives of the education and innovation policy. Without creative and qualified people there is no innovation. For this reason, the focus of pedagogical approaches and strategies at all levels of education has to be on strengthening competences for creative and innovative use of knowledge, skills and competences and on successful response to the changing market conditions as well as addressing societal challenges by also taking into account sustainable development principles. To achieve this, the strengthening of creativity and innovation is to be connected to entrepreneurship, understood as readiness, power and courage to implement creative and innovative ideas in a socially responsible manner.

Employment policies have to encourage organisational changes and new business models in terms of generating innovative jobs. Consumers, too, can be active participants in the process of innovation and can contribute most to the so called mass innovation. It is important to stimulate entrepreneurial culture and creativity, entrepreneurship and innovation which are necessary for the development of dynamic, creative companies. The measures relating to the latter are also specified in the RISS and SIP.

Quality higher education is the foundation for internationally comparable and recognised higher education degree, employability and mobility in the Europe and worldwide.

Table 4: Key policies in the system of education

Area of policy	**Orientations**
Development ond organisation of curriculum	- Review and completion of curricula at all levels of education in terms of strengthening creativity, innovation and entrepreneurship (design of an optional subject, inclusion of projects in the extended part of the programme, optional contents, open curriculum), - Development of adequate teaching materials, - Promotion of various forms of the organisation of educational work, management and governance of schools, - Recognition of knowledge obtained in non-formal learning, - Evaluation of pupils' achievements in this area using internationally comparable instruments.
Creative and innovative educational environment	- Implementation and testing of pedagogical approaches contributing to the use of knowledge, skills and competences in successful problem solving, critical thinking, creativity, innovation and entrepreneurship (OECD, 2013) during the instruction, - Training of teachers for the implementation of pedagogical strategies which contribute to the application of knowledge, skills and competences to boost the development of creativity, innovation and entrepreneurship, - Promotion of projects in line with the EU initiative "Open learning environment", e.g. creative classrooms, - Implementation of the projects during the educational course (extended part of the programme, optional contents) together with the stakeholders from the local environment (companies, organisation in the field of culture, research organisations) for entrepreneurial problem solving in the local environment, - Development of programmes of additional education and specialisation (to obtain the professional title of a specialist) in vocational and professional education at all levels (3-year, 4-year and high professional schools) which would be prepared in cooperation with employers and would focus on immediate employability, - Promotion of research activities of the youth (in societies, ZOTKS - Association for Technical Culture of Slovenia, and in school environment – project tasks as a mandatory part of the secondary educational programme). - Implementation of different projects where the participants in education can realise their creative ideas (design of services, products, ideas realised differently, new method of service implementation etc.), - Promotion of the mobility of (job rotation) of practitioners, - Promotion of the mobility of the participants in education (possibilities of cooperation with various educational organisations in the realisation of ideas), - Provision of conditions for the implementation of events in various area (culture, science etc) where an idea is presented, promoted and networked. - Design of networking portals.

Table 5: Dimensions, key objectives and measures of the ReNPVŠ11-20 (Resolution on National programme of higher education 2011-2020)

Dimensions	**Key objectives and measures**
Diversity and variety of institutions of higher education	- Designing various missions and different profiles of higher-education institutions.
Quality and responsibility	- Transition from programme to institutional accreditation and facilitation of the procedure for changing study programmes, - Preparation of the national qualifications framework, - Re-definition of a part-time study and the introduction of a partial study, - Provision of didactic training and support to pedagogical staff, - Improvement of spatial conditions and equipment of institutions, - Adjustment of institutions to use new technologies and ICT, - Cooperation with public research institutes , economy and non-economy, - Openness to the international space.
Internationalisation	- Target support to student mobility, - Promotion of the mobility of Slovene higher education staff, - Measures aimed at attracting foreign experts, - Increasing the number of transnational projects and activities.
Social dimension	- Financing studies at the first and second levels at any time in life provided that certain conditions are met, - Establishment of a transparent system of social transfers, - Integration of less well represented groups in tertiary education, - Fair access to higher education and unobstructed completion of the study, - Increasing funds for higher education and scientific an research work, - Stable multiannual financing based of achieving results.

7. Annex II: Development specialisation of the regions

Table 6: Development specialisation of regions

Western Slovenian Region	
Osrednjeslovenska	- Green system of Slovenia, - Design, pharmacy, biotechnology, - Intergenerational cooperation, development of health and social services, - Tourism, - Energy efficiency.
Goriška	- Development of new products (new materials, ICT, genetics, biomedicine, biotechnology etc.), - Services related to local products and sustainable tourism, - Wood-processing industry (the entire chain including the energy use of wood), food, thermal water, maritime energy.
Gorenjska	- Technological development, entrepreneurship and innovation: electricity, energy, ICT, wood, polymers, medical technology, - Human resources development, - Tourism, - Environment, space and infrastructure, - Rural development (agriculture, forestry and rural development).
Obalno kraška	- Nautical industry, transport and logistics including the „smart-port“ concept (sustainable development, efficient technologies and energy saving in port operations), - ICT, - Processing activities – sea, food, tourism (house of health), energy.
Eastern Slovenian Region	
Zasavska	- Sustainable energy generation, - Development of new materials in the field of nano-materials, power switching elements, circuit breakers and overcurrent and overvoltage protection, - Development of new products made of new materials: electrical fuses, power switching elements, circuit breakers, overcurrent and overvoltage protection, electronic assemblies. Products made of glass and other industrial products in the field of chemistry, electro-engineering etc., - Sustainable tourism.
Spodnje posavska	- Establishment of the forest-wood chain, connecting the owners of forests, marketing of non-wood forest goods, establishment of training courses for forest owners (formal, non-formal), energy use of wood as a natural source, sustainable disposal of wood as a raw material, environmentally conscious activities in forests (tourism, recreation etc.), wood as a raw material which is usable in its entirety and in several life cycles (as a product, residues of processing as wood biomass, recycling and re-use).
JV Slovenija	- New materials, technologies, medical science, pharmacy, wood (design), - Natural resources – water, wood, - Tourism (spa tourism).
Podravje	- Automotive industry, design, new materials, aluminium, - Wood, water, - Sustainable tourism, - Energy efficiency.
Pomurje	- New materials, - Processing activities (food-processing, oil processing industry), - Geothermal energy, - Spa tourism, sustainable tourism, - Energy efficiency.
Koroška	- Metal processing industry, - Establishment of a forestry-wood processing chain, - Sustainable tourism,

	- Industry of components for the automotive industry, - New materials, - Food self-sufficiency.
Savinjska	- Working or processing of materials: o metal-processing industry – automotive industry, home appliances, tool industry and iron industry are in particular well represented in the region, o wood-processing activity – strengthened networking of the members of the forest-product chain –products and created jobs, o plastics processing—processes of industrial production and processing of plastics, o production and processing of glass – production and processing of crystal glass; - food supply: establishment of short food chains, - Sustainable tourism, - Energy supply.
Notranjsko kraška	- Development- and ecology-oriented region famous for a healthy life style and therefore well established tourist destination; - Carpentry, - Processing industries – food, metal-processing.

8. Annex III: Detailed presentation of the key empirical basis

The information on the R&D intensity by activity from the Burger, Kotnik Study, 2014, and the data on the projects of the 7th FP in the 2007-2013 period were used to identify technologically comparative advantages of Slovene industries. In both cases these were the data on input investments which should ensure technological comparative advantages.

R&D intensity of an individual Slovene branch was compared to the average of five most innovation-active states in the EU and thus the datum on relative R&D intensity compared to the innovation leaders was obtained. The data on R&D expenditure (BERD) were taken from Eurostat, namely for 2011 as the last year available. The data are provided in EUR million for the majority of two-digit branches according to the NACE rev. 2 classification, and some important processing industries were also available at the level of three-digit codes. Thus, all economic sectors are covered, from the primary sector to services; however, the identification of propulsive branches for smart specialisation is limited to the processing industry and business services. Nominal values of the R&D expenditure were put into perspective with the value of sales of an individual activity in the year for which data sources were available within Eurostat (Structural Business Statistics database). In order to facilitate the comparison of branches, the R&D intensity of each activity was normalised to the index where 1 represents the average of the R&D intensity in five leading countries.

The data on the cooperation within the 7th FP reflect a high level of concentration as two institutions, Jožef Stefan Institute and University of Ljubljana, realise 65% of all obtained funds. Regional distribution is also interesting as 86% of the value of all approved projects carried out by knowledge institutions is in the Central Slovenian Region. It is followed by the Podravje region with 6% and the same share was also realised by both costal regions together. The analysis of the participation of companies is also important. It shows the branches which in the 2008–12 period showed export and productivity growth, and those which showed revealed comparative advantages (RCA). The following propulsive activities are above the average: Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus (NACE 2 code 271); Manufacture of medical and dental instruments and

supplies (325); Preparation and spinning of textile fibres (131); Manufacture of other products of wood; manufacture of articles of cork, straw and plaiting material (162); Manufacture of paints, varnishes and similar coatings, printing ink and mastics (203) and Manufacture of parts and accessories for motor vehicles (293).

The above listed areas should also be added at least: Research and development activity in natural science and technology, computer programming, consultancy and other related activities, architectural and technical design and related consultancy and production of plastic products.

The production dimension of comparative advantages is based on the analysis of revealed export comparative advantages (hereinafter: the RCA). The RCA coefficients display relative competitiveness or specialisation of an individual sector by the state, which is obtained by dividing a share of the export of a particular industry by a share of total export of the country in total global export. The RCA index exceeding 1 shows that the state is specialised and thus competitive in the export of a particular sector relatively to the competitiveness of the entire tradable sector of the state.

Two data sources were used to calculate the RCA: OECD database BTDIxE and the WITS database of the World Bank. Both of them record only trade in products and for this reason only the data on processing activities are available but not on services. The OECD data are available only at the level of two-digit processing activities and each activity is further divided into intermediate products and end products. The results are presented in Table 14.

Table 7: Index of revealed comparative advantages by activity and type of products in 2011

NACE 1 code	Activity descriptor	RCA intermediate products	RCA end products
15-16	Food products, Beverages and Tobacco	0.44	0.51
17-19	Textiles, Textile Products, Leather and Footwear	0.73	0.68
20	Wood and Products of Wood and Cork	**3.31**	0.93
21-22	Pulp, Paper, Paper Products, Printing and Publishing	1.87	1.33
23	Coke, Refined Petroleum Products and Nuclear Fuel	0.58	0.00
24	Chemicals and Chemical Products	0.76	**3.11**
25	Rubber and Plastics Products	2.06	1.18
26	Other Non-Metallic Mineral Products	1.71	2.32
27	Basic Metals	1.16	0.00
28	Fabricated Metal Products	2.47	1.36
29	Machinery and Equipment, not elsewhere classified	1.72	1.36
30	Office, Accounting and Computing Machinery	0.11	0.11
31	Electrical Machinery and Apparatus, not elsewhere classified	2.14	1.03
32	Radio, Television and Communication Equipment	0.13	0.36
33	Medical, Precision and Optical Instruments	0.39	0.56
34	Motor Vehicles, Trailers and Semi-Trailers	1.02	1.87
35	Other Transport Equipment	0.47	0.15
36-37	Manufacturing not elsewhere classified; Recycling	**4.73**	0.72

Source: Burger and Kotnik, 2014, own calculation using the OECD database BTDIxE.

The comparison of the size of indexes and the number of activities with comparative advantage shows that these are more considerable in the manufacture or export of intermediate products, which confirms that Slovene processing industry is specialised in intermediate phases of the added value chain, namely as suppliers of intermediate inputs to foreign manufacturers of end products. In the majority of activities with expressed comparative advantages, the latter are expressed in both segments of the production chain. Therefore, we cannot speak about exclusive specialisation in intermediate phases of global value-added chains. Yet, a slightly stressed export of intermediate products draws attention to the importance of the integration of the Slovene economy in global value-added chains.

For a more detailed insight into the state of comparative advantages also the WITS database (*World Integrated Trade Solution*) prepared by the consortium of the World Bank, UNCTAD, International Trade Centre, United Nations Statistical Division (UNSD) and the World Trade Organisation (WTO) was used. There is only one way of the aggregation of the trade flows, namely on the basis of the 3-digit NACE Rev. 1 classification.

The integration into global value-added chains was analysed in terms of foreign direct investments. Sectoral structure of the position of the input foreign direct investments was analysed using the data of the Bank of Slovenia (BS: Direct investments 2012, p. 54) and of the OECD for 2012.

In addition, growing activities including the secondary as well as tertiary sector of the economy were identified. The activities which in the 2008-2012 period recorded positive real growth in productivity and exports were regarded as the growing ones. The data from the financial statements of the AJPES for the entire population of companies were applied. The nominal values were adequately deflated by the consumer price index of the base year of 2012. Real growth of added value per employee and of export in the 2008-2012 period were calculated with each 3-digit SKD 2008 activity (equivalent of NACE 2 classification.

Table 15 shows a summary overview of static and dynamic comparative advantages by activity in manufacturing.

Table 8: Static and dynamic comparative advantages by activity; processing activities

NACE 2 code and descriptor	(1) R&D int.	(2) RCA (WITS)	(3) RCA intermediate products (OECD)	(4) RCA end products (OECD)	(5) Share in total FDI	(6) 3-digit industries with RCA>1	(7) 3-digit industries with increasing export and productivity
C10_C11 - Manufacture of food products and beverages	0.74	0.42	0.44	0.51	1.1%	105	108, 109
C12 - Manufacture of tobacco products	N.A.	0.00	0.44	0.51			
C13 - Manufacture of textiles	**2.83**	0.46	0.73	0.68	0.5%	**131**, 139	131
C14 - Manufacture of wearing apparel	0.21	0.37	0.73	0.68	0.5%		143
C15 - Manufacture of leather and related products	1.23	0.40	0.73	0.68	0.5%		
C16 - Manufacture of wood and of products of wood and cork, except furniture; manufacture of articles of straw and plaiting materials	1.92	2.08	**3.31**	0.93	2.9%	161, 162	162
C17 - Manufacture of paper and paper products	0.68	1.56	1.87	1.33	3.2%	171, 172	
C18 - Printing and reproduction of recorded media	0.35	1.89	1.87	1.33	N.A.	181	181, 182
C182 - Reproduction of recorded media	N.A.	N.A.	N.A.	N.A.	N.A.		
C19 - Manufacture of coke and refined petroleum products	N.A.	0.50	0.58	0.00	0.0%		
C20 - Manufacture of chemicals and chemical products	0.46	0.75	0.76	**3.11**	8.0%	*201*, 202, 203, 204, 206	203, 204, 206
C21 - Manufacture of basic pharmaceutical products and pharmaceutical preparations	**1.33**	**2.56**	**0.76**	**3.11**	**6.2%**	**211, 212**	
C22 - Manufacture of rubber and plastic products	0.53	1.49	2.06	1.18	2.3%	221, 222	
C23 - Manufacture of other non-metallic mineral products	0.46	2.10	1.71	2.32	2.5%	231, 232, 233, *234*, 236	232, 239
C24 - Manufacture of basic metals	**0.91**	**1.16**	**1.16**	0.00	1.2%	241, 243, 244	243
C24_FER - Manufacture of basic iron and steel and of ferro-alloys; of tubes, pipes, hollow profiles, related fittings and other products of first processing of steel; casting of iron and steel	**1.03**	0.30	N.A.	N.A.	1.2%	241, 243	243
C24_NFER - Manufacture of basic precious and other non-ferrous metals; casting of light metals and other non-ferrous metals	**0.94**	**1.16**	N.A.	N.A.	1.2%	244	
C25 - Manufacture of fabricated metal products, except machinery and equipment	**1.07**	**1.39**	**2.47**	**1.36**	3.6%	251, 252, 257, 259	256
C254 - Manufacture of weapons and ammunition	N.A.	0.00	N.A.	N.A.	N.A.		

C26 - Manufacture of computer, electronic and optical products	0.74	0.87	0.11	0.11	0.4%		
C261 - Manufacture of electronic components and boards	0.45	1.05	N.A.	N.A.	0.0%	261	
C262 - Manufacture of computers and peripheral equipment	0.21	0.20	N.A.	N.A.	0.0%		
C263 - Manufacture of communication equipment	**1.73**	**1.52**	0.13	0.36	0.3%	263	
C264 - Manufacture of consumer electronics	0.87	0.68	0.13	0.36	0.3%	264	264
C265 - Manufacture of instruments and appliances for measuring, testing and navigation; watches and clocks	0.64	1.56	0.39	0.56	0.6%		265
C266 - Manufacture of irradiation, electromedical and electrotherapeutic equipment	N.A.	N.A.	N.A.	N.A.	0.6%		
C267 - Manufacture of optical instruments and photographic equipment	N.A.	0.60	0.39	0.56	0.6%		
C268 - Manufacture of magnetic and optical media	N.A.	0.56	N.A.	N.A.	0.3%		
C27 - Manufacture of electrical equipment	0.60	**1.76**	**2.14**	**1.03**	N.A.	271, 272, 275	271, 272
C28 - Manufacture of machinery and equipment n.e.c.	0.78	**1.26**	**1.72**	**1.36**	N.A.	281, 282, *283*, 289	283
C29 - Manufacture of motor vehicles, trailers and semi-trailers	0.59	**2.54**	**1.02**	**1.87**	1.9%	291, 292, 293	293
C30 - Manufacture of other transport equipment	N.A.	1.50	0.47	0.15	0.1%		303
C301 - Building of ships and boats	**8.68**	**1.35**	N.A.	N.A.	N.A.		
C302 - Manufacture of railway locomotives and rolling stock	N.A.	2.42	N.A.	N.A.	N.A.		
C303 - Manufacture of air and spacecraft and related machinery	0.75	2.03	N.A.	N.A.	N.A.		303
C304 - Manufacture of military fighting vehicles	N.A.	0.00	N.A.	N.A.	N.A.		
C309 - Manufacture of transport equipment n.e.c.	0.94	0.56	N.A.	N.A.	N.A.	309	
C31 - Manufacture of furniture	1.52	2.44	3.31	0.93	N.A.	310	
C32 - Other manufacturing	0.70	1.39	4.73	0.72	N.A.	323, 324	321, 323, 329
C325 - Manufacture of medical and dental instruments and supplies	**0.90**	**1.86**	0.39	0.56	N.A.	325	325
C33 - Repair and installation of machinery and equipment	0.87	1.29	N.A.	N.A.	N.A.	331, 332	331

Source: Burger and Kotnik, 2014, own calculation based on the data provided by: AJPES, the Bank of Slovenia, Eurostat, WITS, OECD.

Table 16 presents static and dynamic comparative advantages for other activities.

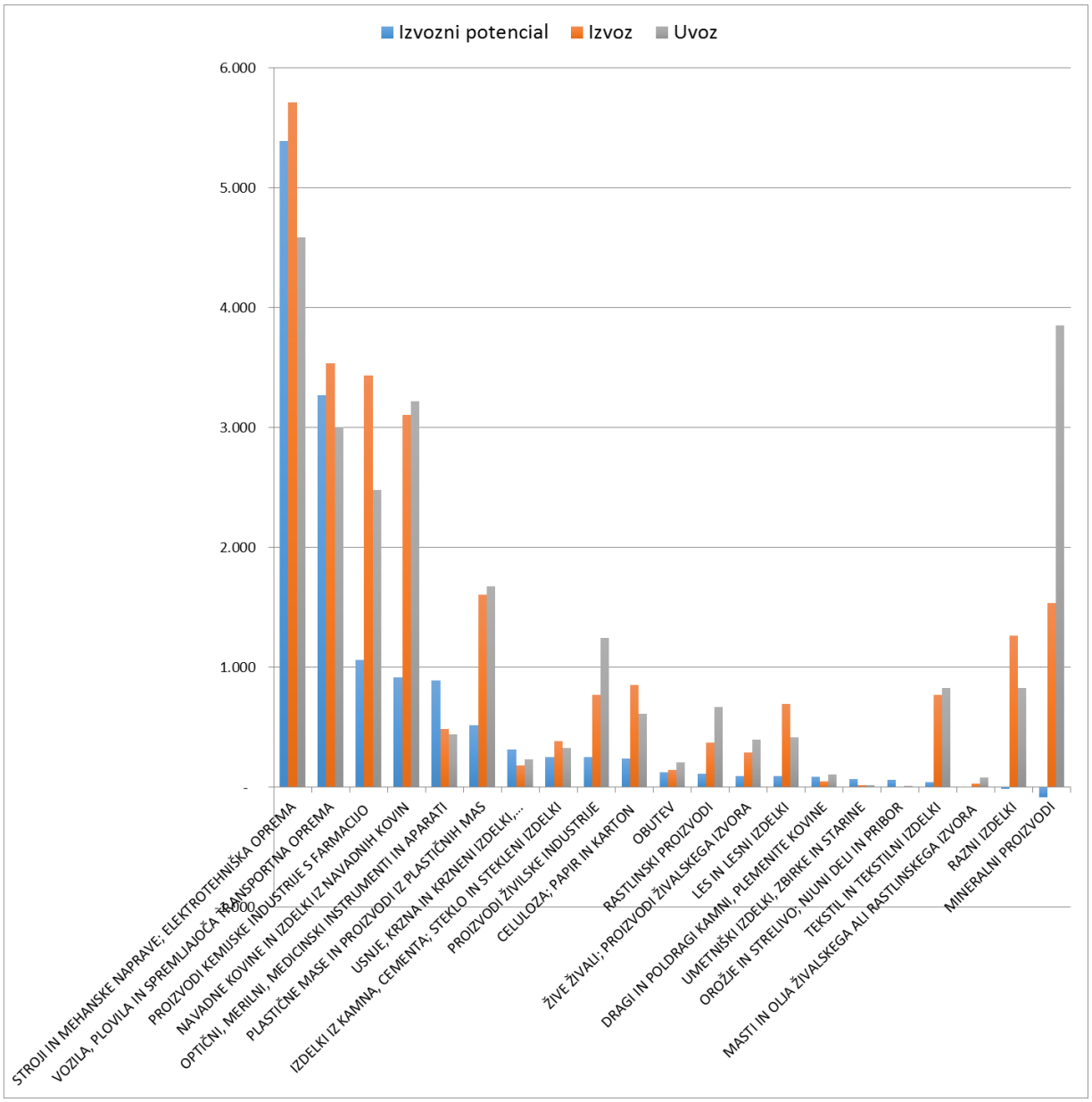
Table 9: Static and dynamic comparative advantages by activity; other activities

NACE 2 code and descriptor	(1) R&D int.	(2) Share in total FDI	(3) 3-digit industries with increasing export and productivity
D35_E36 - Electricity, gas, steam and air conditioning supply; water collection, treatment and supply	0.65	2.6%	351
E37-E39 - Sewerage, waste management, remediation activities	0.00	N.A.	390
F - Construction	0.33	0.4%	
G - Wholesale and retail trade; repair of motor vehicles and motorcycles	0.19	15.6%	464, 477, 479, 492
G465 - Wholesale of information and communication equipment	0.41	N.A.	
H - Transportation and storage	1.24	1.3%	
H49 - Land transport and transport via pipelines	**1.15**	**0.2%**	**492**
H50 - Water transport		0.2%	
H51 - Air transport		0.02%	512
H52 - Warehousing and support activities for transportation	**2.25**	**N.A.**	**521, 522**
H53 - Postal and courier activities	21.4	1.3%	532
I - Accommodation and food service activities		0,3%	
J - Information and communication	0.73	N.A.	611
J58 - Publishing activities	0.70	N.A.	582
J581 - Publishing of books, periodicals and other publishing activities	2.13	N.A.	
J582 - Software publishing	**3.04**	**N.A.**	**582**
J59 - Motion picture, video and television programme production, sound recording and music publishing activities	0.17	N.A.	
J62 - Computer programming, consultancy and related activities	0.78	0.6%	
J63 - Information service activities	1.56	N.A.	
J631 - Data processing, hosting and related activities; web portals	2.85	N.A.	
J639 - Other information service activities		N.A.	
M - Professional, scientific and technical activities	**0.94**	**N.A.**	**721, 732**
M72 - Scientific research and development	0.81	0.1%	721
N - Administrative and support service activities	0.07	N.A.	773, 801, 803, 812, 822
N77 - Rental and leasing activities		0.2%	773
N78 - Employment activities		N.A.	
N79 - Travel agency, tour operator reservation service and related activities		N.A.	
N80 - Security and investigation activities		N.A.	801, 803
N81 - Services to buildings and landscape activities		N.A.	812
N82 - Office administrative, office support and other business support activities	0.16	4.4%	822

Source: Burger and Kotnik, 2014, own calculation based on the data provided by: AJPES, the Bank of Slovenia, Eurostat, WITS, OECD.

Another special study prepared for the needs of the S3 is FIDEA, 2014, which is based on the estimate of the export potential based on the comparison of the volume of export with the leading countries in *individual product groups*. The analysis stems from the Eurostat data - the International Trade Database for the period 2011–2013 at the level of 4-digit product groups. The selection of reference countries is subject to three leaders based on prices and three leaders based on the quantity for a product group. This serves as the basis for the calculation of a weighted average price which the leading countries actually achieve on the market, which is compared to the prices actually achieved on the market by Slovene producers. This is the basis for the estimation of additional export potential. Figure 7 presents key results.

Figure 6: Assessment of the export potential by product division, IN EUR million



Source: FIDEA, 2014

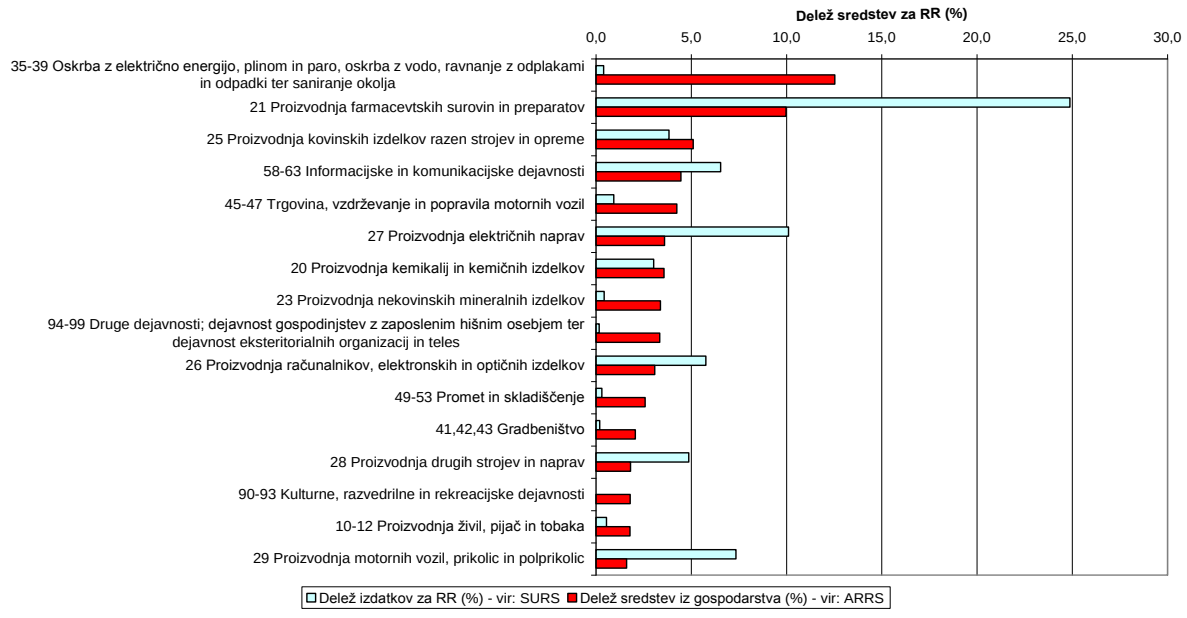
The analysis reveals great potentially in mechanical engineering, electrical and electronic equipment in the segment of automotive and nautical industry, in chemical and pharmaceutical industries, and Slovenia also has great export potentials in the field of materials in particular metal and plastic ones and in the area of optical, measuring and medical instruments and apparatus. These results are consistent with the conclusions of the first study and serve as the basis for the initial proposal of the S3 prepared in 2013.

At the same time, both studies enable a more detailed analysis which was used in the preparation of the amended version of the S3. The first study was not only the analysis at the level of the 2-digit and 3-digit SKD classification but was conducted to the level of individual companies. The S3 does not list concrete companies, however, the insight at this level was useful in the dialogue with the stakeholders when defining individual parts of branches identified as particularly promising.

A detailed analysis was also performed in the FIDEA study, 2014, where the data at the level of 4-digit product groups enable a thorough insight in the export potential and consequently the competitiveness of an individual area. Such an insight is the base for the specification and justification of the priority areas of application. Thus, the authors of the study establish that Slovenia achieves relatively high export prices in product groups associated with fashion, which shows the potential of creative industries (ibid.: 15) that were given much more prominent position in the amended version of the S3.

Among the empirical materials, a comparison of the structure of RD expenses of the business sector and contractual funds from economy prepared by the SRA should be mentioned. Figure 8 presents gross RD expenditure by economic activity (source: SORS) and the data on the involvement of the programme groups (A3) in economy; these are funds obtained from companies (source: the SRA). The data of the SORS refer to 2011 whereas the data of the SRA refer to 2012.

Figure 7: Gross RD expenditure by economic activity expressed as a share of total RD expenditure in 2011, and the data of PROs acquired from companies – as a share of all assets in 2012.



Source: SORS and SRA, recalculation and lay-out by SRA, 2013.

In the Figure, the energy and water supply somehow stands out, but this is an exception as the majority of research work is conducted in the public sector and there is little private development activity. In other areas, most of the development work is carried out in companies. The largest expenditure for both areas are found in pharmacy, chemical industry and engineering industry and ICT, Electric and electronic devices, which show the greatest development potential and need special attention.

9. Annex IV: Process of entrepreneurial discovery

From 2000 onwards, the ministries and agencies of the Government of the RS have supported the integration and knowledge transfer of the RTDI players through clustering, the establishment of technological networks, centres of excellence, competence centres and similar project-oriented organisational forms of consortiums. Owing to the support of the development infrastructure and primarily the pre-market research the players in Slovenia were already connected at the time of the S3 preparation and were able to focus on the phase of the transition to the global markets, namely on the basis of developed technologies, their integration in the priority areas of application and the concentration of the resources available, therefore through cooperation. Direct participation of the stakeholders in the processes for determining priorities and instruments of support by 2013 was significant and has been well documented[53]. With regard to the process of entrepreneurial discovery of the S3 it needs to be pointed out that it builds on and upgrades all the previous processes of focusing on and specialising in the areas where Slovenia achieved knowledge concentration and international visibility during the long past period of extensive investments. In doing so, the recommendations contained in the RIS3 Manual were observed in the methodological sense.

9.1. First phase of the S3 preparation: determination of the basic priorities

The MEDT had the leading role of the S3 coordinator in 2012 and the process consisted of four phases. In the first phase, that is by April 2013, it prepared the grounds and methodological framework for the S3 based on the analyses available then and in the second phase also the Chamber of Commerce and Industry of Slovenia as the national representative institution with a direct contact with the economy and well positioned for the implementation of the process of entrepreneurial discovery following the „bottom-up“ logic was involved. The process contained eight professionally conducted debates/workshops with the stakeholders from the economy, research and development institutions and civil society which were held from May to July 2013 and were attended by 467 representatives. The discussion was organised by content sets covering (1) development centres, (2) pharmacy, chemistry, materials; (3) electronics and electrical engineering, electronic and optical devices, metal industry, materials; (4) transport equipment and systems; (5) medical and measuring instruments, devices and accessories; (6) sustainable technologies in construction and environment; (7) biotechnology, safe food and food processing industry; (8) information and communications technology, creative industries and services; (9) advanced materials and

[53] Of particular note is the process facilitated by the Council of the Government of the RS for competitiveness from 2007 to 2009 which resulted in the determination of the priorities and criteria for tenders cofinanced by the ERDF for centres of excellence and competence centre; prior to the tender related to the latter, the Government of the RS, in the context of entrepreneurial discovery, also published a call for a statement of interest and then received project proposals by almost 100 project consortiums from across Slovenia.

technologies and (10) sustainable technologies for the energy sector and transport. Content-wise, the discussion addressed three levels: (a) the articulation of comparative advantages in terms of knowledge and competences, (b) the definition of opportunities, needs and challenges on the markets and (c) the definition of the needs for changing the RTDI ecosystem and the role of the state.

Based on this round of discussions, the first comprehensive draft of the S3 including the definition of the priorities and the indication of objectives was prepared in the third phase. In August 2013, the document was subject to public discussion where the interested public made comments and recommendations. On the basis of the comments received during the public consultation and additional consultations held in September and October, the basic official version of the S3 was prepared in the final phase. It defined three horizontal content priorities: (a) materials and related technologies, (b) electric and electronic components and devices and (c) process technologies and ICT which are to present the response to societal, environmental and market challenges recognised in the Slovenian industrial policy, namely: sustainable energy, mobility and construction, efficient use of resources, health, food and environment and the inclusive and safe society. Figure 6 summarises the concept.

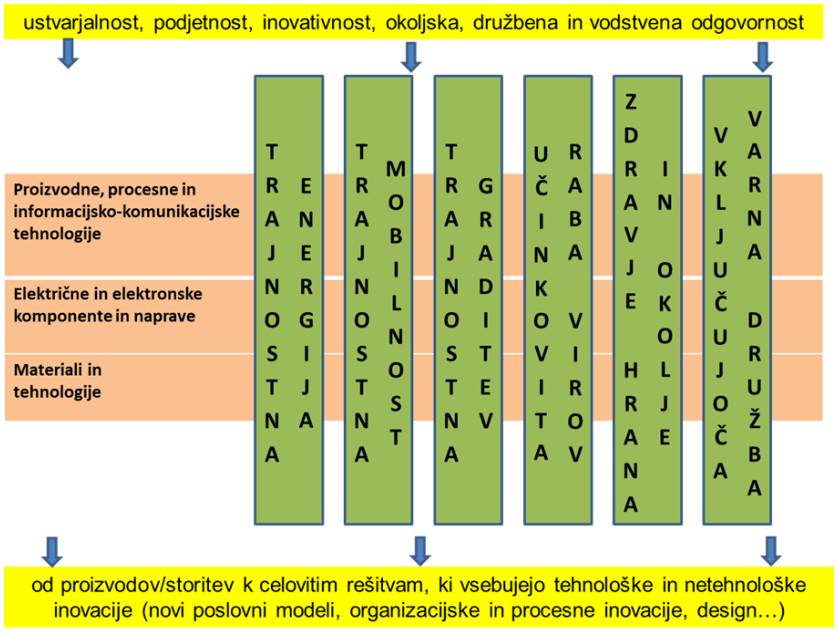


Figure 8: Matrix of identified key priorities of the initial version of the Smart Specialisation strategy

Within the narrow thematic areas, three key content areas were first defined.

a) Within the PRODUCTION, PROCESSING AMD INFORMATION-COMMUNICATIONS TECHNOLOGIES priority area

Competences	Capacities (products and services)[54]
Production and process technologies, systems and services	1) Processing technologies and processes, 2) Intelligent management of systems, processes and devices, 3) Computerisation and systems of management, 4) Eco-technologies.
Information communication technologies, systems and services	5) Communications networks, distributed systems and service platforms, 6) User interfaces and multimedia applications, 7) Internet of things, 8) Cloud computing, 9) Tools and components for radio, control, and navigation systems.

b) Within the priority area ELECTRIC AND ELECTRONIC COMPONENTS AND DEVICES

Table 10: Competences and capacities within the priority area of electric and electronic components and devices

Competences	Capacities (products and services)[55]
Electric drives and actuators	1) Components for propulsion systems, 2) Electric machines, 3) Applications with built-in electric drives.
Optical, photonic and sensor elements	4) Measuring devices and instruments, 5) Sensors and actuators, 6) Analysis and process techniques.
Electronic systems and devices	7) Power electronics, 8) Electronic devices and systems, 9) Electricity equipment.

c) Within the priority area NEW MATERIALS AND TECHNOLOGIES

[54] Description of thematic areas, examples of products, services and technologies: 1) automation, robotisation, measuring, communication and control systems, information and signal processes, modelling, design and simulation of products and systems, mechatronics, tool making, adaptable and adaptive production, 2) customised integrated systems for machines and devices, smart sensors and actuators for applications in various environments, 3) applications in the field of energy, transport, environment and health (e.g. management of biological and medical processes), 4) equipment, components (sensors, optics, infrastructural equipment), protocols and services of managing applications in various environments, development of new metadata systems, mobile platforms, 5) converged communication services and engineering, multimedia systems and services, interactive portals, technological equipment, design and creative services, 6) platforms for the development of applications, processing of huge quantities of data, analyses and visualisation, 7) network systems and services (hardware, component development, application transfer), 8) satellite communications, GIS technologies and applications for spatial data presentation, antenna and radar technology, equipment and devices.

55 Description of areas, examples of products, services and technologies: 1) comutators, terminal blocks, rotors, 2) suction units, electric drives for household appliances and vehicles, industrial electric motors, compressors, purpose ventilation fans, hybrid drives, consumer electronics, 3) home appliances, white goods, vehicles (cars, planes, ships and boats), 4) electronic devices and components, optical and photonic elements, instruments, 5) relays, fuses, small transformers, contactors, circuit breakers, protective devices, 6) applications for various parts of production, energy and environmental systems, medicine (biomedical technique and sensors of biological processes), 7) electronics for propulsion systems (suction units, vehicles), converters for electric drives, photovoltaic systems and uninterruptible power supply, electronic circuits, electromagnetic components, 8) Switching devices and built-in electronic sets, process equipment for managing and controlling systems, systems for the protection, management and automation of processes, 9) Energy, distribution and special transformers, turbines, telecommunications equipment, meters.

Table 11: Competences and capacities within the priority area of new materials and technologies

Competences:	**Capacities: products**[56]
Materials	1) Metal, alloy and lightweight materials, 2) Surface engineering and coatings, 3) Biomaterials, 4) Electrical and optical functional materials, 5) Multifunctional materials, 6) Industrial and other materials, 7) Biologically active substances.
Service activities associated with materials	8) Characterisation, research in natural science, technology and biotechnology, control and testing, research … 9) Recycling and re-use.

The period from November 2013 and February 2014 was marked by the opinion which the European Commission prepared with regard to the initial proposal of the S3. Irrespective of a wide range of preparatory and consultation activities the initial proposal was strongly criticised and it received a considerable response in the media. The reactions mainly referred to:

- Criticism of the management of the entire process, mainly of the weak role of the state,
- Insufficient focus on the priorities which would not be sufficiently based on the analysis and SWOT,
- Incompleteness of the tools of policies to support the priorities,
- Insufficiently elaborated international dimension of the strategy.

9.2. Second phase of the S3 preparation: upgrading it and the agreement on the S3

Also based on these circumstances, the Government of the Republic of Slovenia adopted a decision to establish a special service for the coordination of the development process, namely the Government Office for Development and European Cohesion Policy which prepared a new methodological framework in March 2014 and started a new cycle of the coordination of priorities of the S3 with the stakeholders.

Two additional empirical studies were prepared as the basis for decision-making concerning the section referring to networks and value chains. Their focus was on the comparison of the performance of the Slovene economy and the reference best performing European countries in individual fields – the content is presented in detail in the next subsection. At the same time, two additional technical bases were prepared in the field of supportive environment for entrepreneurship with particular reference to the start-up ecosystem (Kos, 2014) and knowledge transfer and application (Stres, 2014). In March and April, the first round of

56 Description of areas, examples of products, services and technologies: 1) metals and alloys, lightweight materials: steels, aluminium, 2) surface engineering and coatings: thin-layer coatings, 3) biomaterials: natural materials and natural-based materials, bio-degradable materials, 4) electrical and optical functional materials: high-energy permanent magnets with high content of rare earth elements, magnetic composites, magnetocalorics, electronic ceramics, ZnO ceramics, piezo ceramics, transparent conductive films, thermoelectrics, 5) multifunctional materials: insulation materials, sensor materials, electronics, tribological materials, textiles, 6) industrial and other materials: lubricants, additives, glues, ZnO, insulation materials (construction material), recycled materials and their re-use, composites, colloids and liquid crystals, polymeric materials, materials for sustainable and low-carbon applications, storing materials, 7) biologically active substances, 8) characterisation, research in natural science and technology: characterisation of materials, testing, research in natural science and technology, 9) new solutions for processing waste materials and their re-use.

coordination was carried out involving representative stakeholders regarding the methodological approach. Among these stakeholders the following should in particular be exposed: Chamber of Commerce and Industry – Technological Development Council, the Chamber of Craft and Small Business of Slovenia, rectors' conference and the coordination of public research organisation KOsRIS and some other organisations such as for example the Slovenian Academy of Engineering. In parallel, a dialogue with key institutions within the Government, including the implementing bodies, took place.

This process was completed by an official opening of the public discussion, namely on 16 and 17 April in the Creative Centre Poligon where the updated concept of the Smart Specialisation strategy was presented. The conference on 16 and 17 April was attended by more than 200 participants each day. The participation was not only representative but also at an extremely high level. This included the Prime Minister, two ministers, four state secretaries, rectors, directors of institutes, representatives of the Chamber of Commerce and Industry and the Chamber of Craft and Small Business of Slovenia, non-governmental organisations and companies, researchers innovators, youth organisations and similar. The supplemented concept of smart specialisation as presented in section three achieved very broad support. This restored positive and constructive dynamics of development coordination focused on the future. This was the result of sufficiently clear concept and especially sufficiently credible management of the entire process whose mandate should not only be limited to the document preparation but should also cover the phase of implementation after its approval.

In a part of the discussion that addressed further focusing on the priorities of the S3, The purpose of a concrete shift from „priorities" to „priority areas of application" was introduced. It was clearly presented that this was a step forward continuing the work done in 2013, which means the concretisation of the areas which Slovenia will focus on – therefore the areas of use. The structure of workshops and speakers were selected on the basis of prepared empirical basis (electric and electronic components and devices, materials, ICT, chemistry, tool industry, pharmacy) and there was an open discussion concerning the potentials of traditional industries (textile, furniture industry, construction business …) and also the potentials of the rural areas and their services were addressed (nature, tourism, agriculture, wood, food, energy, industries bio-based industries). On the other hand, the discussion in the field of entrepreneurial-innovation ecosystem focused on defining the necessary measures and support services for fast-growing companies with the global growth potential, the promotion of entrepreneurship at the regional level and the field of social innovation. It provided orientations for the necessary further steps. A lively process of entrepreneurial discovery is reflected in the fact that that in the case of two thematic workshops the participants organised themselves and prepared written initiatives concerning the orientation the S3 should take (e.g. in the field of social innovation).

At the conference, an additional cycle of the entrepreneurial discovery process was encouraged which, in itself, could not constitute sufficiently sound basis for the preparation of a proposal for the priority areas of application. To obtain a better insight into the dynamic potentials of the future in addition to the empirical bases offering the assessment of the situation and potentials based on the past development, a public call for the submission of written initiatives was announced at the conference. These should be prepared in a form of business plans because this enables the best evaluation of the market potential of individual initiatives – but it is true that due to a short period of time and incomplete technology this was in many cases not realistic to demand.

The Government Office for Development and European Cohesion Policy was submitted 48 written initiatives. They were sent by the universities, the Slovenian Academy of Sciences and

Arts, a group of companies, research organisations, various, sometimes even related intermediary institutions (e.g. centres of excellence, competence centres, various platforms), non-governmental organisations and also CCI. The submitted initiatives were in most cases an excellent basis for the definition of the priority areas of application (especially where cross-sectional links of the potentials of several stakeholders or technologies were integrated). A definition of the role of the state which should provide support services and measures needed most by the initiators proved to be particularly useful.

On the basis of all the activities carried out till then and by taking into account the initial S3 the first synthesis was prepared regarding the orientation of the Smart Specialisation Strategy in the future. Six priority areas of application were presented at two public events, namely at a conference PODIM 2014 on 14 may in Maribor and during the Peer Review organised by the Commission's Joint Research Centre from Sevilla on 15 and 16 may in Portorož. Peer review with selected participants reflected a high level of motivation of stakeholders to prepare a quality document for long-term guidance of the instruments of innovation and entrepreneurial ecosystem in Slovenia. It mirrored a critical and open view of the existing situation and this is why the discussion was focused. As is evident from the report[57], the selection of priorities already at this stage reflected a considerable level of coherence as well as that the defined orientations (although relatively numerous) would have to be placed within a more solid framework of measures and especially a more robust system of uniform governance and monitoring of the effects. Content-wise, the key shortcoming and at the same time the recommendation of the participants was the need to check and consider the cross-border of the RTDI cooperation, which was taken into account in the second official proposal.

The fourth event of this round of the Smart Specialisation Strategy preparation was then organised on 6 June in Maribor 2014. The workshop was attended by more than 120 representatives from the economy, development and government institutions, institutes, chambers, centres of excellence, universities and other important stakeholders with whom the Government office for Development and European Cohesion Policy had a constructive dialogue throughout the process. In the field of value chains and networks, the upgraded concept, the so called second iteration of the priority areas of application whose number decreased to five, was presented in line with the then discussion. The discussion revealed strong cooperation and support of the players from the economy to the selected priority areas of application, as well as it provided additional arguments supporting the selection. In the second part, the discussion touched upon reasonable clusters of measures to support priority areas of application.

In the following month, the GODC organised an intensive round of consultations with the ministries and competent government agencies. Based on this, the second official draft of the S3 was prepared.

[57] Feedback Report from the peer review of the Slovenia RIS 3, SPS Platform, EC, June 2014