Slovenia's Smart Specialisation Strategy

S4

September 2015

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LIST OF ABBREVIATIONS

AJPES	Agency of the Republic of Slovenia for Public Legal Records and Related Services
ERA	European Research Area
ESFRI	European Strategy Forum on Research Infrastructures
EU	European Union
EUSAIR	EU Strategy for the Adriatic and Ionian Region
EUSAR	EU Strategy for the Alpine Region
EUSDR	EU Strategy for the Danube Region
FDI	Foreign direct investments
FTE	Full time equivalent
GDP	Gross domestic product
GEM	Global Entrepreneurship Monitor
GODC	Government Office for Development and European Cohesion Policy
ICT	Information and communications technology
IMAD	Institute of macroeconomic Analysis and Development
IUS	Innovation Union Scoreboard
NIP	National Innovation Platform
OECD	Organisation for Economic Cooperation and Development
OP	Operational Programme for the Implementation of the EU Cohesion Policy 2014-2020
RDA	Research and development activity
RDI	Research, development and innovation
RISS	Research and innovation Strategy of Slovenia
SIP	Slovenian Industry Policy
SME	Small and medium-sized enterprises
SORS	Statistical Office of the Republic of Slovenia
SRA	Slovenian Research Agency
TFEU	Treaty on the Functioning of the European Union
TRL	Technology readiness level
UNWTO	United Nations World Tourism Organization
VA	Value added
WTTC	World Travel and Tourism Council

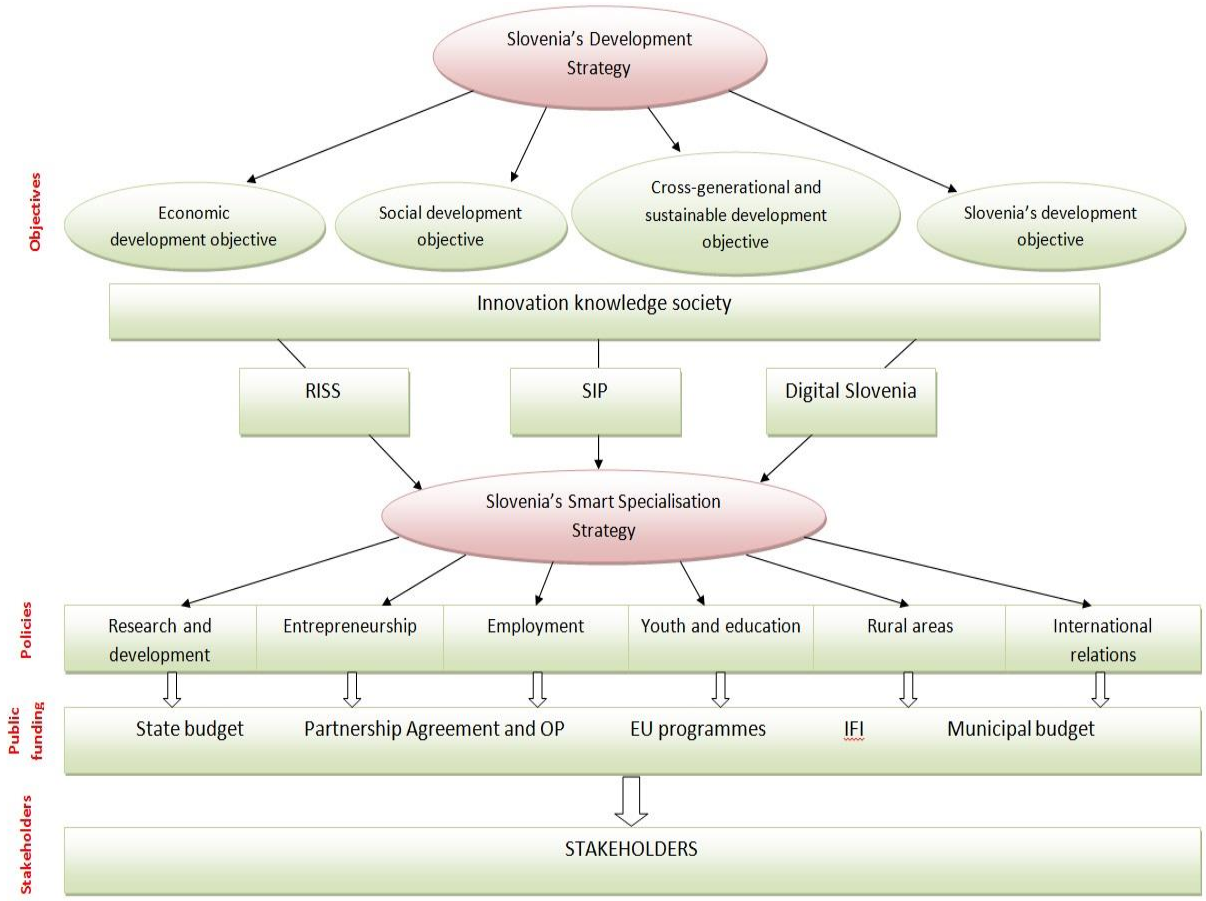
What is S4

Smart specialisation is a platform for concentrating development investments in areas where Slovenia has the critical mass of knowledge, capacities and competences and where there is innovation potential for placing Slovenia within global markets and thus enhancing its recognisability. Smart specialisation is a strategy aiming to:

a) strengthen the competitiveness of the economy by enhancing its innovation capacity
b) diversify existing industries and service activities
c) boost growth of new and fast-growing industries and enterprises

S4 is an implementing document relating to the already-adopted strategic documents. S4 addresses all four objectives set under the existing Slovenia's Development Strategy for the 2006-2013 period which pertain to establishing an "innovative knowledge society" for which Slovenia has already identified three key field-specific strategies, namely the Research and Innovation Strategy of Slovenia 2011-2020 (RISS), Slovenian Industry Policy (SIP) and Digital Agenda, as well as other specific and relevant strategies in the field of nature protection, energy, education, etc. Slovenia's guidelines are thus integrated and outlined in a more concrete manner within a single and a consistent framework facilitating the implementation of focused and synergistic measures.

Figure 1: Position of S4 within Slovenia's development planning



1. Vision and strategic objectives

1.1. What is the state of play

The below-given table summarises the key strengths, weaknesses, opportunities and threats (SWOT analysis) of Slovenia's economic, research and development innovation system. The relevant strengths, weaknesses, opportunities and threats, which are presented in more detail in the supporting document, served as the basis for identifying the S4 concept and the relevant policy mix.

Strengths	Weaknesses
- Diversified economic structure ➔ potential in terms of complementarity and the provision of integrated solutions. - High level of research and development activity (RDA) in the business sector. - Good research and development (R&D) capacity and potential in the public sector. - Strong involvement of Slovenian stakeholders in international vale chains and networks. - High productivity of well-managed companies, including subsidiaries of multinational companies in Slovenia, in particular those with preserved function of development. - Areas of excellence in academic and industrial research. - Educated labour force, language skills and willingness to learn. - Comparatively intensive research, development and innovation (RDI) policy over the past 15 years and a stimulating tax environment for RDI. - Well-developed infrastructure/internet accessibility. - High-quality living and working environment, and resources for the transition to green economy: o security o clean and healthy living environment, preserved biodiversity, natural resources o developed tourist infrastructure and tradition and cultural heritage - The awareness that structural changes are needed is gradually growing ➔ this is reflected in the gradual innovation-related changes (e.g. in terms of companies being prepared to cooperate with each other).	- Diversified economic structure ➔ fragmentation, lack of critical mass and relative absence of strong economic systems. - Over-indebtedness of companies and often unstable ownership structure with the absence of strategic shareholders, including foreign investments. - Share of budgetary resources and public expenditure for RDA, and a significant gap between R&D expenditure of the public and business sector. - Public funding and RDI management model. - Commercialisation of knowledge and technologies. - Low level of internationalisation of science and higher education. - Innovation-related activity and performance of companies. - Despite the extensive scope of inventions the transition to innovation is not sufficient due to: o Weak development departments in companies o Weak *cooperation* (a) between knowledge institutions and the economy; (b) between companies; (c) between knowledge institutions o (absence of) systemic incentives within knowledge institutions (career systems and mobility, rehabilitation procedures, etc.) o Partiality and incompleteness of the supportive environment and development incentives which (a) do not address in a systematic manner the entire development cycle (through technological levels), (b) are overly-fragmented in terms of content, (c) do not cover integrated support and (d) are time-wise unpredictable and unstable o Fragmentation of support institutions lacking sufficient critical mass o Orientation in developing products based on the development of technologies (push factor) with too little emphasis on the development of services/experiences (pull factor) o Underutilised potential of culture and creative industries

	- Weak and unstable institutional capacity of the state, excessive bureaucratisation of procedures and non-supportive tax environment for entrepreneurship.
Threats	**Opportunities**
- *Brain drain*, in particular of young people, the educated, those having entrepreneurial spirit and posessing experiences, witihn the economy as well as konwledge institutions and public adminsitration, with the ageing of the population being an issue as well. - *Capital flight*, redirected investments and departure of companies to other regions and countries. - Enhanced responsiveness, adapatability, activity with our competitors. - Domination of neighbouring economic and knowledge centres (Graz, Udine, Zagreb, etc.). - Compared to our competitors the quality of infrastructure poses a threat: e.g. ICT infrastructure as well as rail and road infrastructure (risk of a declining accessibility of Slovenia as an economic, logistic and tourist location). - Perception of Slovenia as a peripheral, non-competitive and rigid country which is investment-and talent-unfriendly. - Focusing individual activities on existing locations.	- Reorganisation of international value chains and new industrial revolution: o Opportunities to establish a stronger position within higher level value added (VA) value chains o Global uncertainty may enhance the attractiveness of locations that are closer to end markets o Opportunities to attract foreign investments, namely to enhance the existing and attract new foreign investments, in particular through knowledge-intensive activities (development departments) - Brain circulation and attracting foreign talents. - Green jobs and material and energy efficiency in relation to the use of natural resources, water management biodiversity and traditional knowledge. - Strengthening integration instruments at the EU level - Cross-border complementary linkages with the specialisation of neighbouring economic and knowledge centres ➔ synergies for mutual benefit. - Accessibility/location: proximity of strong economies, innovation leaders. - Visibility in terms of well-preserved nature, cultural heritage and offer, gastronomy and other traditional activities and the extraordinary achievements of individuals (e.g. in sports, culture). - Further opening up of markets among major world trading blocks and traditional presence of Slovenian stakeholders in certain emerging markets (Southeastern Europe, Russia, Middle East, etc.). - The small size of Slovenia and proximity of stakeholders (Slovenia as a reference country).

1.2. Objectives: where are we headed

S4 strategic objective is

SUSTAINABLE TECHNOLOGIES AND SERVICES FOR A HEALTHY LIFE

on the basis of which Slovenia will become a green, active, healthy and digital region

with top-level conditions fostering creativity and innovation

focused on the development of medium- and high-level technological solutions in niche areas.

In priority niche areas Slovenia will no longer act as a **follower but as a co-creator of global trends** which is, indeed, S4 mission.

The key S4 target variable is ***raising the value added per employee*** which is to be measured at the level of the individual areas of application. Overall S4 implementation performance (by 2023) will result in:

1. **increased share of high-tech intensive products in export ➔** increase from 22.3% to EU-15 average of 26.5%

2. **increased share of export of knowledge-intensive services in total export ➔** increase from 21.4% to 33% which will reduce Slovenia's below-EU-average rate by a half

3. **increased overall entrepreneurial activity ➔** increase from the current 11% to at least the EU average of 12.8%

1.3. How do we get there – S4 concept

S4 addresses in a comprehensive manner a broad range of development policies related to innovation, in particular the policy of promoting research and innovation, industrial policy, entrepreneurship promotion as well as some parts of the education system, rural development policy, international relations, improved regulatory environment (procedures related to the issuing of permits), etc. The state will provide financial support to the identified priority areas as well as non-financial support providing services implemented in close cooperation with strategic partnerships.

S4 identifies priority areas and the areas of application to be addressed as a priority under Slovenia's development policy. S4 also optimizes the supportive business-innovation ecosystem the nature of which should be horizontal with the performance thereof also depending on the competitiveness of priority areas (e.g. in promoting the establishment of new enterprises).

Due to Slovenia's limited critical mass in a given area and due to the strong regional complementarities between stakeholders in all areas, S4 is designed as a nationwide document. Nevertheless, Structural Funds are divided between the two cohesion regions, namely the cohesion region Vzhodna Slovenija and the cohesion region Zahodna Slovenija,

which will guarantee Slovenia's harmonious development and enhance overall national competitiveness. In addition to addressing individual cities and the related urban areas, S4 also directly addresses the innovation potential of rural areas.

S4 is based on a model of "open and responsible innovation", including social innovation. A critical contemplation regarding various aspects and consequences of the process of increasing (market) competition and market specialisation for the individual and the society is indeed an integral element of the smart specialisation process. In addition to purely economic parameters and conditions, the introduction and penetration of new technologies depends on a wide range of soft factors. S4 therefore places great emphasis on non-technological and social aspects at various levels (individual, social groups, organisations), e.g. in terms of identifying, defining and evaluating the individual thematic areas and future societal needs, joint co-decision, etc.

Key principles pursued during S4 implementation:

1. *Consistency of the policy mix* in terms of the degree of technological development, over time and in terms of the size of projects

2. *Integrated approach* that addresses in a comprehensive manner RDI, infrastructure, human resources, demand-side measures, regulation and internationalisation

3. *Strategic approach* with clearly defined priorities and tailored governance structure

4. *Complementarity* in relation to other financial instruments (leverage), and between grants and refundable types of support

5. S4 focuses on technologies and areas which will show results by 2020 and which predominantly pertain to the current economic structure and its potential, by *also supporting emerging industries and areas*. The share of the latter in the financing structure, by also taking into account the funds used for research and development in the framework of promoting entrepreneurship, will be targeted at approximately 20%.

6. *Tailored response* in terms of the specificity of individual priority areas.

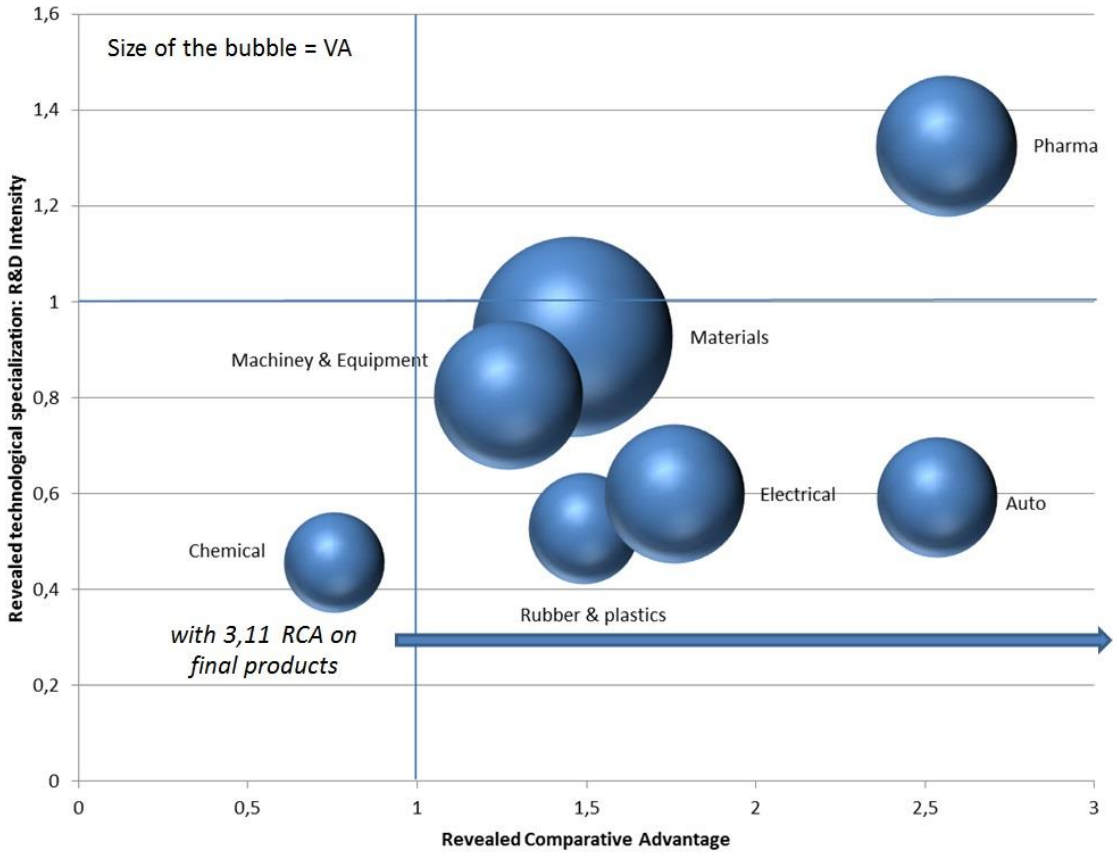
2. S4 priority areas

Empirical bases

In identifying S4 priority areas of application great emphasis was given to strong empirical bases. The key bases, prepared specifically for S4, are Burger and Kotnik 2014 and FIDEA 2014. During the empirical bases preparation phase we focused on the international competitiveness of specific economic activities and product groups. The sector-specific analysis was prepared by taking account of technological specialisation, analysis of comparative export-related advantages, the attractiveness of a specific area in terms of foreign investments and dynamic analysis of performance in terms of the growth in productivity and export performance. The structure of each sector was analysed up to the level of individual companies which thus provided a better insight into the potential of well-performing companies in the sectors demonstrating poor performance. The second study evaluated the untapped export-related potential at the level of products, namely in comparison to the best performing EU Member States.

The obtained data, regardless of whether technological or comparative export advantages were used (be it comparative export advantage at the level of individual products or the scope of cooperation between science and the economy), concretely show that a stable set of key economic activities exists in Slovenia. Figure 2 identifies the economic activities with revealed comparative advantages which form the backbone underpinning S4. The below-given areas account for a quarter of Slovenia's value added with the areas of S4 application representing further specialisation. This means that S4 in practice pertains to the selection of a limited set of priorities. The figure also demonstrates that, with the exception of pharmacy, all areas are technology-wise lagging behind the leading countries, which is an issue at the core of S4.

Figure 2: Presentation of revealed comparative advantages and revealed technological specialisation by areas; the size of the bubble shows the scope of the value added



Source: Data from Burger and Kotnik 2014, calculated and demonstrated by Government Office for Development and European Cohesion Policy (GODC)

Entrepreneurial discovery process

In addition to the strong empirical bases with international benchmarking, an intense entrepreneurial discovery process played a key role in identifying S4 priority areas. During the period 2012-2014 over 1500 participants took part in the entrepreneurial discovery process. Based on the empirical bases identifying the areas where Slovenia has comparative advantages a structured dialogue took place with the stakeholders. The aim of this structured dialogue was to identify priority areas of application. On the basis of an open invitation in 2014 we gathered written initiatives specifying the direction in which Slovenia should go. At this stage the overall entrepreneurial discovery process facilitated identifying indicative

priority areas of application, including eliminating the areas possessing a smaller critical mass or potential, but not ensuring sufficient concretisation of priority areas. In 2015 we therefore carried out another round of entrepreneurial discovery process, the scope, depth and quality of which was a culmination of this process and also the launching of a strategic cooperation between stakeholders. In April 2015 we published an open invitation for identifying the most high-potential technologies and product directions. We received a response from over 400 companies and virtually all relevant knowledge institutions. Since the invitation required identification of the most promising product directions the process was marked by a strong response of the economy and knowledge institutions, which established a bridge with the latter being one of the key challenges in the transition from inventions to innovation. 170 initiatives were developed with an average of 10 partners per initiative. The initiatives represented the basis for further concretisation of S4. Through an active dialogue between stakeholders integration was promoted in accordance with the following criteria:

- The existence of a critical mass of competences and capacities both in the field of RDA and sales.
- Quality of the initiative, in particular in terms of the presence of a clear and convincing chain of product development to the market through various levels of technological development, the expected results and in terms of financial, material and institutional feasibility.

The concentration process, including elimination, was implemented in several stages. The first stage, which took place in 2013 and 2014, was implemented on the basis of structured dialogue and gathering of written initiatives. The second stage, which took place in 2015, was based on a clear guidance in the framework of an open invitation which allowed participation of only mature and most ambitious initiatives. Participants themselves often eliminated the areas which did not comply with the given criteria. The third stage eliminated initiatives which did not take into account the identified criteria; such initiatives were not taken into account as a basis for identifying the priority areas. Stage four of the entrepreneurial discovery process was a direct dialogue with the stakeholders (e.g. in the framework of a conference which took place on 15 and 16 June 2015) which served as a basis for further developing the priority areas. In the framework of an interministerial coordination process focus areas were further strengthened, but the expressed expectations to include additional priorities, which indeed might prove interesting but do not for example poses the needed critical mass, were not accepted. The set of priority areas of application is a result of a long and challenging process of elimination and concentration of key areas where Slovenia can position itself within global markets. A detail description of this process is given in the supporting document.

The following table gives a summary of the bases for the priority areas presented below:

Table 1: Justification for the priority areas prepared on the basis of the number and quality of the submitted initiatives for an individual priority area.

	Empirical basis	Source of comparative advantages	Response received under entrepreneurial discovery process
Healthy living and working	STRONG	Knowledge, economy and	VERY STRONG

environment		tradition/heritage	
Natural and traditional resources for the future	MEDIUM	Nature, values and economic potential	STRONG
(S)Industry 4.0	STRONG	Knowledge, economy and tradition/heritage	EXCEPTIONALLY STRONG

Each priority area comprises various areas of application in the framework of which focus areas and technologies are identified.

S4 concentration as a process

The S4 concentration process does not end with the identification of focus areas and technologies in the framework of various areas of application. Together with the promotion of establishing strategic partnerships (for a more detail description see section 6 on governance system) it should be understood as a process which shall continue after S4 approval. If S4 is a platform for concentrating development investments, it is clear that concentration cannot and should not be implemented in one step but should indeed be based on entrepreneurial initiative as S4 concentration is a permanent and dynamic process.

One of the key tasks of strategic partnerships is thus the design of action plans (roadmaps) in the framework of which the concentration process shall continue. In addition to the critical mass of capacities and competences the process of further concretisation of focus areas and technologies shall give specific emphasis to:

1. Analysis of market opportunities and the impact on competitiveness, resulting from joint and coordinated appearance of stakeholders (both large, medium and small-sized enterprises in cooperation with research and other organisations).
2. Identification of comparative advantages of stakeholders in Slovenia compared to the competition.
3. Willingness of the private sector to invest in these areas.

In terms of concentration the preparation of action plans is thus a continuation of the entrepreneurial discovery process.

2.1. HEALTHY WORKING AND LIVING ENVIRONMENT

This priority area pertains to those areas of application where systemic solutions, i.e. integration of process technologies with end products, should be developed. These areas are in need of intensive investment in research and development, as well as intensive integration of stakeholders. Such cooperation does not only pertain to cooperation of the scientific sphere with the economy, but also to the cooperation of stakeholders introducing solutions into the market. With regard to the latter the role of the state and the public sector as a whole is of great relevance not only in terms of its role as the promoter of cooperation but also in terms of demand, i.e. promoting development through innovative public procurement.

2.1.1. Smart cities and communities

Objectives

I. develop globally-competitive systemic solutions in the field of smart grids and IT platforms with user solutions

II. establish at least two pilot projects, in particular in the area of energy, urban mobility and safety

III. use reforms of public administration and introduction of smart health systems for the entrepreneurship promotion and access to global markets

2023 objective: raise value added per employee in companies by 15%.

Focus areas and technologies

- *Focus areas*

1. Systems and IT platform solutions – IT ecosystem for hosting (mobile) applications
2. Conversion, distribution and energy management

- *Technologies*

1. Cloud computing and big and open data
2. Internet of things and future internet
3. Embedded smart systems
4. High Performance Computing (HPC) infrastructure
5. Capture and use of long-distance earth observation data

Empirical bases and SI competitive advantage

ICT is well developed in Slovenia and demonstrates high comparative R&D intensity compared to leading European countries (e.g. within the economic activity C63 "Other information service activities" the average is exceeded by 56%; see Burger and Kotnik 2014:

21). The leading Slovenian export-oriented companies and their solutions have been present for decades both in the most developed economies as well as in emerging markets (e.g. BRICS). In addition to the usual marketing channels the competitive advantage also lies in the traditionally well-developed and well-established cooperation between top-level knowledge institutions and the economy, resulting in the greater scope of ICT revenues of software research groups (EUR 2 million in annual revenue). In the framework of ICT we can identify intensive cooperation within FP7 on the basis of which we can predict a fruitful cooperation under Horizon 2020. Among the states that joined the EU in or after 2004 Slovenia is the only country with its own development and manufacture of major telecommunication systems having own global brand.

The establishment of national cloud computing in 2015 provides a good platform for enabling transmission of open data and services. The new innovative development of the cloud shall act as a key platform for the development of application solutions using open data and open services that will be systematically provided by e-Government projects. This concept opens up opportunities in particular for small and medium-sized enterprises as cooperation and sharing of information generated within the government in various fields create opportunities for new innovative e-services, mobile applications and the consequent creation of new digital jobs. Opportunities for availability of ICT tools used for development and testing of future commercial applications also arise.

We predict establishment of strong synergies and complementarities with other S4 areas of application and OP investments under thematic objectives 2, 3, 4 and 11 as ICT is by its nature a horizontal area.

Slovenia has revealed comparative advantages in the area "Manufacture of electric motors, generators, transformers and electricity distribution and control apparatus" (C27.1 see Burger and Kotnik 2014: 18) where companies enhanced value added per employee in the period 2008-2012 by 13.5% and exports by 15.7% (ibid.) which demonstrates that great potential exists in this area. Slovenia's competitive advantage lies in the supply of cost-competitive solutions by offering better-developed technological solutions (e.g. greater energy savings, new technological solutions) for systems in smart settlements. Culture and creative industries also represent an opportunity as these industries are developing faster than other segments of the national economy.

During the entrepreneurial discovery process 16 initiatives, pertaining to the area of Smart cities and communities, were prepared with an estimated investment value of EUR 200 million. 230 stakeholders participated in the preparation of these initiatives of which 130 are representatives of the economy.

International dimension

Stakeholders are intensively and internationally connected through industrial and interest groups (e.g. AIS (Association for Information Systems), EUNIS (European University Information Systems), INNS (International Society on Neural Networks), IACIS (International Association for Computer Information Systems), SYDDARTA (System for Digitalisation and Diagnosis in ART Applications) as well as through EU technology platforms (NESSI, NEM, Networld2020). International research connections with neighbouring regions have also been established (from Milan to Budapest) with regional links being further strengthened in the future (Alpine Mediterranean Region, Danube Region). The economic partners have established numerous global links to markets in Europe, Asia and the USA, including the world's leading IT companies. Pursuant to the decision of 2 July 2015 Slovenia is a full member of the European Space Agency (ESA) which shall give a new

impetus to Slovenian SMEs – in the 5-year period, during which Slovenia acted as a participating ESA Member State, ESA approved 26 Slovenian projects in the total amount of EUR 5.2 million.

2.1.2. Smart buildings and homes, including wood chain

Objectives

I. develop integrated management systems for buildings, homes and the working environment of the future, and smart appliances for energy efficiency and self-sufficiency of buildings and Internet of things as a horizontal orientation

II. inter-sectoral networking and integration of the wood chain in the design of homes and working environment of the future by also promoting research and innovation deriving from traditional knowledge and skills of the use of wood and wood-compatible natural materials

2023 objective: raise value added and export of companies by 15%.

The above-given will be achieved by establishing stronger links with knowledge institutions, connecting stakeholders in the supply and demand side, as well as through innovative and pre-commercial public procurements in synergy with the planned investments under OP thematic objective 4.

Focus areas and technologies

1. Smart housing units
2. Smart environment using intelligent building management systems
3. Smart appliances
4. Advanced materials and products, including wood composites

Empirical bases and SI competitive advantage

Slovenian companies in the field of building construction master a wide range of technologies and knowledge covering almost all of the fundamental aspects of modern and sustainable construction with respect to tradition and cultural heritage. Slovenian companies, backed by the experience of research and educational institutions, manage to construct buildings and implement competitive projects which combine various areas of modern engineering such as energy autonomy of buildings, multifunctional building envelope, smart systems in buildings, advanced building materials and computer-integrated life cycle of buildings, which is complemented by activities in the field of smart built environment. Joining into chains with a more uniform market presence enables stronger penetration into foreign markets. The potential is also supported by empirical data with Slovenia having pronounced revealed comparative advantages in the framework of "Manufacture of other non-metallic mineral products" (C23) as well as in "Manufacture of paints, varnishes and similar coatings, printing ink and mastics" (C20.3) where value added per employee increased by 6.4% in the period 2008-2012.

The field of smart equipment and domestic appliances demonstrates significant concentration of capacities and potential which is also reflected in stable export-related comparative advantages (see the production of domestic appliances, C27.5 in Burger and Kotnik 2014).

Specific emphasis in this area of application is given to wood. With 1,184,526 hectares of forests covering 58.4% of the country, Slovenia is one of the most forested countries in Europe and wood is, indeed, a natural asset that should be utilised. The annual increment in Slovenia stands at over 9 million m^3 of wood, which is a renewable raw material. Slovenia is an active exporter of wood but is currently exporting mainly various forms of raw wood. Wood should therefore be actively supported as part of products which are successfully marketed by Slovenian companies. Slovenia has export competitive prices of builders' joinery or various building materials made of wood (product groups 4418, 4421, 4412 – see FIDEA 2014) with the Slovenian manufactures of prefabricated buildings offering competitive prices in comparison to Europe's leading companies. The current annual export amounts to around EUR 150 million (ibid.).

Many development opportunities lie in the investments in renovation of the building stock (including cultural heritage), energy efficiency and the use of renewable energy sources, which will be financed within OP thematic objective 4. With a clear focus on innovative business models S4 measures will strengthen the existing high investment potential of companies.

During the entrepreneurial discovery process 15 initiatives, pertaining to the area of Smart buildings and homes, were prepared with an estimated investment value of EUR 250 million. 220 stakeholders participated in the preparation of these initiatives of which 120 are representatives of the economy.

International dimension

Stakeholders are already heavily involved in a number of international networks such as Renewable Heating and Cooling Technology Platform, E2B Technology Joint Initiative, Enbrel, European Network of Building Research Institutes, ECTP, European Construction Technology Platform (including FA Cultural Heritage), EPAQ, the European Quality Assurance Association for Panels and Profiles, RESSEEPE – Retrofitting Solutions and Services for the enhancement of Energy Efficiency in Public Edification, HEROMAT – Protection of Cultural Heritage Objects with Multifunctional Advanced Materials, ICOMOS, International Council on Monuments and Sites, IIR, International Institute of Refrigeration, DKV – Deutsche kältetechnische Verein, IDEA – International District Energy Association, the US ESTTP – European Solar Thermal Technology Platform (Faculty of Mechanical Engineering). Stakeholders also have rich and extensive experience in the field of international development and research cooperation in the context of the Framework Programmes (FP6, FP7), COST, international technological platforms, clusters and networks. Among the many research projects funded by international instruments the following are particularly noteworthy: project InnoRenew, which was accepted for the first phase under the *Teaming* tender. The aim of the initiative is to establish a leading regional institution in the field of renewable materials and healthy living environment, namely within the cooperation established by 9 partners, including the great foreign partner Fraunhofer-Institut für Holzforschung Wilhelm- Klaudit-Institut.

2.2. NATURAL AND TRADITIONAL RESOURCES FOR THE FUTURE

This priority area pertains to those areas of application which depend on the use of natural and traditional resources (e.g. cultural heritage, crafts, etc.) and which involve a number of stakeholders, usually without an obvious dominant actor. In these areas progress depends greatly on the integration of various production stages into a single chain or network. Within this priority area the state plays three roles, namely acting as the promoter of cooperation, assuming the risks related to the development of technologies, as well as playing a key role in terms of establishing adequate regulatory conditions.

2.2.1. Networks for the transition to circular economy

Objective

Connecting stakeholders – business entities, educational and research system, non-governmental organisations, the state and individuals – into value chains according to the principle "economy of closed material cycles" to development new business models for the transition to circular economy

2023 objectives:

1. raise the material efficiency index of 1.07 (2011) to 1.50 (2020)
2. establish 5 new value chains with closed material cycles

Focus areas and technologies

1. Technologies for sustainable biomass transformation and new bio-based materials
2. Technologies for use of secondary and raw-materials and reuse of waste
3. Production of energy based on alternative sources

Empirical bases and SI competitive advantage

Trends regarding natural resources demonstrate a sharp rise in prices accompanied by 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 in accessing natural resources. The pressures regarding access to natural resources are further increased by the growth of the global population and in this context mainly the growth of middle class consumers. Slovenia has relatively well-preserved natural resources but the mentioned pressures call for better and more efficient preservation and management of natural resources, in particular when they are important for long-term prosperity and ecosystem services. Consequently, economic systems of linear economies have to transform to circular ones by eliminating the concept of waste, and thus provide conditions for long circulation period of products in use, their cascading use and the provision of clean and unpolluted materials which can be reused. For establishing such a system innovation at the level of business models and the establishment of adequate systems of the so called reverse logistics are essential.

It is estimated that by 2020, the market of bio-based products will equal EUR 200 billion. In the period 2014-2030 this field will create 1 million jobs, mainly in rural areas. The same can be said for bio-plastics which could replace about 90% of conventional plastics. Currently less than 1% of biopolymers based on renewable raw materials are being used.

Putting the model of industrial symbiosis into place is a development opportunity not only for the chemical industry, which is one of the most competitive industries in Slovenia, but also for a range of traditional industries such as paper, wood and textile industries, agriculture, agro-industry and service activities. In the field of "Materials recovery" (E38.3) Slovenia does not demonstrate revealed comparative advantages, however companies demonstrate an average value added per employee of over EUR 48,000 which exceeds the Slovenian average by more than a quarter.

Market potential of sustainable energy production is steadily growing, in particular with regard to solar and wind energy, with anticipated high growth being pronounced also in systems for combined heat and power (CHP) which utilize a variety of different materials. Slovenia will focus on those segments of the market where companies are already represented in global markets or have a real potential for a breakthrough into global markets. The field of sustainable energy production demonstrates an already-established cooperation between companies as well as research institutions, which will be further upgraded with the aim of maintaining the highest level of quality and in particular with the objective of integrating entire systems where higher value added of products can be generated in accordance with the B2C business model.

During the entrepreneurial discovery process 30 initiatives, pertaining to the area of Networks for the transition to circular economy, were prepared with an estimated investment value of over EUR 950 million. Over 250 stakeholders participated in the preparation of these initiatives of which over 150 are representatives of the economy.

In the field of technologies for the use of secondary raw materials and reuse great potential is demonstrated in the building sector, paper industry, manufacture of rubber, agriculture, metallurgy and food industry. Using biomass does not only pertain to the production of energy; the initiatives build on the use of biomass for new biological materials and related products in papermaking and chemical industry.

International dimension

Partners participate in the EU Joint Technology Initiative in the field of Bio-based Industries. By implementing joint projects they cooperate with foreign research and industry-related partners in various programmes under Horizon 2020, *inter alia*, NMP (advanced materials), FoF (Factories of the Future), Spire (sustainable industry) etc. Certain initiatives and international connections have already been established for example in the field of development and use of nanomaterials in cooperation with partners from the Netherlands, Belgium, Israel and Sweden, and in the field of advanced technologies for the processing of pulp and paper with partners from Germany, Finland, Italy, the Netherlands, Spain and Portugal, the development of new next-generation microbial cell factories for the production of green chemicals, in the field of algae and biogas technologies, etc. Stakeholders have also established intense international links through EU projects, for example BERST "BioEconomy Regional Strategy Toolkit" or Poly4EmI, with such cooperation being further enhanced in the future.

2.2.2. Sustainable food production

Objectives

I. promote sustainable production of high-quality food in relation to a business model that will integrate knowledge institutions with manufacturers and economic entities along the entire value chain, including the development of new marketing models in domestic, European and global markets

II. establish an innovative and short supply chains for locally and organically produced foods with a guaranteed and recognised traceability from the field to the table

III. ensure long-term sustainable conditions for the development of the varieties and farming practices adapted to Slovenian territory and to climate change

2023 objectives:

1. establish at least three value chains which will provide a critical mass of consumption and which will be supported by long-term contractual partnership based on economic initiative
2. raise value added per employee in companies by 20%

Focus areas and technologies

I. Sustainable production and processing of food products into functional foods

II. Technologies for sustainable agricultural production (livestock and plants)

Empirical bases and SI competitive advantage

When it comes to the food sector Slovenia does not demonstrate overall comparative advantages, however, certain segments demonstrate a positive trend which shows that there is potential in this area. "Manufacture of dairy products" (C10.5) demonstrates revealed comparative advantages, while "Manufacture of other food products" (C10.8) and "Manufacture of prepared animal feeds" (C10.9) record positive growth in value added per employee and exports during the period 2008-2012. The positive trend in terms of revealed comparative advantage is also observed in the field of livestock (Burger and Kotnik 2014: 13). In "Manufacture of agricultural and forestry machinery" (C28.3) Slovenian companies do not disclose comparative advantages; however data for the period 2008-2012 show a 4% real growth in value added per employee and over 9% of growth in exports, which reflects the dynamic nature of the areas and demonstrates that there is untapped potential.

During the entrepreneurial discovery process 30 initiatives, pertaining to the area of Sustainable food production, were prepared with an estimated investment value of over EUR 500 million. Over 200 stakeholders participated in the preparation of these initiatives of which over a half are representatives of the economy.

In this context we have identified focus areas where the market potential is the strongest and where stakeholders work towards establishing a value chain by taking into account Slovenia's natural resources. Thus, entrepreneurial discovery process demonstrated that in terms of natural resources Slovenia has great potential in the field of bovine meat production based on the model of sustainable extensification. This is also a result of the fact that the percentage of

grasslands stands at around two-thirds of agricultural land, which represent the ideal primary production resources while ensuring sustainable management of natural habitats with dominant grassland in less-favoured cultivation areas. The same applies to functional foods, which represent a great market opportunity for the development of the food processing industry along with the supply chain and all the local suppliers that provide process solutions in manufacturing. Market analyses show that 56% of Europeans are trying to improve their health by using proper food/drinks, and that 19% of Europeans use functional foods at least a few times a week, with demand not being strongly related to the already-established brands.

International dimension

Stakeholders are active in the European Research and Innovation Area, including the EU framework programmes, Horizon 2020 Co-fund scheme (ERA NET, EU EJP) Intereg, Life +, COST, EURAMET etc. In 2012 the European Commission established the European Innovation Partnership in the field of agriculture (EIP-AGRI) which encourages all forms of sustainable agricultural production by applying an innovative approach and through the cooperation between research and production organisations where Slovenia intends to actively participate. In the area of functional foods stakeholders are active and have established links under a variety of European technology platforms and initiatives such as the "Food for Life", "Plants for the Future", "Agriculture Food Security and Climate Change" – FACC JPI, "A healthy diet for a healthy life" – HDHL JPI. A network of partners throughout Europe has also been established where cooperation will be further strengthened and which involves stakeholders from France, Germany, Greece, Austria, Italy, the Netherlands, Spain, Czech Republic and Belgium.

2.2.3. Sustainable tourism

Objective

A key development priority of the Slovenian tourism is the design of a competitive and sustainable tourism product which will place Slovenia on global markets as a green, active and healthy tourist destination. Emphasis will be placed on the development of integrated services providing a top-level experience by including and taking into account the preservation of nature and natural and cultural resources. This will be achieved through systematic development of targeted, specialised, customized and innovative tourism products and services tailored to individual needs and wishes, namely at national, destination and local level.

2023 objectives:

1. raise value added of tourism by 15%
2. increase the inflow from export of travel services by 4 to 6% annually
3. enhance energy efficiency in tourist facilities by 20%

Organisation-wise the above-mentioned will be achieved by connecting tourist economy stakeholders and by establishing connections with other sectors, namely:

I. between holders of tourist companies

II. holders of tourist companies within a specific area with other stakeholders (stakeholders from other sectors, smaller providers, local communities, non-governmental organisation, etc.)

III. by promoting innovative and connecting products according to the bottom-up approach

which will be supported with a strategic partnership, international networking, good supportive environment (e.g. incubators) and proactive role of the state.

Focus areas and technologies

In light of the fact that S4 focuses on innovation and entrepreneurship and in particular on the integration of stakeholders with the objective of achieving the common objectives, the priorities are as follows[1]:

1. IT-based marketing and networking through the creation of innovative, integrated and sustainable tourism products and services in line with upcoming needs

2. Knowledge for enhancing the quality of services ➔ service design, innovative management, process innovation, branding of basic (catering) and thematic tourism products by taking into account internationally recognised brands, and training

3. Technological solutions for sustainable use of resources in accommodation facilities ➔ in relation to activities in the field of smart buildings

4. Green Slovenian tourism scheme ➔ systematic approach to integration, guiding and developing sustainable and integrated solutions at the destination and local level

Empirical bases and SI competitive advantage

Tourism is the fourth largest economic activity in the world reaching high growth rates. According to UNWTO forecasts, the number of tourists will rise to EUR 1.8 billion by 2030 (currently standing at EUR 1.03 billion) which represents 800 million new arrivals globally over the next 15 years (UNWTO, 2013). According to WTTC, tourism in Slovenia directly generated EUR 1,296 million in 2012, which represents 3.5% of GDP with the total contribution of travel and tourism industry representing EUR 4,707 million in 2014 which represents 12.7% of GDP – the total GDP, which is a result of tourist consumption. Tourism is also a very important export activity – in the balance of payments it covers a little over 8% of total exports and over 40% of exports of services. Inflows from export of travel (consumption of foreign tourists in Slovenia) totalled EUR 2,240 million in 2014, which represents 39.4% of service exports in 2014 and 8% of total exports of goods and services in 2014. The current trends in tourism are focusing on developing high-quality sustainable tourism for demanding customers, also in relation to well-preserved natural and rich cultural heritage (nature and culture tourism). Among European countries Slovenia has already been recognized as a country with the highest plant and animal biodiversity rate, also having a very high proportion of Natura 2000 sites, rich and diverse cultural heritage and developed potentials of cultural offer from exhibitions to concerts and festivals. Such wealth represents a great potential for the development of high-quality eco-tourism. This kind of activity can also be a platform for establishing horizontal links with the development of innovative green technologies and is the perfect complement to the policies in the field of sustainable food.

[1] This area of application will not receive direct support under OP thematic objective 1 but will be supported through a specific policy mix – see section 4.1.6.

During the entrepreneurial discovery process 24 initiatives, pertaining to the area of Sustainable tourism, were prepared with an estimated investment value of over EUR 200 million. Nearly 100 stakeholders participated in the preparation of these initiatives of which over three quarters are representatives of the economy.

The focus areas have been identified on the basis of a limited number of initiatives that demonstrate the highest level of integration and on the basis of which the tourism industry will specialise in a systematic manner.

International dimension

Stakeholders have established strong links within international research organisations and with international tourism businesses and operators. Tourism is strongly represented when it comes to participation in EU programmes and projects (e.g. cultural heritage, Unesco, European Heritage Label, Eden Destination, Transromantica, Gothicmed, Camino de Santiago in Slovenia, St Emma trail), in particular in the context of European Territorial Cooperation where a number of projects and initiatives are being, or will be, implemented (e.g. CBC SI-HR project HISTUR, HINT-LAB, Malvasia TourIstra, CrossBench, Wellness Istria, CBC SI-ITA project eTurist T-Lab, Adriatic programme, Zero Waste project; Erasmus Lifelong Learning Programme, project Innovative Marketing of Coastal Destinations, Leonardo Da Vinci project VIRBUS etc.). Also the green Slovenian tourism scheme is integrated into the framework of sustainable tourism at the global level; the scheme is in the final stages of the certification process by the Global Sustainable Tourism Council which will make the scheme a globally-accepted development and certification scheme.

2.3. (S)INDUSTRY 4.0

This priority area pertains to those areas of application which, as a rule, have a dominant actor or a group of strong actors with an already-established cooperation with the scientific sphere but where the opportunities are not fully taken advantage of in terms of:

a. stronger strategic links between strong private sector actors in order to offer integrated solutions and consequently to have a joint appearance on the market
b. stronger links with research organisations in developing products with respect to the upcoming needs in the medium and long term
c. stronger links with small and medium-sized enterprises in terms of strengthening supplier networks as well as creating development networks
d. promoting the creation of new product directions by promoting the establishment of new companies
e. modernisation and digitalisation of production processes and production cycle management

2.3.1. Factories of the Future (FoF)

Objective

1. Comprehensive technological restructuring of tool industry by raising value added per employee by 25%, i.e. on average EUR 45,000 per employee by 2023.

2. Raising the level of digitalisation with automation and robotisation in manufacturing: in the automotive industry the rate of robotisation is comparatively high[2] so emphasis will primarily be put on introducing automation[3]. In all other areas automation as well as increasing the number of robots is key with the target standing at a 50% increase, i.e. an increase from 48 to 72 per 10,000 employees. In the framework of demonstration factories value added per employee will rise by at least 20%.
3. Connect knowledge and creativity of stakeholders in the field of photonics for new impetus and new market opportunities in the global markets with the aim of achieving the average value added of EUR 75,000 by 2023.
4. Increase *export* of automated industrial systems and equipment by at least 25% by 2023, in particular in tool industry, robotics and smart industrial mechatronic systems.

Focus areas and technologies[4]

➢ *Focus areas*

1. Production optimisation: (distributed) production management and control, quality assurance, regulation and data processing, intralogistics, automation
2. Optimisation and automation of production processes: smart machines and equipment, mechatronic systems, actuators and smart sensors

➢ *Technologies*

Technologies to be used under the area of application Factories of the Future are cross-cutting and will – as a priority – be applied also in other areas of application as shown in the below-given table (the identification of areas of application derives from the entrepreneurial discovery process).

Table 2: Identification of priority areas of application where enabling technologies under this domain shall be applied in accordance with the entrepreneurial discover process

	1.1. Smart cities	1.2. Smart buildings and homes	2.1. Circular economy	3.2. Health - medicine	3.3. Mobility	3.4. Materials
1. Robotics			✓	✓	✓	✓
2. Nanotechnologies		✓	✓	✓		✓
3. Modern production technologies for materials		✓	✓	✓	✓	
4. Plasma technologies			✓	✓	✓	✓
5. Photonics and micro- and nanoelectronics	✓	✓		✓	✓	
6. Control technology		✓	✓			

[2] Source: http://www.worldrobotics.org: 638 robots per 10,000 employees in 2013.
[3] The objective in terms of the number of demonstration factories in this field is specified under the domain "Mobility".
[4] In light of the complexity of the area and linkages to other areas, this topic is divided into focus areas and technologies.

Empirical bases and SI competitive advantage

In the field "Manufacture of machinery and equipment" (C28), including "Manufacture of other special-purpose machinery" (C28.9), Slovenia has revealed comparative advantages in terms of intermediate and final products (see Burger and Kotnik 2014). The long-term dynamics, with the exception of the analysed period of the last two years, demonstrates continued strengthening of comparative advantage from 2004 onwards. The study FIDEA 2014 identifies huge untapped export potential which exceeds EUR 3.5 billion in the product group 84. The area also has great research potential. For example, in the field of photonics Slovenia has the highest number of diode-pumped solid-state medical lasers per capita with a series of small and medium-sized highly specialized companies many of which have become world leaders. In terms of the number of toolmakers per million inhabitants, Slovenia takes the second place with Japan having the highest number in the world. In terms of excellence of services Slovenia is second in Europe, preceded only by Portugal. This demonstrates that there is great potential for development.

During the entrepreneurial discovery process 16 initiatives, pertaining to the area of Factories of the Future, were prepared with an estimated investment value of EUR 950 million. Over 200 stakeholders participated in the preparation of these initiatives of which over 150 are representatives of the economy.

The area of smart factories is an extremely integrating and horizontal area with a marked interest of users as well as providers of smart factory technologies.

International dimension

International partnerships have already been established, in particular through active involvement in platforms such as EFFRA, ISTMA, Žemva, CEEPUS, MATERA ERA-NET – Bonaco, MATERA- ERA-NET- Multifuncoat, Photonics 21, PPP platform euRobotics etc. Links with similar clusters in Central European countries (Austria, Poland, Czech Republic, Slovakia and Hungary) and the Balkans (Croatia, Serbia, Romania, Bulgaria) have also been established. Such links will serve as the basis for cooperation, in particular in the framework of territorial cooperation projects.

2.3.2. Health – medicine

Objective

Establish a strong partnership in the area of health – medicine which will:

I. position Slovenia as one of the global pillars of development in the field of biopharmaceuticals in symbiosis with large, medium-sized and small enterprises and newly established enterprises
II. establish Slovenia as a top-level research centre for translational research in the field of pharmacy and therapeutics
III. enhance the development of new product directions related to natural substances and spa tourism (natural medicines, dermatological cosmetics and cell therapeutics and rehabilitation)
IV. link pharmaceutical industry in terms of human resources development

2023 objective: increase export of companies by over 30% of which small and medium-sized enterprises should increase export by at least EUR 250 million. In addition to promoting the establishment of at least 20 new companies the objective is also to attract at least one foreign direct investment which will employ over 50 people.

Focus areas and technologies

1. Biopharmaceuticals
2. Translational medicine: diagnostics and therapeutics
3. Cancer treatment – diagnosis and therapy
4. Resistant bacteria
5. Natural medicines and cosmetics

Empirical bases and SI competitive advantage

The economic activity "Manufacture of pharmaceutical raw materials and preparations" stands out in terms of revealed export and technological comparative advantages that are dynamically strengthened (see Burger and Kotnik 2014). This economic activity uses 25% of total gross expenditure for research and development and is one of the top areas in terms of the intensity of cooperation between public research organisations and the economy (SRA, 2013). The study FIDEA 2014 shows that Slovenian manufacturers, who export medicines worth nearly EUR 2 million, are leading companies in this area price-wise.

In addition to pharmacy, which is an extremely concentrated economic activity, Slovenia possesses comparative advantages also in the field of "Manufacture of medical and dental instruments and supplies" (C32.5). This area is dominated by small and medium-sized enterprises where value added per employee is considerably lower than in pharmaceutical economic activity; however, this is a very dynamic area with great potential. In the period 2009-2012 growth of value added per employee stood at 13.6% and the growth in exports stood at 25.8% (Burger and Kotnik 2014) with companies being very active in terms of international integration, e.g. within the Seventh EU Framework Programme. 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 in optical, measuring, medical or surgical instruments and apparatus (Section 90) could triple compared to the current EUR 465 million of average annual export (FIDEA 2014).

"Manufacture of soap and detergents, cleaning and polishing preparations, perfumes and toilet preparations" (C20.4) is also a promising area with revealed comparative advantages and identified high dynamics when it comes to increasing value added per employee and enhancing exports.

During the entrepreneurial discovery process 24 initiatives, pertaining to the area of Health – medicine, were prepared with an estimated investment value of over EUR 500 million. Over 170 stakeholders participated in the preparation of these initiatives of which the majority are representatives of the economy.

Focus areas were identified as the areas with the highest complementarity and knowledge concentration rate as well as with the highest market potential.

International dimension

Strong international partnerships have been established through a number of organisations and platforms such as: EATRIS.ERIC, EFPIA (European Federation of Pharmaceutical Industries and Associations, International Probiotics Association, IPA, AACR American Association for Cancer Research; ESTRO The European Society for Therapeutic Radiology and Oncology, European Technology Platform for Advanced Engineering Materials and Technologies – EuMaT, EUFEPS European Federation for Pharmaceutical Sciences. Companies and research

institutions have also established direct links with the world's leading manufacturers in the field of medicine. A number of partners have already established links and developed joint projects in the framework of territorial cooperation with Croatia, Austria (Styria, Carinthia and Vienna) and Italy (Friuli). Among the multitude of research projects financed under Horizon 2020 and other programmes the project Artemis should be mentioned which was accepted for the first phase under the Teaming tender with the aim of setting up a Centre of excellence for translational medicine which will coordinate and develop research and innovation activity in Central and Southeast Europe.

2.3.3. Mobility

Objective

I. transition from developing individual components and materials to developing demanding and complex energy-efficient products with higher value added, consistent with the new EU standards in the field of emission reductions (EURO 6c, EURO 7) and in the field of security (EURO NCAP)

II. strengthen Slovenian manufactures as pre-development suppliers

2023 objectives:

1. raise value added of companies by 20%
2. increase the number of pre-development suppliers from 15 to 22 (45% increase)

The above-given objectives will be achieved through:

a. Focusing on ambitious medium- and long-term research and development projects with a strong role of knowledge institutions which will result in:
   - ➔ joint business investment in development, manufacture and marketing, amounting to at least EUR 500 million
   - ➔ doubled volume of business investment in knowledge institutions, amounting to at least EUR 15 million by 2020
   - ➔ increased number of researchers (FTE) in companies by at least 25%

b. Implementation of five demonstration or pilot projects introducing factories of the future with full automation of the manufacturing process.

c. Strengthening links between large companies and medium and small-sized enterprises ➔ by 2020 at least 50% of leading partnership companies will introduce open innovation business models which will strengthen and further develop their supply chain.

Focus areas and technologies

1. Niche components and systems for internal combustion engines
2. E-mobility and energy storage systems
3. Systems and components for security and comfort (interior and exterior)
4. Materials for the automotive industry

Empirical bases and SI competitive advantage

Mobility is one of the key areas of Slovenian economy as it creates around 10% of GDP with the supply chain, which does not have one single car manufacturer, generating EUR 3.8 billion in turnover. The supply chain includes over 100 Tier 1 and Tier 2 suppliers and more than 600 lower-level sub-suppliers. "Manufacture of motor vehicles, trailers and semi-trailers" (C29) demonstrates revealed comparative advantages with below-average technological intensity with respect to leading countries, which is indeed a priority for the coming period. In terms of competitiveness this is not just about the role of a dominant car manufacturer which is shown by the revealed comparative advantage in the area of "Manufacture of parts and accessories for motor vehicles" (C29.3) where the period 2008-2012 saw increased value added per employee by over 14% and an increase in exports by over 27% (Burger and Kotnik 2014). With enhanced interdisciplinary character the automotive industry is directly intertwined with the metal processing industry, electrical engineering industry, tool industry and mechanical engineering industry. A wide range of cooperation with public research and educational sectors has been established.

Due to high price pressures, which are transmitted down the supply chain, and due to the fact that most of the suppliers are Tier 2 suppliers, the Slovenian suppliers face high pricing pressure and, on the other hand, high quality demands regarding their solution. To enhance the performance of Slovenian automotive supply industry Slovenia should take a higher position in the supply chain (Tier 1), which provides a direct supply to vehicle manufacturers, or develop niche products and technologies (pre-development supplier), duly protected by patents, which will facilitate supplying exclusive products for global car manufacturers despite the lower position in the supply chain.

A strategic partnership has already been established in the area of Mobility which will have to be further strengthened. The partnership has and will continue to enhance specialisation in niche markets by taking advantage of economies of scale, in particular when it comes to research, development and marketing.

International dimension

Stakeholders in the area of mobility are actively involved in European level associations and participate in interest as well as development initiatives, namely CLEPA (European Association of Automotive Suppliers), ERTRAC (European Road Transport Research Advisory Council), SMARTGRIDS (European Technology Platform for the Electricity Networks of the Future), EARPA (European Automotive Research Partners Association) and EGVI (European Green Vehicles Initiative). Stakeholders also maintain permanent contact with technological trends on a global scale. Through CLEPE the Slovenian automotive suppliers maintain a global level network for example in the framework of JAMA (the Japanese association of automotive suppliers). Intensive cooperation has also been established with industrial and scientific-development partners from European countries through joint marketing or development projects financed mainly under EU programmes. The most important scientific partners in this area include AVL (Austria), Fraunhofer Institute (Germany), Centro Richerche FIAT (Italy), Vitrual Vehicle Research Centre (Graz, Austria), IK4 Research Alliance (Spain).

2.3.4. Development of materials as end products

Objective

Strengthen cooperation of manufacturers of finished materials achieving high value added and competing – with each other and with knowledge institutions – in international value chains.

2023 objectives:

1. raise value added per employee in companies manufacturing alloys by 25% by 2023
2. increase exports and value added per employee in the field of smart coatings by 20%
3. increase investment in development by 15%, value added by 5% and exports of multi-component smart materials by 10%

Focus areas and technologies

1. Sustainable production technologies in metallurgy
2. Multi-component smart materials and coatings

Empirical bases and SI competitive advantage

In the area of "Manufacture of basic metals" (C24) and "Manufacture of fabricated metal products, except machinery and equipment" (C25) Slovenia has revealed comparative advantages and is in terms of technological intensity comparable to leading European countries (Burger and Kotnik 2014). The study FIDEA 2014 also demonstrates that Slovenia is highly competitive in terms of the prices of a number of iron, steel and aluminium products (product codes 7208-7228 and 7601-7607) where Slovenia takes an equal or even better position compared to the most successful European manufactures. In the framework of this economic activity Slovenia has generated EUR 9 billion of net income and is involved in many supply chains. Slovenia focuses on the development of advanced metallic materials for demanding applications following the trends of transition to a circular economy. According to the data of the programme "Metallurgy Europe – Renaissance program for 2012-2022" the combination of the primary manufacture of metallic materials and their further processing and integrated metal products including recycling, represent value added of approximately EUR 1.3 trillion a year in the EU alone. During the entrepreneurial discovery process 16 initiatives were prepared with a clearly pronounced market potential and intense research and development component in terms of developing specialised products.

Another area where Slovenia has great potential is smart multi-component materials and coatings. "Manufacture of man-made fibres" (C20.6) demonstrates both revealed comparative advantage as well as dynamic growth of value added per employee and exports in the 2008-2012 period. OECD data further show that the comparative advantages are being dynamically strengthened (Burger and Kotnik 2014: 64). Comparative advantages also exist in related fields such as "Preparation and spinning of textile fibres" (C13.1) marked by high growth in value added per employee and exports, as well as in "Manufacture of other textiles" (C13.9). Slovenia also possesses the necessary competences and capacities in complementary areas such as "Manufacture of basic chemicals, fertilisers and nitrogen compounds, plastics and synthetic rubber in primary forms" (C20.1). Slovenian companies have a strong position also in the area of coatings where "Manufacture of paints, varnishes and similar coatings" (C20.3) discloses revealed comparative advantages with the global market of smart coatings growing from EUR 540 million in 2015 to EUR 5.2 billion by 2020.

During the entrepreneurial discovery process 25 initiatives, pertaining to the area of Materials as end products, were prepared with an estimated investment value of over EUR 850 million.

Over 200 stakeholders participated in the preparation of these initiatives with half of the stakeholders representing the economy.

Focus areas were identified as the areas with the highest complementarity rate as well as with the highest market potential.

International dimension

Slovenian representatives actively participated in the preparation of the European programme "Metallurgy Europe – Renaissance programme" for 2012-2022. In light of the relevance of technological development of new materials and their application this initiative brought together some of the largest European industrial companies, e.g. Airbus Group, Siemens, Daimler, BMW, Rolls-Royce, Philips, Linde, ESI, Arcellor Mittal, Sandvik, SKF, Thyssen Krupp, Tata Steel, Fiat etc. Cooperation with international partners is also planned as well as participation in EU initiatives, in particular with German, Austrian and Italian initiatives, under the initiative CECIMO, Factory of the Future in Manufacture. In the field of multi-component materials the stakeholders participate in various associations and networks, e.g. Central and East European Polymer Network (www.ceepn.org) and European Polymer Federation (www.europolyfed.org), CIRFS – European Man-Made Fibres Association, European Technology Platform for Water (WssTP). Stakeholders also participate in numerous projects and programmes, e.g. under the programme Central Europe: Innovative value chain development for sustainable plastics in Central Europe (acronym: PLASTiCE, No.: 3CE368P1, www.plastice.org); under the programme IPA Adriatic: Derelict Fishing Gear Management System in the Adriatic Region, (acronym: DeFishGear, No.: STR/00010, www.defishgear.net); under the programme COST MP1105 – FLARETEX etc.

3. International dimension – horizontally

EU macro-regional connections

Slovenia lies at the crossroads of the current and the future EU macro-regional strategies, namely 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 a priority for Slovenia:

- Research, technological development and innovation in accordance with S4 priority areas of application
- Water management, environmental risks and biodiversity preservation
- Environmental protection and the promotion of resource efficiency
- Improved mobility and multimodality – road, railway and air connections

Specific attention will be given to:

- Joint development and use of research infrastructure
- Joint RDI projects in the field of macro-regional strategies and within the single European Research Area (ERA)
- Strengthened joint participation in major EU strategic projects

- Clustering at the macro-regional level through achieved critical mass in key areas
- Promotion of international mobility of researchers and developers

Concrete examples of best practices, which are already under way, demonstrate that these are not merely principle policies. 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.

Cross-border connections

Considering Slovenia's small size establishing links with the neighbouring regions and complementary development of capacities are of great importance for Slovenia (see e.g. OECD, 2014b). The existing cross-border cooperation programmes have already promoted cooperation in the field of research, development and innovation which means that foundations already exist. Within cross-border cooperation programme between Slovenia and Italy for the 2007-2013 period 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.

In the Region of Friuli-Venezia Giulia, there are seven industrial areas[5] specialised in the manufacture of furniture, knives, foods, digital technologies, chairs, coffee and thermo-electrical components. The economic activities that are only being asserted are in particular a) domestic automation, b) biotechnology and health, c) agri-food and d) ICT. Friuli-Venezia Giulia also has a strong position in the nautical field 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 and 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 medicinal products in oncology research and similar have proven to be very promising.

In Austrian neighbouring regions of Carinthia, Styria and the Province of Burgenland 12 clusters have been established, namely:

1. In Styria, clusters operating in the field of automotive industry, design, energy and environment, food, human resources, logistics, materials and wood and furniture respectively.
2. In Carinthia, clusters operating in the field of ICT and mechatronics.
3. In the Province of Burgenland, clusters operating in the field of ICT and plastics.

[5] 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.

In terms of the identified S4 priority areas of application, cooperation in the following fields is of particular relevance: automotive industry, design, energy and environment, food, materials, wood and furniture, ICT and mechatronics. There is also great potential when it comes to the established close cooperation between two strong universities in natural science and technique, namely the University of Maribor and the Technical University of Graz which perform complementary research in many areas. Preparations to integrate potentials in the field of polymers are already underway, namely integration on the Maribor–Graz axis regarding education, innovative activities and the transfer of knowledge into industry.

50 clusters have been established in Croatia some of which are relatively small. The areas where Croatia spends most on R&D and which prove most interesting for Slovenia are the field of mechatronics, life sciences, biomedicine and health and biotechnology with the field of ICT, telecommunications, agriculture, chemistry and healthcare also being relevant. In the process of developing its smart specialisation strategy Croatia specified the flowing priority areas a) health, b) sustainable energy and environment, c) mechanics and d) biotechnology and biochemistry. In terms of complementarity particular attention should be paid to the following areas: spa, green and gastro tourism, advanced production technologies and industrial biotechnology.

Cooperation with Hungary also shows potential. Hungarian priority areas are, to a certain degree, complementary to Slovenian priority areas, in particular in terms of (1) healthy society and prosperity, where Hungary, *inter alia*, focuses on therapeutics; (2) advanced technologies in the automotive industry and tool making, in particular with regard to advanced manufacturing systems and materials; (3) clean and renewable energy and (4) healthy local food.

The above-given analysis shows that the existing complementarity can serve as a basis for cooperation and joint provision of the critical mass of knowledge and research infrastructure. Thus, specific attention will be given to cross-border and transnational cooperation. In doing so, S4 priority areas will be systematically promoted as a priority of the Republic of Slovenia.

Slovenia will also be proactive in establishing cooperation at the **strategic level**, namely with international stakeholders who can contribute to S4 implementation performance. Slovenia is one of the testing regions within SmartSpec project which is financed under the Seventh EU Framework Programme and which brings together leading European experts in the field of smart specialisation. Slovenia also plays an active role in developing expert bases and designing future EU-level smart specialisation policy. Cooperation with OECD will be considerably strengthened, especially with the aim of ensuring strict evaluation and international comparisons.

Government Office responsible for development, Ministry responsible for economy and Ministry responsible for science as well as other stakeholders at national level will systematically promote participation and the positioning of Slovenian stakeholders in international networks as this intensifies exchange of best practices and experiences and provides the critical mass of knowledge and research infrastructure which is of great relevance considering Slovenia’s small size.

4. Policy Mix

The policy mix is identified in compliance with S4 principles presented under section 1.3.

4.1.Research, development and innovation

4.1.1. Basic science

The main measures are mostly financed through the Slovenian Research Agency (SRA) which provides the core funding for national research potential. The key purpose of financing is to develop scientific excellence in a broad area of research (funding scientific disciplines with the aim of providing adequate corpus of internationally comparable knowledge, and providing research of national importance, in particular in the field of humanities and social sciences). SRA thus provides stable financing for research organisations, basic research in all areas and facilitates the operation of infrastructure centres. Funding the development of scientific staff is also very important as this ensures the development of new promising areas which do not demonstrate a direct and immediate economic impact.

Funding of research in the framework of establishing the European Research Area also falls within the same category. Based on the national research policy (which may be broader than S4 priority areas) such research aims to bring together/establish convergence of national research programmes in various thematic or horizontal areas.

OP will further support breakthrough research and development projects demonstrating potential in terms of the transfer of results into the economy with the aim of creating new innovation, technology and business solutions within S4 priority areas. During the pilot phase a smaller number of projects for the period of up to 2 years will be supported; such projects represent an upgrade of applicative projects financed by SRA, namely projects demonstrating potential in terms of commercialisation (including in the form of new companies). This pilot measure is a shift from co-financing research projects by national funds to co-financing under Structural Funds.

4.1.2. Research, development and innovation in value chains and networks

Improving international competitiveness and excellence in research to participate in value chains

The measure will promote the preparation and implementation of joint industry research projects (with an emphasis on TRL3-6) of economic entities and knowledge institutions with the aim of linking knowledge and competences relevant for developing new products, services and processes with high value added and a demonstrated market potential at the international level.

Support will be given to joint multi-annual projects of consortia demonstrating market potential in global value chains and networks, concentration of knowledge and competences, scientific and technological excellence, commitment and capability to invest in all stages of knowledge development and project sustainability (including the period of co-financing).

Support to RDI processes
The measure will focus on research and innovation projects developing new products, processes and services within priority areas of application (Phase TRL6-9). With regard to projects special attention will be paid also to non-technological innovation and investment, and to achieving sustained value, including industrial design and own brands. The measure will consist of three complementary instruments:

- smaller RDI projects of companies or partner consortia by also promoting non-technological innovation
- individual RDI projects of companies or partner consortia which are positively assessed in the framework of the SME instrument and other EU-level instruments targeting individual companies not reaching the threshold for project co-financing
- Major RDI projects of companies or partner consortia which require integration and cooperation of research institutions and enterprises, in particular SMEs. The instrument will be implemented in a complementary manner facilitating the continuation of successfully completed projects under the previous phase (TRL3-6) as well as funding of new initiatives.

4.1.3. Support to investments

The measure addresses the final stage of the development process of new products, namely:

- Development and installation of pilot lines, first validation activities, optimisation of advanced production technologies and first production while introducing ICT solutions.
- Testing new solutions developed for direct use in practice and a clear demonstration of their use (e.g. Living Labs, CreativeHubs, etc.). Support will be given to setting up the first reference project for demonstration solutions in real-world environments.
- Projects focusing on commercialisation of developed solutions and on new technologies entering the market (e.g. through (innovative) public procurement procedures).

From the viewpoint of providing adequate funding, debt financing of development projects should be accompanied by equity or quasi-equity financing instruments for development projects which can represent a more adequate alternative to debt financing of development projects which will take account of the financing gap analysis results. Advanced forms of financing development projects, which are in their final stages of development before entering the market, are not sufficiently developed in Slovenia if compared to the developed economies. As the projects which are innovative and therefore more risky than average investment projects adequate (riskier) sources of funding should be provided. At the moment there are only a few risk-financing instruments in Slovenia which provide funding for new and fast growing companies but not for development projects, irrespective of the type of company addressed under this measure. Adequate instruments of financing development projects of companies in all development stages will be developed or upgraded in accordance with the results of the ex-ante financing gap analysis.

4.1.4. Complementarity with Horizon 2020 and international initiatives

The measure will support integration of Slovenian partners in international networks, promoting research and attracting foreign top experts to Slovenia, mainly through schemes of complementary highly-competitive international calls for proposals (e.g. ERC).

Support will be given to activities relating to the establishment of the European Research Area (e.g. The ERA-NET), Innovation Union and Horizon 2020 with a focus on co-financing instruments targeted at expanding participation within Horizon 2020 (Teaming, ERA Chair, Twinning). Thus, complementary measures will support projects which pursue and achieve scientific excellence and are internationally comparable to the best research projects. Projects will have to demonstrate top-level quality in the context of initiatives and projects which are recognized as scientifically excellent in central EU Horizon 2020 programmes.

Support will also be given to international research and development projects on the basis of Articles 185 and 187 of the Treaty on the Functioning of the European Union (TFEU), e.g. EUREKA/Eurostars, and the activities pertaining to cross-border cooperation of regions, for example within the EU Strategy for the Danube Region.

4.1.5. Better utilisation and development of research infrastructure

Developing research infrastructures will be implemented in line with the European Strategy Forum on Research Infrastructures (ESFRI) roadmap and the national Research Infrastructure Development Plan, in particular in terms of establishing centres or partner facilities which support functional integration of Slovenian infrastructure into international infrastructure.

Infrastructure-related investments will focus on priority areas representing a precondition for international competitiveness of Slovenian RDI environment. Support will be given to upgrading the existing research infrastructure or, where relevant, the construction of new research infrastructures within S4 areas of application, and projects identified under the National Research Infrastructure Development Plan, in the framework of which emphasis will be given to the ESFRI projects. With regard to investments in research infrastructure Ministry responsible for science surveyed the overall research infrastructure financed by national resources, with the survey also covering the level of utilisation thereof. I terms of granting support to projects future investment will give particular emphasis to support (and the level of utilisation) with regard to the present state of infrastructure available to researchers. Specific attention will be given to infrastructure development in cooperation with economic entities. Thus, an important aspect (where possible) of research infrastructures development is the integration of the economy to promote faster economic development and direct cooperation with research organisations.

4.1.6. Specific measures

Sustainable food production
The field of sustainable food production will be supported under RDI policy. All other aspects of development in the field of sustainable food production, including human resources development and investments, will be addressed under Rural Development Programme, in particular under the following measures:

- Knowledge transfer and information and publicity activities
- Quality schemes for agricultural products and food
- Investments in fixed assets
- Establishment of producer groups and organisations
- Cooperation

Sustainable tourism

For the field of sustainable tourism OP thematic objective 3 allocates funding to developing new and innovative tourism products and services. Such funding will be supplemented by European Social Fund support with the aim of upgrading and raising the quality level of services and technology-based marketing and networking. Promoting entrepreneurship will be further supported under specific programmes for medium-sized and small enterprises and new businesses, while solutions for sustainable use of resources in accommodation facilities will be supported under OP thematic objective 1 in relation to smart buildings, as one of the specific areas of application. Sustainable tourism (including culture tourism) is also a priority under European Territorial Cooperation programmes.

4.2. Human resources

Key challenges addressed by the measures:

- provide sufficient number of qualified staff meeting the needs of the economy
- contribute to increasing value added by encouraging the establishment of new organisational and business models relating to human resources management in companies
- awareness-raising and integration of social partners and other stakeholders in order to identify their role in supporting these processes

Under the 2007-2013 financial perspective we have already developed and implemented certain mechanisms/projects in this field (e.g. competence centres, scholarship schemes, mentoring schemes, lifelong career orientation, co-financing of projects of social partners, etc.), however lack of integration between such mechanisms/projects has been observed. Development policy will therefore aim to establish integrity and enhance focus on priority areas, including the vertical project selection mechanism. The measures will enhance (i) addressing human resources development and staff competence (education, training and specialisation), (ii) establishing a clear distinction between specific measures supporting the identified area of application and horizontal measure within the education system.

4.2.1. Research potential of researchers and international mobility

With the involvement of researchers and their research potential the incentive will focus on the implementation of research projects with the cooperation of research organisations and the economy, while striving to transfer best practices that will have an impact on RDI activities of enterprises or the creation of new knowledge and its use in the context of research projects with foreign research organisations in Slovenia. Specific attention will be given to researchers who are returning to Slovenia after completing their research or educational work at international research and/or higher education institutions and who bring experience and know-how from abroad back home.

The measure will stimulate Slovenian enterprises which, based on their long-term needs, participate in shaping the research activities of researchers at research institutions, and transfer the knowledge of researchers to future researches as well as to economic research/development environment where enterprises will continue to carry out R&D activities in the context of the acquired knowledge and thus enhance the competitiveness of Slovenia's economy.

4.2.2. Strengthening development competences and innovation potentials

In the framework of this measure, which complements the preceding measure, research organisations play a key role as this segment needs to focus on the transfer of knowledge into economy and strengthening innovative potential of companies (e.g. mass innovation). The measure aims to initiate processes that facilitate strengthening of research and development departments in companies, in particular with the involvement of inter- and multi-disciplinary skills (creativity, art, design and other non-technological solutions).

4.2.3. Employee knowledge and competences

The measure focuses on strengthening specific knowledge, competences, skills and career development of employees in companies that operate and integrate within S4 priority areas (in particular the companies the nature of which makes the measure, relating to strengthening research potential of researchers, less relevant) to enhance their competitiveness. To a smaller extent the measure will also support other promising areas (e.g. culture and creative industries, language resources, paper industry, glass industry, etc.) having the potential to create better jobs and generate higher value added.

Key instrument in this area are:

1. ***Competence centres for human resources development 2.0*** focusing on:

- identifying the competences required in specific S4 priority areas of application
- design and implementation of training programmes, including enhancing knowledge of engineers in order to obtain new competences
- networking of companies in specific priority areas of application and transfer of knowledge and best practices in the field of human resources management, promotion of innovation, internationalisation and reform of business models

This model will also support the implementation of mentoring schemes acting as one of the fundamental measures for intergenerational transfer of knowledge, skills and competences, as well as the implementation of lifelong career orientation services.

2. ***Scholarships***:

Slovenian employers should enhance their participation in scholarship schemes for their future employees, in particular with regard to company scholarships. Therefore, companies participating in the relevant support systems under this measure (either competence centres, mentoring schemes and other forms of support) will have to act in a more active manner in the field of scholarship for (their) key employees within the selected priority areas, while the state will provide support for regional scholarships and support under the scholarship policy for professions in high demand and specialised professions.

The participating companies will thus provide long-term support for their employees with the state focusing on a more systematic and long-term human resource development in selected key areas of development.

4.2.4. Young and creative Slovenia

People are of key importance in terms of knowledge- and innovation-based society and the competitiveness of the economy. In the next period priority will thus be given to promoting

creativity, innovation and entrepreneurship of young people, talent development and improving their key competences in all phases of the educational process and vertically.

The measures will, as a priority, address two elements which thus far lacked relevant focus:

- *identification, promotion and development of the potential of young people and their skills* → from developing a system for identifying talent to initiatives supporting innovative projects at various levels of education
- *promotion of entrepreneurship and creativity of young people vertically along the entire educational process* → ensuring pilot implementation of activities as well as implementation embedded into the system. Such activities are e.g. redesigning and updating study programmes with topics and subjects which develop competences in the field of innovation, creativity and entrepreneurship, providing open learning environments, integration of visiting domestic and foreign experts in the teaching process, accelerators of ideas and promotion of the opportunities for testing and implementation of concrete ideas.

While the measure Young and creative Slovenia pertains to systemic and long-term measures within the education system for the acquisition of key knowledge and competences, the measure Employee knowledge and competences pertains to targeted measures providing a rapid response in terms of the acquisition of specific professional competence and specific skills, knowledge and competences. One of the fundamental differences between the two groups of measures relates to the fact that in the event of required change of the education system, the changes, *inter alia*, take into account changes in the labour market, whereas other changes, relating to training and specialised training programmes to meet employers' needs, pertain to fast and direct response and adapting to developments in the market and labour market needs.

4.3. Entrepreneurship and innovation

The aim is to provide related, tailored and predictable/permanent support in all phases of company growth (from the pre-seed and start-up phase to the growth and maturity phase), and comprehensive support services which should cover the following key areas:

- adequate infrastructure and services provided by supportive environment entities (one stop shop services, entities of innovative environment, etc.)
- financial resources (subsidies, equity and debt financing – public and private)
- content-related support (training programmes, mentoring, coaching, training courses, counselling) and generating synergies and upgrades between financial and content-related support
- uniform implementation (by national institutions and institutions selected under a transparent public selection procedure, monitoring and effective control of the use of public resources) and promotion of programmes (including the attraction of talents)

Horizontal entrepreneurship-related measures are identified in compliance with the above-given logic and the relevant S4 principles. The measures focus on start-up and knowledge transfer as well as on the development and growth phase of small and medium-sized enterprises.

4.3.1. Newly established enterprises and knowledge transfer

Establishment of new enterprises brings a dynamic dimension to the entrepreneurial environment with knowledge transfer from public research organisations to the economy representing an underutilised potential in terms of creating new value. Due to a high risk related to the introduction of new products, services and processes, innovation is commercialised via isolated formal establishments such as start-up companies. Start-ups are established mainly 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. In addition to establishing start-ups public research organisations transfer knowledge also through contractually regulated cooperation, selling or licencing intellectual property.

Planned measures:

- Infrastructure: entrepreneurial hubs; supportive environment (at universities and public research organisations, including offices of technology transfer, technological parks, incubators, co-working premises); platforms for early testing (before entering the market) and financing of projects; creativity centres; cross-sectoral cooperation centres
- Financial resources: providing grants for pre seed and initial stage of company development, and further development of venture capital and seed capital instrument, including instruments that encourage investing in Slovenian start-up companies (including co-investing at the level of one investment) as well as in venture capital funds, and the transfer of knowledge between individual stakeholders (i.e. "smart money"); promoting angel investment and massive funding; further development of instruments for seed and start-up financing and seed investments; other financial incentives for start-up and initial operation of companies (subsidies for newly established companies, microcredits, loans and guarantee schemes), and development/implementation of new and upgraded forms of the most adequate financing (also the combination of financial instruments with grants)
- Content-related support: mentoring and international networking; support in integrating in foreign ecosystems; support in protecting and marketing intellectual property; programmes supporting start-up companies in terms of global growth and integration into foreign supportive ecosystems; attracting foreign founders of start-up companies and mentors to Slovenia
- Uniform implementation and promotion: organisation of educational-motivational events across Slovenia with a view to promote and prepare start-up entrepreneurs for starting up business; organisation of competitions for business ideas

4.3.2. Growth and development of SMEs

Innovation, introduction of new technologies and models are important factors of growth and development for all types of companies. Mature companies having innovation potential for growth and development are one of the specific S4 target groups. One of the major problems of SMEs in Slovenia is that SMEs often struggle with development-management transition from a „family" or „local" company to a medium-sized or even global company having potential and ambition for fast growth.

Social enterprises (or social economy), where Slovenia has vast untapped potential, face similar problems as other SMEs, however due to the specifics related to all stages of the life cycle and the related need for specific skills social enterprises require support in particular during the start-up, growth and development phase. Thus, an integrated concept of support should be established for such companies which would ensure that they are properly integrated into the entrepreneurial environment. Promoting social entrepreneurship can act as an important complementary generator of cooperation and integration leading to new jobs.

Linking culture and creative industries as well as other economic sectors is the driver of innovation also in those branches of the economy where investing in research and development is low, e.g. in traditional sectors and services.

Planned measures:

- Infrastructure: entrepreneurial hubs and supportive environment; knowledge sharing platform (open innovation) as a form of promoting innovation in companies; creativity centre
- Financial mechanisms: microcredits, loans, guarantee schemes, equity and quasi equity financing, subsidies for start-up as well as mentoring for specific target groups (e.g. culture and creative industries, social enterprises)
- Content-related support: support by mentors and advisors, trainings in various fields (including social entrepreneurship, design management and transfer of traditional knowledge and skills); dissemination of modern methodology of product development, such as lean method; development of socially responsible intrapreneurship in companies at management and employee level; promoting the development of social innovation in internal and external entrepreneurial environments; preparing companies for international growth; integration and networking in various areas (e.g. with creative industries)
- Uniform implementation and promotion: organisation of informational, educational-motivational events across Slovenia with a view to promote the existing measures and infrastructure

4.3.3. Internationalisation and FDI

Internationalisation and FDI related measures address the promotion of enhanced international integration of Slovenian economy and attracting foreign direct investments (FDI), internationalisation. The target is to promote exports and attract foreign investment with SMEs also being a target group – the aim is to enhance their international involvement. These activities require stakeholder participation and strengthening the role of the agency SPIRIT Slovenia acting as a single contact point providing overall support to investors and exporters.

Measures to attract FDI support the objective of presenting Slovenia as a regional research and development centre (R&D hub) which can attract and further strengthen development departments of foreign companies, connect stakeholders in this field, encourage the pursuit of higher value added, innovation and linking new knowledge with the economy. As the centre for green economy (green hub) Slovenia can be developed as an environment- and people-friendly economy, namely through new technologies and materials, development of new services, as well as through the improvement of material and energy efficiency.

Integrated support to the internationalisation of the economy will cover a variety of activities which will enable companies to upgrade international operations, as well as the activities which support companies that have just started their international business; such activities are counselling, support for presentations of companies at international fairs, providing information about foreign markets, supporting market research of foreign markets, support in finding local agents in new foreign markets, promoting the integration of SMEs into global value chains, including the development and use of new business models, supporting feasibility studies for projects with international potential, supporting demonstration or pilot projects with an international component.

Setting up a national one stop shop service, which will provide integrated services (providing information/counselling, active assistance to investors, etc.), is very important for attracting foreign (as well promoting national) investments. Support will also be given to specific projects e.g. development of strategic partnerships to promote integration of enterprises into global value chains, joint investments as pilot projects designed to further market high-quality products/services and the development and application of new business models in enterprises.

4.4. Slovenia of development

Innovative and green public procurement

The Public Procurement Act sets out the conditions relating to public procurement procedures and facilitates establishment of innovation partnerships which means that the development stage and supply of services are combined in one single procedure. Innovation partnerships should be established in those S4 areas of application where the public sector acts as the contracting authority, in particular with regard to priority area Healthy living and working environment. In 2011 the Decree on green public procurement upgraded the Public Procurement Act. The Decree will be to amendments in 2016. The aim is to reduce negative environmental impact of public procurement, namely by contacting less environmentally-burdensome goods, services and works by taking into account the prescribed (basic) environmental requirements and additional requirements established by the contracting authority. The objectives in this area are:

- To implement by 2017 at least three public procurements by applying innovation partnerships in the area of Healthy living and working environment, followed by transferring best practices to all public procurement procedures with the aim of promoting innovation.
- Consistent respect of the provisions of the Decree on green public procurement when contracting products and services included into S4 priority areas, namely in terms of the provisions which enable additional contracting authority's requirements in accordance with the required S4 product directions.

Tax relief

Tax relief targets well-performing profit-generating companies which can reduce tax due to their investment in research and development (R&D). In accordance with their business activities, such companies can plan R&D expenditure to achieve two results simultaneously, namely competitive advantage through their R&D activity, and tax base reduced by the relevant R&D expenditure. Tax relief amounts to the 100% amount of the R&D investment.

The net effect for companies amounts to 17%. Slovenia will continue to implement this measure also in the next period.

Economic diplomacy and promotion

Economic diplomacy, responsible for international economic cooperation, plays an important role in supporting international cooperation and the promotion of S4 areas. The relevant measures to support companies will be implemented in the framework of intergovernmental commissions, economic delegations, economic representations abroad, advising companies regarding the selected foreign market, providing information on foreign markets and other services provided by diplomatic and consular representations (e.g. priority issuing of visas), namely by focusing on enhancing the network of economic advisers. Certain activities will also be governed through involvement and participation in international organisations.

Issuing permits and eliminating regulatory barriers

Slovenia will, also on the basis of the received proposals prepared in the framework of strategic partnerships and/or National Innovation Platform (NIP), implement activities to eliminate regulatory barriers and well as speed-up the process of issuing and/or priority treatment of permits or consents within its jurisdiction, namely for investments and projects falling under the identified priority areas. Measures to improve the regulatory environment are also planned to be implemented which will eliminate administrative burdens. The introduction of the SME test will ensure consistent implementation of assessing the impacts of regulations on the economy.

Efficient justice administration

With a view to accelerating economic recovery and the inflow of foreign investment, Slovenia will implement, namely on the basis of the Strategy Justice 2020, activities to accelerate the settlement of commercial disputes, executions, alternative forms of resolving commercial disputes, improved insolvency proceedings and effective elimination of economic crime and corruption.

5. Financial framework

In the next three-year period S4 will serve as the basis for investing in development. Such investments amount to EUR 656 million annually of which public funding amounts to over EUR 366 million, or EUR 455 million if including the financial leverage under financial instruments, which represent a direct development incentive for the identified priority areas.

		Total 2016-2018	Average – annually
RDI		**1,025,483,596**	**341,827,865**
OP 2014-2020		552,957,004	184,319,001
	EU	90,484,000	30,161,333
1.1 Enhancing research and innovation infrastructure	SI	19,021,000	6,340,333
Business investment	PRIVATE	36,501,667	12,167,222
	EU	86,484,000	28,828,000
1.2 Promoting business investment in research and innovation	SI	18,021,000	6,007,000
Business investment	PRIVATE	243,845,000	81,281,667
Financial instruments	EU	23,440,135	7,813,378
Leverage under financial instruments	FIN	23,440,135	7,813,378
Additional business investment in FI	PRIVATE	11,720,067	3,906,689
State budget – national sources		472,526,592	157,508,864
SRA programme	SI	426,991,241	142,330,414
Ministry of Education, Science and Sport – science	SI	32,266,789	10,755,596
Ministry of Education, Science and Sport - investments	SI	3,668,562	1,222,854
Ministry of Economic Development and Technology – technology, Eureka, Eurostars	SI	9,600,000	3,200,000
Entrepreneurship		**887,923,182**	**295,974,394**
OP 2014-2020 PUBLIC		710,923,182	236,974,394
	EU	79,500,926	26,500,309
3.1 Promoting entrepreneurship	SI	15,614,620	5,204,873
Business investment	PRIVATE	95,115,546	31,705,182
Financial instruments	EU	122,505,668	40,835,223
Leverage under financial instruments	FIN	245,011,336	81,670,445
Additional business investment in FI	PRIVATE	91,879,251	30,626,417
	EU	24,518,334	8,172,778
3.2 Developing and implementing new business models for SMEs, in particular with regard to internationalisation	SI	6,129,584	2,043,195
Business investment	PRIVATE	30,647,918	10,215,973
National resources		177,000,000	59,000,000
Ministry of Economic Development and Technology programmes – entrepreneurship	SI	27,000,000	9,000,000
Ministry of Economic Development and Technology – internationalisation and tourism	SI	75,000,000	25,000,000
Business investment	PRIVATE	75,000,000	25,000,000
Human resources		**56,234,436**	**18,744,812**
10.1 Enhancing equal access to lifelong learning	EU	29,420,774	9,806,925

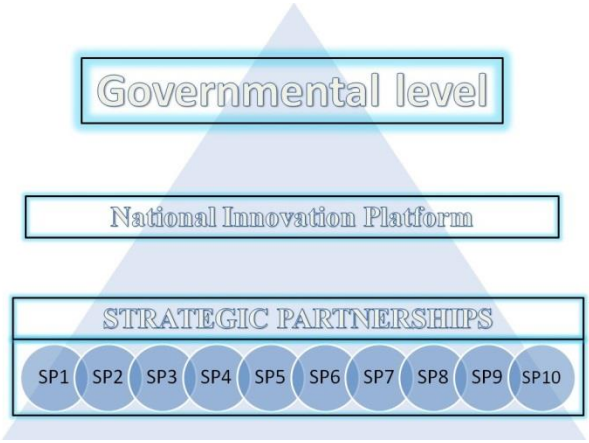
	SI	7,355,194	2,451,731
Business investment	PRIVATE	19,458,468	6,486,156
TOTAL		**1,969,641,214**	**656,547,071**
TOTAL	EU	456,353,837	152,117,946
TOTAL	SI	640,667,990	213,559,997
TOTAL	FIN	268,451,471	89,483,824
TOTAL	PRIVATE	604,167,197	201,389,306

Source: Ordinance amending the Ordinance adopting the implementation plan of the Operational Programme for the Implementation of the EU Cohesion Policy in the Period 2014-2020, Official Gazette of the Republic of Slovenia No 58/15

6. Governance system

Structure of S4 governance system

S4 is the key strategic document of the Government of the Republic of Slovenia in the field of innovation. S4 shall serve as the basis for Slovenia's development policy. The S4 governance system is a three-level system as demonstrated in the below-given figure:



The **state** is responsible for S4 management, namely S4 preparation, supplementations, implementation, monitoring and evaluation. To establish close, operational and smooth cooperation supporting S4 implementation a working group called Implementation Working Group will be established at the national level within two months following S4 approval. The Working Group shall comprise representatives, namely State Secretaries, of ministries directly participating in S4 implementation. The Working Group will be headed by the State Secretary of the Government Office responsible for development with State Secretary of the Ministry responsible for science and State Secretary of the Ministry responsible for economy acting as deputy heads of the Working Group. The three State Secretaries constitute Working Group's chairmanship. The Working Group shall be responsible for inter-ministerial coordination of S4 activities implementation at the strategic and substantive level, namely by taking into account the competences of each participating institution. In addition to the Government of the Republic of Slovenia, which makes decisions relating to Slovenia's Smart Specialisation Strategy and amendments thereon, the Working Group is the institution which monitors and guides S4 delivery at the political level and thus ensures that the findings and recommendations made at a lower governance levels are actually realised.

In the framework of the Government of the Republic of Slovenia coordination of S4 shall be the responsibility of the Government Office responsible for development. Coordination-related activities will be implemented by the Office in close cooperation with Government stakeholders, namely (i) the strongest cooperation will be established with the Ministry responsible for economy and the Ministry responsible for science acting as the two ministries directly responsible for the area of RDI; (ii) cooperation with the ministries whose contribution in their areas of responsibility is most pronounced in terms of achieving the set S4 objectives; these areas are labour, education, agriculture, infrastructure, public administration, culture and foreign affairs; and (iii) cooperation with the representatives of executing agencies, in particular Slovenian Research Agency, Public Agency of the Republic of Slovenia for the Promotion of Entrepreneurship, Innovation, Development, Investment and Tourism, Slovenian Tourist Board, Slovene Export and Development Bank, Slovene Enterprise Fund, Public Fund of the Republic of Slovenia for Regional Development and

Development of Rural Areas, Slovene Human Resources Development and Scholarship Fund and Employment Service of Slovenia.

To support efficient and effective delivery of S4 a specific unit responsible for S4 shall be established in the framework of the above-mentioned Office, namely following S4 approval. In addition to providing technical support (organisation, preparation of material, dissemination of messages and adopted decisions to other levels of governance, etc.) to the Working Group comprising State Secretaries and the National Innovation Platform, the unit shall be responsible for coordinated delivery of S4 at the operational level. Together with the above-listed institutions the unit shall provide national-level support when it comes to establishment and operation of strategic partnerships; the unit shall also be responsible for S4 monitoring and evaluation. In the framework of its competences within the Managing Authority the unit supporting S4 implementation shall establish whether OP implementation complies with S4 provisions, namely in accordance with the strategic guidelines and on the basis of the approved operation selection criteria.

At the second level the **National Innovation Platform** (NIP) will be established bringing together development-related stakeholders in compliance with the quadruple helix principle. NIP is a consultative body which expert- and interest-wise deals with national, horizontal innovation-related issues, in particular performance of the supportive environment for innovation and entrepreneurship, elimination of horizontal regulatory barriers, measures to promote innovation, and coordination of research and educational capacities within the government sector. NIP shall monitor S4 implementation within the above-mentioned horizontal areas and thus offer its opinion and give recommendations to the national level. NIP may also introduce the initiative to perform horizontal area-related evaluations. NIP shall be established by the Ministers responsible for development, science, and economy.

Strategic partnerships are the main institutional form established at the level of the areas of application. A limited number of partnerships deriving from the entrepreneurial discovery process are planned to be established. The established partnerships will support S4 implementation. The internal management structure is tailored to the technology- and market-specific characteristics of each area of application. Some of the partnerships will be horizontal relating to more than just one area. For enabling technologies, as identified under the domain Factories of the Future, a network horizontal relation to other areas will also be ensured as specified under Table 2.

Strategic partnerships shall facilitate promoting system-wide and long-term cooperation of stakeholders within an individual area, namely cooperation between stakeholders, cooperation of stakeholders with other entities, and cooperation with the state. The key functions of strategic partnerships thus pertain to internationalisation, integration and development of joint RDI initiatives, including the concentration of research capacities, human resources development and representing common interest with the state (e.g. innovative public procurement initiatives, required amendments of sectoral legislation, economic diplomacy and priority treatment in terms of issuing investment-related permits).

Following their establishment the partnerships will design action plans (roadmaps) which will, *inter alia*, enhance further concentration of focus areas and coordination of development policies with the state. In addition to the existence of the critical mass of capacities and competences, further concretisation of focus areas and technologies, where development investments shall be concentrated, shall pay specific attention to the analysis of market opportunities and the impact on competitiveness, resulting from joint and coordinated acting of stakeholders, the identification of comparative advantages of stakeholders in Slovenia in terms of the competition and the willingness of the private sector to invest in these areas.

Action plans, including monitoring and evaluations of the effectiveness and efficiency of their delivery, shall therefore serve as a basis for further concentration and upgrading of S4 in compliance with the procedure described in the section pertaining to monitoring and evaluation. Strategic partnerships cooperate with the national level directly with the exception of horizontal issues related to innovation – this is where strategic partnerships cooperate with the national level through NIP.

Partnership membership shall in no way have a direct influence on awarding financing for RDI projects. Projects will be selected on the basis of competition between project proposals. Strategic partnerships will receive funding from the state and also some funding from stakeholders. Strategic partnerships comprise representatives of the economy, research and educational organisations and other relevant partners. Strategic partnerships shall be established in the second quarter of 2016 by the latest, while action plans shall be prepared within six months following the establishment of each of the partnerships. A detailed presentation of the manner in which strategic partnerships shall operate is given in S4 supporting document.

S4 monitoring and evaluation

S4 implementation will be monitored by all three levels, in particular by the Working Group established at the national level, horizontally by NIP and by strategic partnerships at the level of individual areas of application. The unit responsible for S4 and established within the Government Office responsible for development shall establish a monitoring and evaluation system, namely in cooperation with ministries and implementing institutions. The unit will also be responsible for coordination with the monitoring and evaluation process in the framework of European Cohesion Policy.

S4 monitoring and evaluation will be based on the quantified objectives identified under S4 and founded on the entrepreneurial discovery process. Measurable S4 indicators, including the period of monitoring, are identified in the below-given table. The indicators at the level of areas of application will be further developed in a more concrete manner and, where relevant, revised following the preparation of action plans (roadmaps) developed by strategic partnerships, namely within six months following the establishment of each of the partnerships. Monitoring the progress with regard to the implementation of action plans will take place regularly on the basis of annual reports giving emphasis to achieving the set objectives and indicators. The annual reports are prepared by strategic partnerships by the end of the first quarter of the following year.

Monitoring by the state at the operational level shall be performed on a regular basis through the representative of the Government Office responsible for development as well as other state-level institutions in the framework of strategic partnerships themselves (depending on the area), which will also serve as a basis for close cooperation and introduction and implementation of the planned measures as well as potential additional measures which need to be implemented at the national level. Representatives of the state, participating in strategic partnerships, where appropriate, inform or include the Working Group when coordination and decision making at the national level is needed. The Working Groups monitors the progress at a strategic level at least once a year on the basis of the reports on the implementation of action plans, namely in the second quarter of the following year and additionally when the evaluations are taken into consideration. The Working Group gives its opinion about the annual reports serving as a basis for coordinating the activities at the strategic level between strategic partnerships and the national level.

A more detailed analysis and evaluation of action plans and the efficiency and effectiveness of strategic partnerships will be carried out in 2018. The evaluations will be detailed and implemented for each area of application taking into account technological and market specifics of each area. These evaluations will be financed under the OP.

On such basis and on the basis of a wide entrepreneurial discovery process, which will include the wider interested public in addition to the stakeholders in NIP and strategic partnerships, an in depth revision of S4 will be implemented if needed. The revision of S4 will be in compliance with the process of the OP performance review. The revision process is directed by the Government Office responsible for development, namely in cooperation with the Ministry responsible for economy.

The evaluations will be subject to consideration at all institutional levels of S4 governance. The Working Group for S4 implementation will take into account the recommendations of other levels of governance including action plans and the proposals given by strategic partnerships pertaining to further concentration, and assess the potential additional amendments to S4.

The Operational Programme Monitoring Committee shall annually take note of evaluation results and the progress made.

Monitoring indicators:

Indicator	Measurement unit	Result Output	Baseline value	Year	Target value	Source of data	Frequency of measurement
Share of high-tech products in exports	percentage	R	22.30	2012	26.50	IMAD	annually
Share of exports of knowledge-intensive services in total exports	percentage	R	21.40	2012	33.00	IMAD	annually
Entrepreneurial activity	index	R	11	2012	12.8	IMAD and GEM	annually
Share of funds from abroad to finance the total gross domestic expenditure on R&D	share	R	8.60	2012	8.60	SORS	annually
Placing Slovenia above the EU average in the Innovation Union Scoreboard	place	R	12.00	2014	11.00	IUS	annually
Share of funds in public sector expenditure on R&D funded by the business sector	percentage	R	9.70	2012	12.00	SORS	annually
Share of corporate funds to finance research and development activities in GDP	percentage	R	1.76	2012	2.00	SORS	annually
Share of innovation-active companies	percentage	R	46.50	2012	55.00	SORS	every 2 years
Number of researchers in supported entities	Full-time equivalent	O	0	2015	350	monitoring	annually
Number of companies cooperating with knowledge institutions	companies	O	0	2015	135	monitoring	annually

Number of supported companies	companies	O	0	2015	5400	monitoring	annually
Number of fast-growing companies	number	R	3,725	2012	5,000	AJPES	annually
Value added per employee in SMEs	EUR	R	31,175	2012	38,000	AJPES	annually
Higher resource productivity	GDP/DMC	R	1.07	2011	1.50	EUROSTAT/ SORS	annually
Number of companies having introduced efficient resource management measures	number	O	0	2014	1000	monitoring	annually

7. Literature

I. Burger A. and Kotnik P, 2014: “Professional analysis as the basis for the Smart Specialisation Strategy”, April 2014

II. European Commission, 2013b, “Research and innovation performance in Slovenia”, Country Profile, 2013

III. FIDEA, 2014, “The assessment of industry growth potential. Smart Specialization Strategy. Export value benchmarking. RIS3 Slovenia case analysis.”, The report was part of contribution to the event “Dynamic, Innovative and Open Slovenia” April 17th, 2014, Ljubljana, Slovenia. 15 May, 2014., Riga

IV. Government of the RS, 2011a, “Research and Innovation Strategy of Slovenia 2011-2020”, Government of the RS, June 2011.

V. Government of the RS, 2011b, “Resolution on the National Programme of Higher Education 2011-2020”, Government of the RS, June 2011.

VI. OECD, 2014b, “Regions and Innovation: Collaborating Across Borders”, OECD Publishing

VII. SRA, 2013, “Comparison of the structure of R&D expenditure of the business sector and contractual funds from the economy to programming groups of public research organisations”, mimeo