

INNOVATION POTENTIAL & SPECIALIZATION STRATEGY PAPERS

Deliverable D.T.1.2.2

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FabLabNet Project Partners:

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HappyLab - Vienna (AT),

FabLab Budapest (HU),

Brno University of Technology (CZ),

Regional Development Agency in Bielsko-Biala (PL),

RogLab - Ljubljana (SI),

Slovak Scientific and Technical Information Centre - FabLab Slovensko (SK),

FabLab Zagreb (HR),

UnternehmerTUM MakerSpace GmbH - Garching bei München (DE).



T1	Capacity Building and Networking of FabLabs
AT1.2	Creating links to Smart Specialisation Strategies and relevant policy players
D.T.1.2.2	Innovation Potential & Specialization Strategy Papers



1. Characteristic of local innovation ecosystems

1.1. Position of the Region

The Autonomous Province of Trento “Trentino” gains economic and social benefits from its autonomous state. It is a vivid economic reality and a prolific innovation cradle.

Trentino boasts a natural heritage of extraordinary beauty, with unique and exciting landscapes: woods, alpine lakes, natural parks, mountain groups, and natural trails. The Dolomites - thanks to their stunning and unique landscapes as well as their geological and geomorphological features - are listed among UNESCO’s Natural World Heritage sites. Lake Garda, the largest lake in Italy with its 370 km², attracts tourists from all over the World with its mild climate and plethora of old towns, as well as the opportunity of practicing several open-air sports.

The province is divided into 177 municipalities and covers an area of more than 6,000 km², with a total population of about 540,000. The Trentino is renowned for its mountains, such as the Dolomites, which are part of the Alps.

The historical and cultural identity of the Autonomous Province of Trento, enshrined in the Statute of Autonomy, endows it with legislative, administrative, and financial powers in strategic fields such as education, health, manufacturing policies, transport and university. Thanks to its financial autonomy, 90% of tax revenues are reinvested locally. This enables Trentino to offer extraordinary tools to local enterprises, such as opportunities for tax offsetting, outright grants that cover up to 80% of the eligible investment for applied research projects, innovative public-private financing instruments, and a five-year exemption for regional tax on productive activity (IRAP) for new initiatives.

As a borderland with the right balance between Italian tradition and Austro-Hungarian heritage, Trentino is right at the heart of the Alpine mountain range and of Europe. A mountainous area as well as an important connection hub for goods and people and sound economic fundamentals, Trentino enjoys levels of wealth and quality of life among the highest in Italy and in Europe.

1.2. Research and development in the Region, Innovative Business

The economic fabric of Trentino benefits from a quality-oriented agriculture in the field of fruit and wine production, a well-rooted and internationally renowned tourism industry (5 million tourists per year, 40% of which are foreigners), innovative industrial realities, a widespread tradition of craftsmanship and cooperation. Per capita GDP in the area is 26% higher than the European average.

With a per capita investment in research and innovation at the level of the most advanced countries in Europe, Trentino is at the forefront of scientific progress, with a University ranked among the best in Italy and more than 20 international public and private research institutions. Trentino is an important hub for several big international research networks in sectors like the study of materials, neuroscience, nanotechnology, genomics, and the development of algorithms for voice recognition.

Trentino tops the list of the Italian provinces with the highest density of innovative start-up firms with a record of 144 enterprises out of a total of 10,000 companies. In total, 147 new enterprises with a high rate of innovation are established in Trentino, thanks to the opportunities provided by the “Trentino system” and the programmes financed by the Autonomous Province of Trento, such as Seed Money- FESR and incentives to new entrepreneurship, the spaces and mentoring services offered in the business incubator centres, and the quality of its University, Foundations and Research Institutions.

1.3. Main Stakeholders

Public institutions

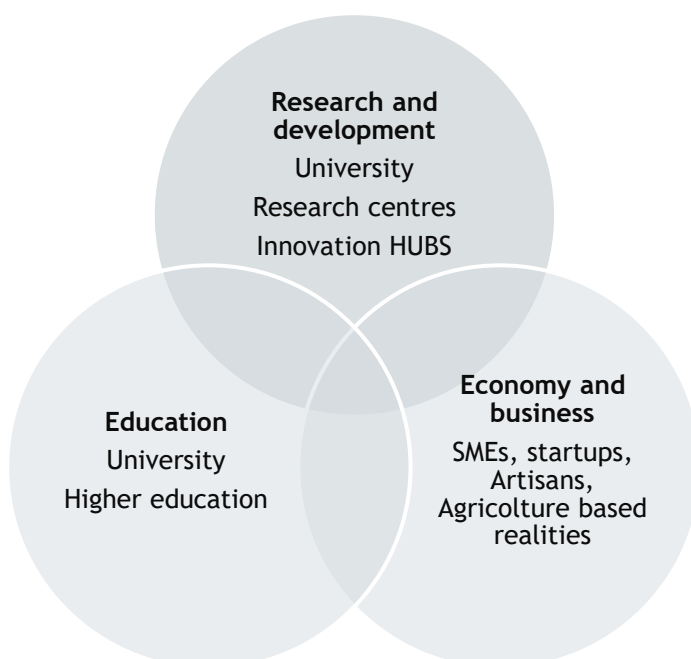
Trentino is currently investing in several flagship projects: BiC, Business Innovation Centre, where innovative enterprises receives spaces and assistance, Polo Meccatronica, a single hub that gathers the stakeholders involved in education, training, innovation, and industrial applications, Progetto Manifattura, a hub open to enterprises operating in the field of environmental sustainability, sustainable construction, renewables, and cleantech. Aside of these specific business incubators, several research institutes are present on the territory, the Fondazione Bruno Kessler, the National Research Council, the Fondazione Edmund Mach.

Education institutions

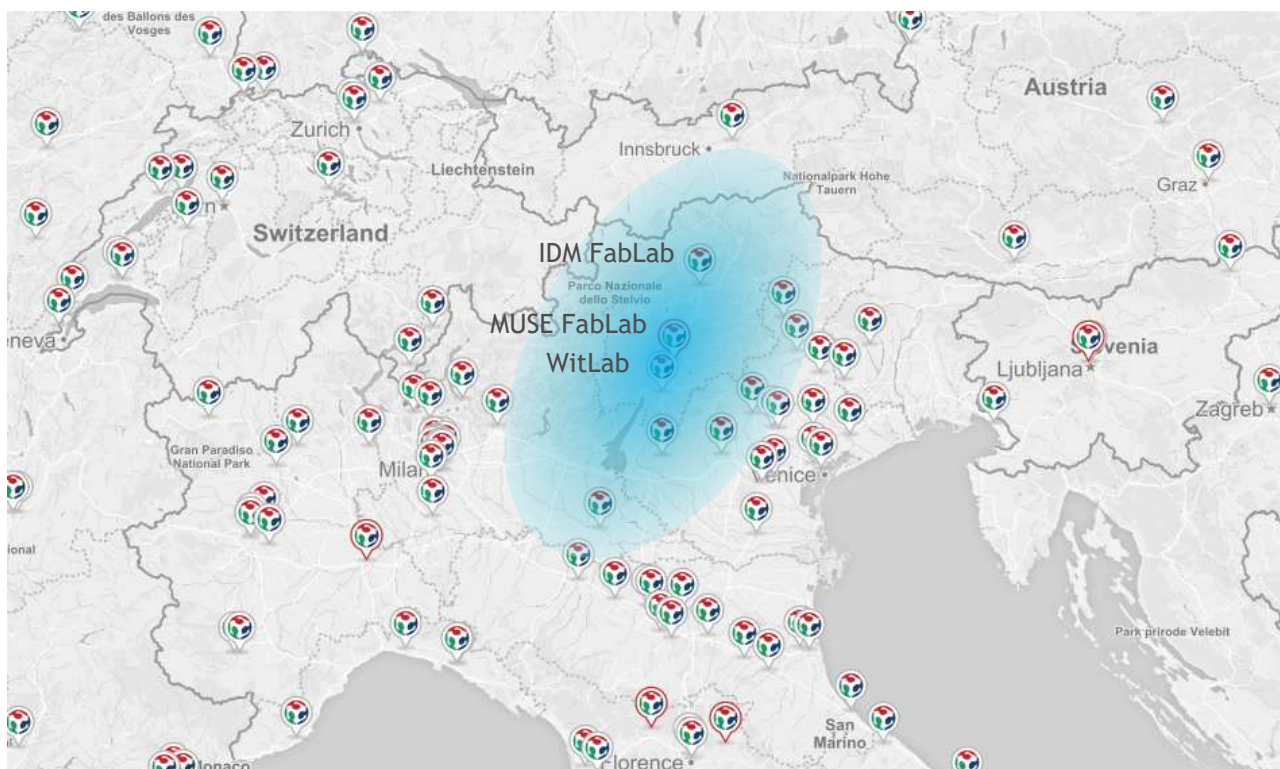
The territory boasts a high level of education, accompanied by very low dropout rates and high levels of school performance, thanks to the activities of groundbreaking education and training centres and an advanced vocational training system. Trentino invests heavily in the development of cross-sectorial upskilling projects that aim at increasing the students' competitiveness on the labour market. Examples of these projects are "Trentino trilingue" (trilingual Trentino), a school-work transition programme, and a territorial cooperation project. The University of Trento comprises almost 30 Bachelor's degree courses, and more than 30 Master's degree courses. Strategic areas for innovation are courses on Engineering, Physics, mathematics, Mechatronics engineering, Materials and production Engineering¹.

Private stakeholders

In Trentino there are more than 30 thousands enterprises, and about 8000 are associated as Artisans. In the Province just 3 FabLabs are operating in 2017 (MUSE FabLab in Trento, IDM FabLab in Bolzano and WitLab in Rovereto, in the map below), thus creating a potential basin of 10.000 enterprises per FabLab. Considering a realistic esteem of 1 % of enterprises cooperating with FabLab, the potential is an interesting 100 enterprises per FabLab.



¹ Sources of the whole chapter: Trentino Sviluppo, www.progettomanifattura.it/en, Provincia autonoma di Trento www.provincia.tn.it, www.investintrentino.it



Key Numbers referred to Trentino:

Employment rate 71,10%

Unemployment rate 6,40%

R&D expenditure / GDP per capita 2%

GDP (current prices) 18,4 billion €

GDP per capita 34.196 €

20 Research institutes

147 innovative startups

Exports 3,4 billion €

Imports 2,03 billion €

GDP growth 0,8%

Trentino Structural indicators in comparison to Italy and Europe (year 2012)

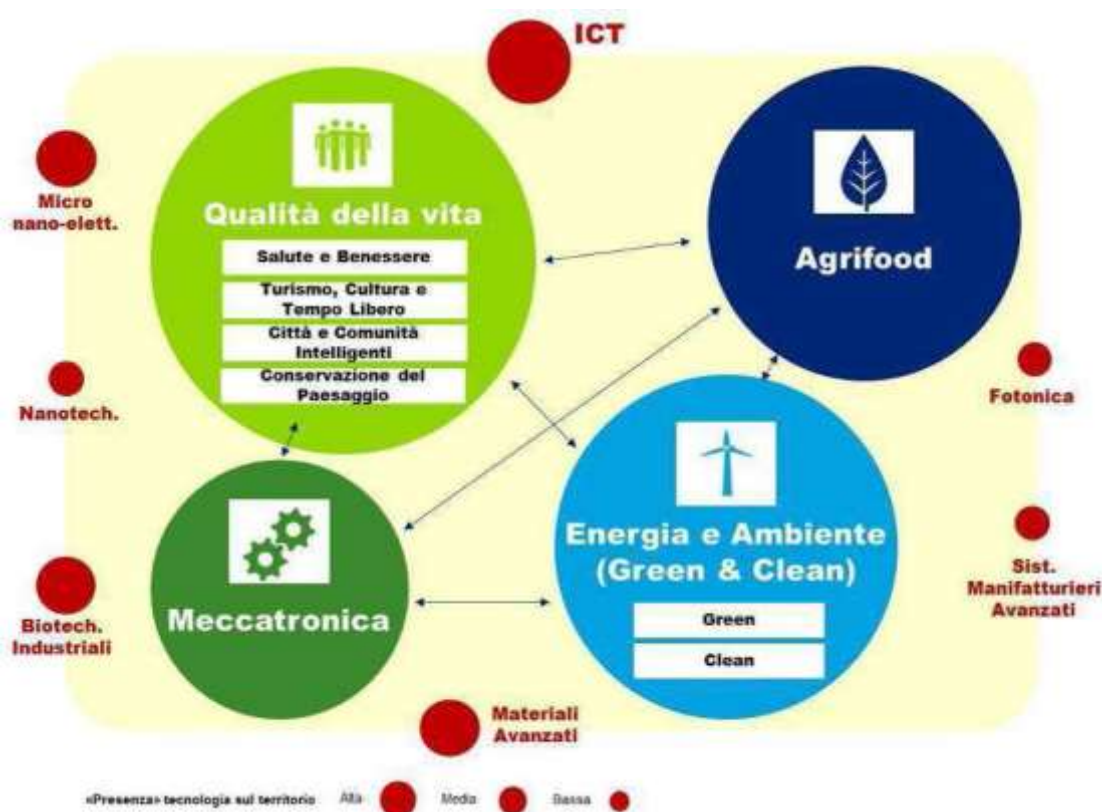
	Trentino	Italy	EU15
Per capita GDP in PPS	€ 29,677.77	€ 25,928.12	€ 25,491.19
Employment rate	65.5%	56.8%	65.2%
Unemployment rate	6.2%	10.7%	10.6%
Unemployment rate for young people (aged 15-24)	20.5%	35.5%	22.3%
Activity rate	70.2%	63.7%	73.0%



2. Thematic specialisation and “areas of change” of S3

2.1. Thematic specialisation and “priority areas” of S3

The Regional RIS3 strategy concept focuses on interventions aimed at strengthening the economic and social development of the territory. The four main priority area for Province development are: Agrifood, Quality of life, Energy and Environment, Mechatronics.



2.2. Horizontal and vertical strategy of RIS3

In order to implement an effective Intelligence Specialization Strategy, with respect to its own strategic vision and the investment concentration principle, the Autonomous Province of Trento has identified the following objectives specify the inspirational principles best suited to the challenge of economic and social development for the territory:

- to strengthen the research and innovation ecosystem to ensure collaboration among the various actors,
- to value the potential of local economic system innovation to stimulate new opportunities for growth and market in the territory and internationally,
- to encourage the birth and the development of innovative entrepreneurial initiatives, with particular reference to the intensive knowledge and emerging sub-sectors,
- to increase the focus of applied research of research centers and universities on the economy and society needs,



- to strengthen the Public role as an indirect innovation generator, to create a virtuous circle for the benefit and support of the innovation process.
- to empower human capital and its skills to develop and support innovation and to increase the ability to absorb it.

Thus, the actions foreseen for facing the challenges and realizing the key objectives are schematized in the following table.

Actions/tools	Objectives					
	Strength research and innovation ecosystem	Value the potential of local economic system innovation	Encourage the birth and the development of innovative entrepreneurial initiatives	Increase the focus of applied research	Strengthen the Public role as an indirect innovation generator	Empower human capital and its skills
Strengthening and development of Specialization poles	✓	✓	✓	✓		✓
Strengthening and development of local laboratories	✓	✓	✓	✓		✓
Support the participation of the SME to the National Technological Clusters	✓	✓	✓			✓
Actions targeted to efficient coordination private-public	✓		✓	✓	✓	
Sustain to industrial research projects and experimental development	✓	✓	✓		✓	✓
Sustain to creation of incubators, accelerators, spin off and innovative startups	✓	✓	✓			✓
Professional training support	✓	✓				✓
Confirmation of public redevelopment	✓	✓			✓	
Actions to increase the digital territorial growth	✓	✓				
Actions to sustain social innovation	✓	✓				✓

3. Fablab specialization in line with regional innovation strategies

What follows is a brief identification of the alignment of the FabLab specialization with Provincial RIS3 and relevant objectives of the project addressing the RIS3 strategy. The key interventions which FabLab project aligns with in general are:

- Role of catalyser to strength the research and innovation ecosystem to ensure collaboration among the various actors.
- Increase the innovation performances of companies and related economic outcomes stimulating new opportunities for growth and market in the territory and internationally.
- Increase the focus of applied research of research centers and universities on the economy and society needs, Improving quality and economic benefits of public research.
- Empower human capital and its skills to develop and support innovation and to increase the ability to absorb it in innovative enterprise, research and development agencies.
- Encourage the birth and the development of innovative entrepreneurial initiatives, with particular reference to the intensive knowledge and emerging sub-sectors,

3.1. OPPORTUNITIES AND POLICIES FOR FABLABS IN INDUSTRY 4.0

At a European level, EU supports industrial change through its industrial policy and through research and infrastructure funding. Member States are also sponsoring national initiatives such as Industrie 4.0 in Germany, the Factory of the Future in France and Italy, and Catapult centres in the UK.

What basically these policies are putting available are fundings for investing in Research and Development and for improving technological equipment and capital. In many cases, like in the Italian country, the policies are foreseeing a 100% refund of investments in a short time, like a year. We can summarise that the actions at European level are aiming to 3 fundamental goals:

- Evaluate and manage Impact of digital transformation
- Support Access to Digital Transformation
- Supporting training

Now, let's consider FabLabs as independent, sometimes non-profit, open-to-people creative agencies based on grassroots communities work-force and shared knowledge, aiming to support this Digital Transformation by providing connection with customers (end-users, people, communities); a creative knowledge in technology (with a specific focus on making technologies accessible to all) and a cultural approach (the maker approach) that is basically the innovative ethos that companies and organizations are internally lacking and looking to absorb from outside the organizations.

- **IMPACT** / Understanding and then taking care of how a massive technological push would impact society and business. And take action from a policy making perspective.
- **ACCESS** / Enhancing urban resilience in the context of a massive technological improvement, by facilitating the access to technological infrastructures at several levels:
 - Facilitating access to FabLabs to schools, students, unemployed and other critical categories
 - Supporting fablabs in the acquisition of new technologies



- As for companies, it is crucial supporting fablabs in investing themselves in research and development for improving the quality of services that labs can offer to several stakeholders, SMEs included, under the umbrella of social and entrepreneurial innovation
- Recognising a central role of FabLabs in this process for what concerns with bottom-up processes, such as inclusive policy making
- **TO ENABLE ACCESS, IT IS CRUCIAL TO OFFER MASSIVE TRAINING** / Talents training will be a crucial element in Fourth Industrial Revolution technological change. To this extent, training on use of integrated enabling technologies will be highly demanded, on both scholar and advanced level. Policy makers will be in charge of facilitating and promoting a fine grained, customisable and diversified training programs on territories.

4. S3 alignment through pilot action implementation

Main goal of pilot action joint concept is to drop the rigid one-size-fits-all model adopting a greater flexibility of a network. All countries move at different speed and not always toward a same goal. We focus on an enhanced-cooperation among project partners in which a variable geometry is foreseen. Finally, we can copy the Angela Merkel Europe definition at the European Council happened in Malta at March 2017, about a multi-speed Europe in which an enhanced-cooperation get implemented. So, FabLabNet can't do anything else than reflecting a general European condition in its actions and flexible approach. The FabLabNet Joint Concept for Pilot Actions aims to cover the three fundamental goals of digital transformation related to Industry 4.0 acting on three levels:

- **CONNECTING TO COMMUNITIES** / (IT, SI, PL, CZ) / Open Innovation program to aggregate a community of makers around a fablab or a community of labs to solve challenges related to Digital Transformation within the local productive/manufacturing/craftsmanship ecosystem
- **CONNECTING TO BUSINESS** / (HU, IT, SK, HR, DE) / Business development
- **CONNECTING TO EDUCATION** / (AT, SK, CZ, HR, SK, PL, DE, IT) / Training formats and education

The whole system of FabLabNet pilot actions is conceived as an open framework in which project partners from the different European countries can set their local pilot actions based on local environment and resources (both in term of human resources and physical infrastructure) reaching a common goals at consortium level. Since the differences occurring among the several fablabs, the pilot actions joint concepts must be conceived as a set of flexible guidelines in which each partner can design a specific fablab-service according to local ecosystem specific needs and fablab capacity.

The Pilot Action will be concluded with a final pitch where local investors, entrepreneurs together with journalists and local population are invited. This will be an important knowledge moment where these stakeholders can practically experience the key role of the MUSE FabLab for innovation and economical, technical and scientific growth.

5. Long term strategy deriving from pilot action and S3 consultations

Thanks to government financing, organisations dealing with S3 are enabled in investing in R&D and in technical equipment acquisition. They are also interested in improving their practices for innovation through innovative formats, design thinking, interaction design, Open Innovation.

Through S3 and using Publicity Papers we scout:

- 1- Organisations needing innovative service (such as FabLabs settlements, open innovation practices, industrialization of ideas, high level trainings)
- 2- Organisations able to provide specific know-how and interested in partnership with the FabLab for innovation services.
- 3- Which organisations are getting support from policies for Industry 4.0
- 4- What are the topics in which companies are investing for innovation
 - >> which gives us the topics for call for ideas pilot 1
 - >> which gives us the topics for HLT pilot 3

Thanks to these information we can:

- Draft the strategy paper
- Select the partners for Memorandum of Understanding beyond APs
- Set an S3-aligned call for ideas for pilot 1
- Set an S3-aligned mentorship program for pilot 2
- Set an S3-aligned training program for pilot 3



6. Involving new actors and outreach

MUSE FabLab begun networking and bilateral connections with many stakeholders. MUSE FabLab can provide innovative equipment for research and prototypes projects, to members who can benefit also of the Vision on innovation and of the assistance on divulgation of the projects. The following tools and activities are foreseen for dedicated stakeholder groups.

Stakeholder Group	Objective	Tools and Activities
Companies, SME's , Artisans	To engage the business in the FabLab activities, support long term sustainability	Presenting the FabLab potential in Industrial/Artisan Federation or Groups. Direct involvement with some key stakeholder.
Academic community and faculties	Awareness of FabLab opportunity for academics	Contact with relevant professors for sharing the knowledge of thesis possibilities realized with the help of FL.
University Students	Provide students with an affordable infrastructure to realize their personal projects. To offer opportunity to use the FabLab equipment in research and study activities	Project base oriented learning system.
School Students	To support and encourage interest of student in digital fabrication and teach them to use the equipment. To offer opportunity to use the FabLab equipment in research and study activities.	Workshops, courses within official study curriculum. Apprenticeship possibilities to be realized in FL during the high school 4 th year.

7. Conclusion

MUSE FabLab is located in North Italy, well eradicated in the Trentino Province and with good connections with Economical, Industrial, Artisan, Agriculture, Political frameworks. The FabLab has an Educational role with many courses dedicated to schools, an industrial role with projects and collaboration with many SME, a scientific role with support to the Science Museum Activities and finally is open to the community and members for their own projects.



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AT1.2 | **Creating links to Smart Specialisation Strategies and relevant policy players**

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1. Characteristics of Vienna's innovation ecosystems

In 2015 the city of Vienna published the RTI Strategy "Innovative Vienna 2020"¹. This paper and the "Business Location"² report published by the city in 2016 are the source for the brief characterization of the relevant facts regarding the innovative ecosystems in Vienna.

1.1. Position of the region

Vienna is one of the European cities that is annually listed at the top of numerous rankings, such as life quality (Mercer, UN-Habitat) , innovation (Innovation Cities Index 2015) or in the Smart Cities Ranking. Therefore, it is not surprising that in the past 15 years the population has increased by 300,000 inhabitants and according to current forecasts the two million mark will be hit by 2030. This trend also has an influence on levels of economic development in the city: *"One fifth of the Austrian population generates one fourth of Austria's gross domestic product. This proves Vienna's high level of economic development and the high labour productivity of its working population"*³

The strength of Vienna as an economic center is also reflected in the following numbers: *"(...) In 2014, Vienna's gross regional product amounted to about 84 billion Euros, which is about a quarter of Austria's value added. Vienna is also Austria's leader with regard to productivity: the gross regional product per employee amounts to EUR 82,400 in Vienna, which is 13% above the Austrian average and 26% above the EU-28 average"*.⁴

The city of Vienna has an awareness that innovation is a main source for creating new jobs and services: *"In this context, innovation is not limited to private enterprises but also involves the city as a purchaser and supplier of products and services with significant innovative power. Recently Vienna has adopted a new strategy for research, technology and innovation ("Innovative Vienna 2020") that calls for innovation in the private and public sector alike."*⁵ This publication was a reaction to some profound structural changes, also as a response to the fall of the Iron Curtain. Vienna tries to focus on knowledge-based services, which also becomes noticeable in an above-average productivity and is one of the key locational advantages for the City.⁶

¹ <https://innovation2020.wien.gv.at/site/download/>

² <https://www.wien.gv.at/statistik/pdf/wirtschaftsstandort-wien-2016-deutsch.pdf>

³ <https://www.wien.gv.at/statistik/pdf/wirtschaftsstandort-wien-2016-deutsch.pdf>, p. 9.

⁴ <https://www.wien.gv.at/statistik/pdf/wirtschaftsstandort-wien-2016-deutsch.pdf>, p. 8.

⁵ <https://www.wien.gv.at/statistik/pdf/wirtschaftsstandort-wien-2016-deutsch.pdf> p. 5.

⁶ <https://innovation2020.wien.gv.at/site/download/>, p. 10



1.2 Research and development in the region, innovative business

The City of Vienna has a long tradition as an important science and research hub, since Vienna the largest and oldest (founded in 1365) university center within the German-speaking countries. In 2014 Vienna had a student population of more than 190.000. 10% of the Viennese population are students (“By comparison: Berlin has about 171,000 students, Munich 112,000 (2013) and Zurich about 66,000 students.”⁷). These facts are also visible in the following figures: *“Spending over EUR 2.9 billion on R&D, Vienna has become a centre of research and experimental development in Austria. The Austrian capital accounts for some 31% of the country’s total research expenditure. Two sectors account for the greatest share of R&D spending in Vienna: private businesses, with 54%, and the higher education sector, with 38% of total expenditure.”*⁸

With that budget the City features 1.466 different research entities like universities, businesses or institutions active in research. This has a positive impact on the establishment of new business in Vienna: “Every year, up to 9,000 new companies are established in Vienna. What is more, Vienna is one of the cities with the highest purchasing power in the EU.”⁹ In general about 43.700 (2013) persons are employed in R&D sector: *“It is a positive development that the share of women rose from 37 % in 2007 to 39 % in 2013 (EU-28: 34.7 %5). At 5 % employment in R&D, Vienna ranked third among the region’s employment of the EU– 28 in 2011.”*¹⁰

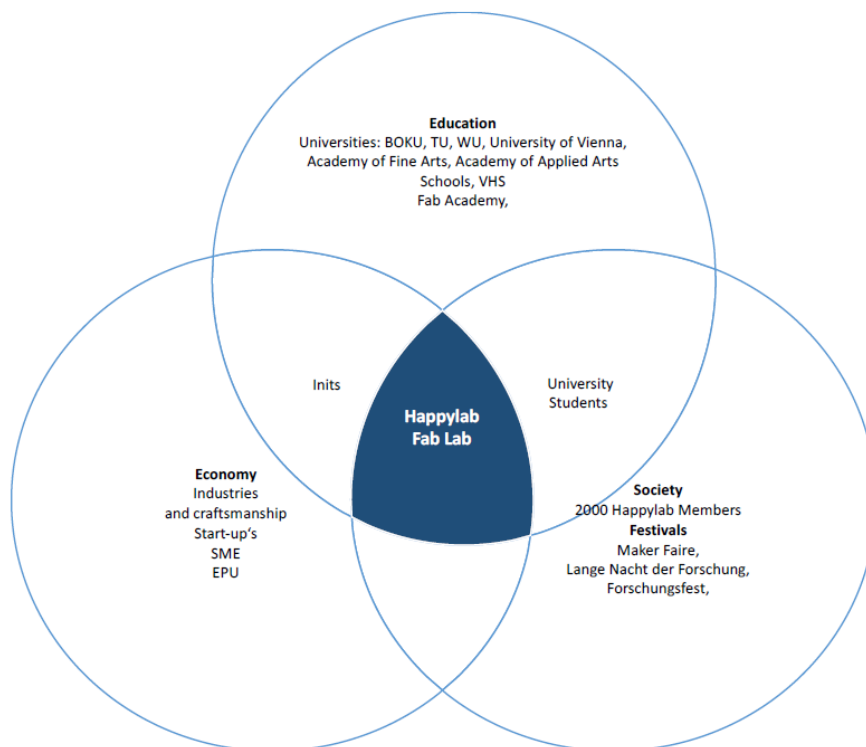
⁷ <https://innovation2020.wien.gv.at/site/download/> p. 27

⁸ <https://www.wien.gv.at/statistik/pdf/wirtschaftsstandort-wien-2016-deutsch.pdf>, p. 25

⁹ <https://innovation2020.wien.gv.at/site/download/> p. 26

¹⁰ <https://innovation2020.wien.gv.at/site/download/> p. 27

1.3. Main stakeholders of Happylab



2. Thematic specialisation and “areas of change” of S3 in Vienna

The strategic paper that was published by the city of Vienna in 2015 is a strategy that defines innovation in a very broad sense: “Innovation comprises any and all new approaches in thinking and acting, with due consideration of the context in terms of time, topic and social setting.”¹¹ This also reflects the general Austrian Smart Specialisation Strategy that sees S3 as a long-term concept, that mainly aims to boost growth and competitiveness. The reason for the broad conceptualisation of innovations is connected to the concept of open innovation.¹²




Vienna is a service oriented metropolitan region where many multiregional Austrian companies are located. In this area we can observe a high concentration of research and development activities. Vienna's goal is to become one of top five research centers in Europe also by“(…) taking advantage of the innovation triangle Vienna-Brno-Bratislava as one of the most promising regions in Europe.” Compared to other Länder priorities in Austria, Vienna has strong priorities in eight out of eleven themes (Tab.1).

Figure 2: Länder priorities corresponding to the federal nation-wide themes

THEMES	Burgenland	Carinthia	Lower Austria*	Upper Austria	Salzburg	Styria*	Tyrol	Vorarlberg	Vienna
Information and Communications Technology									
Life Sciences									
Materials Sciences									
Production Technology									
Sustainability									
Energy, Climate Change, Resources									
Mobility									
Quality of Life and Demography						**			
Humanities, Social and Cultural Sciences			**			**			
Creative Industries, Service Innovations									
Tourism (as part of the RTI Strategy)									
Tourism (separate tourism strategy)									

Bio-economy is an inter-sectoral theme and is found in sustainability, life sciences and materials sciences.

* Economic strategy as a basis for smart specialisation
 ** Complementary priority area in the research strategy of the respective Land

 strong
 low
 hardly/not at all

Source: Strategy documents of the Länder, own research

Tab1. Länder priorities corresponding to the federal nation-wide themes. In: Policy framework for smart specialisation in Austria. www.oerok.at, p. 25.

¹¹ <https://innovation2020.wien.gv.at/site/download/> p. 4

¹² Policy framework for smart specialisation in Austria. www.oerok.at, p. 27

2.1 Objectives under Innovative Vienna 2020

Vienna aims to become a City of opportunities with an innovative city administration and tries to reach that goal by defining innovation in a very broadened way:

“Innovative Vienna 2020 is a strategy for innovation in the broadest sense of the term. Innovation comprises any and all new approaches in thinking and acting, with due consideration of the context in terms of time, topic and social setting.”

We will first have a look at all the listed objectives in Vienna’s innovative strategy before having a closer look at the innovation goals of cities and regions that Fab Labs can help aim at.

The following objectives are listed in the Innovative Vienna 2020 strategy:

Innovation objective no. 1

City of opportunity: Vienna provides optimal conditions for innovation potential to develop in the metropolitan region.

Action area 1: Attractive location for researchers and businesses

Action area 2: Further developing areas of strength

Action area 3: Sustainable financing and effective funding

Action area 4: Education as a stepping stone towards innovation

Innovation objective no. 2

Innovative City Administration: Vienna is committed to innovation driven by the public sector and to its role in shaping, buying and using innovations.

Action area 5: Embedding a culture of innovation within the City Administration for the long haul

Action area 6: Innovation-friendly public procurement

Innovation objective no. 3

Vienna as a place where different people meet: Vienna creates an innovation-friendly climate and relies on cooperation and open-mindedness.

Action area 7: Spaces that promote an innovative climate

Action area 8: Increasing visibility and arousing interest

In the next chapter we analyse the areas of action listed in the Innovative Vienna 2020 strategy that are relevant for Fab Labs.

3. Fablab specialization in line with regional innovation strategies Innovative Vienna 2020

3.1. Action areas 1 and 2

Action areas 1: Attractive location for research and businesses

Objective: *“Promote start-ups - The number of start-ups has increased considerably (...). Vienna is taking advantage of this trend in order to establish itself internationally as an excellent start-up hub and to further increase its attractiveness to investors.”*

Action area 2: Further developing areas of strength - Promote a state-of-the-art manufacturing and services location

Objective: *“The conditions governing the manufacturing of goods are subject to profound and fast-paced change. In goods manufacturing, more and more products are being tailored specifically to customer demands. Production facilities need to be able to efficiently and economically produce even small series. Machines are supposed to determine themselves the amount of resources they need and to know when they are due for maintenance.”*

3.1.1 How Fab Labs can help to reach the objectives

The aim of tools and machines in Fab Labs is to enable users to make “almost everything” with digital fabrication. When it comes to technology-enabled products in particular, Fab Labs enable production of complex products on a small scale. This way they empower individuals, as opposed to mass production, to create smart devices. The products and devices can be tailored to individual and local needs. This allows producers, designers and entrepreneurs to adapt their ideas very dynamically to upcoming needs on the market in their local environment, which, compared to mass production, is an advantage.

Fab Labs are far more than just a room with machines. They provide access to necessary equipment so people are able carry out their own projects. Fab Labs are spaces where innovative ideas start to grow - users have the chance to develop prototypes that may turn into new innovative products. If they do, some users even start their own company! In the early stages especially, entrepreneurs are not able to finance infrastructure for manufacturing or developing the prototypes. Fab Labs are empowering young entrepreneurs with limited financial resources to realize new product ideas. They provide them with the necessary infrastructure in the beginning, when they cannot afford their own workshop or machines. We therefore have several successful examples of users, that managed to develop prototypes or produce their product in small-scale series and became successful with their own business.

Our workshop program “Fab Lab Boot Camp” is especially aimed at people who already work in an innovative field such as inventors, start-up entrepreneurs or students who want to make prototypes or finished products in a small scale using digital prototyping. In this way we are empowering potential entrepreneurs with new knowledge and infrastructure to create innovation for the region.

3.2. Action area 7 and 8

Action area 7: Spaces that promote an innovative climate

Objective: *“(...) The purpose of bringing innovation stakeholders together is to pool the competences and capabilities of businesses, research institutions and pilot users. Establishing cooperative relationships based on mutual trust ensures that product developments will not primarily target what is technologically feasible, but what future users really need.”*

Action area 8: Increasing visibility and arousing interest

“Awareness and participation - For an innovation location, it is pivotal that society at large has an open mind for new technologies. This is why Vienna promotes initiatives that aim to reduce scepticism towards technology and to raise enthusiasm for research and technology. A key element of such awareness is to provide opportunities for participation in different ways with a view to encouraging public debate. The Vienna Research Festival and workshops for children and young people help increase the visibility of innovation drivers and promote enthusiasm for natural sciences and technology, thus ensuring a supply of young talent for the local labour market.”

3.2.1 How Fab Labs can help to reach the objectives

Fab Labs in general are becoming more important as interdisciplinary research and development facilities. Sharing of knowledge, which is crucial for innovation, requires contact between people that have different backgrounds. Transferring and sharing this knowledge becomes easier, when those people are close to one another. A low-threshold access for people with different backgrounds in combination with access to professional equipment is one of our main objectives at Happylab. This way Fab Labs can foster the establishment of cooperative relationships, since people are working on different projects with different skills right next to each other.

We try to raise enthusiasm for digital fabrication on a weekly basis. Every Wednesday, a free Fab Lab tour takes place, which anyone can join, to learn about the different possibilities for users to realize their projects and ideas in a Fab Lab. We also have special offers for children, teenagers and people without any previous technical knowledge. We offer tours and hands-on workshops for schools, but also special workshops during the holidays for children and adolescents. During the workshops they can learn a variety of new skills, for example 3d modelling or machine handling. With our mobile Pop-Up Fab Lab we can make an even wider public familiar with the different opportunities offered by digital design and fabrication.

Regarding these areas of actions Fab Labs can support the City of Vienna in achieving the innovation objectives and strengthening research and innovation entrepreneurship or start-ups in the region. With our activities we especially help to increase the visibility and potential of Fab Labs, arouse interest for digital fabrication and provide a space with an innovative climate.

4. Fab Labs as an efficient tool for increasing regional competitiveness

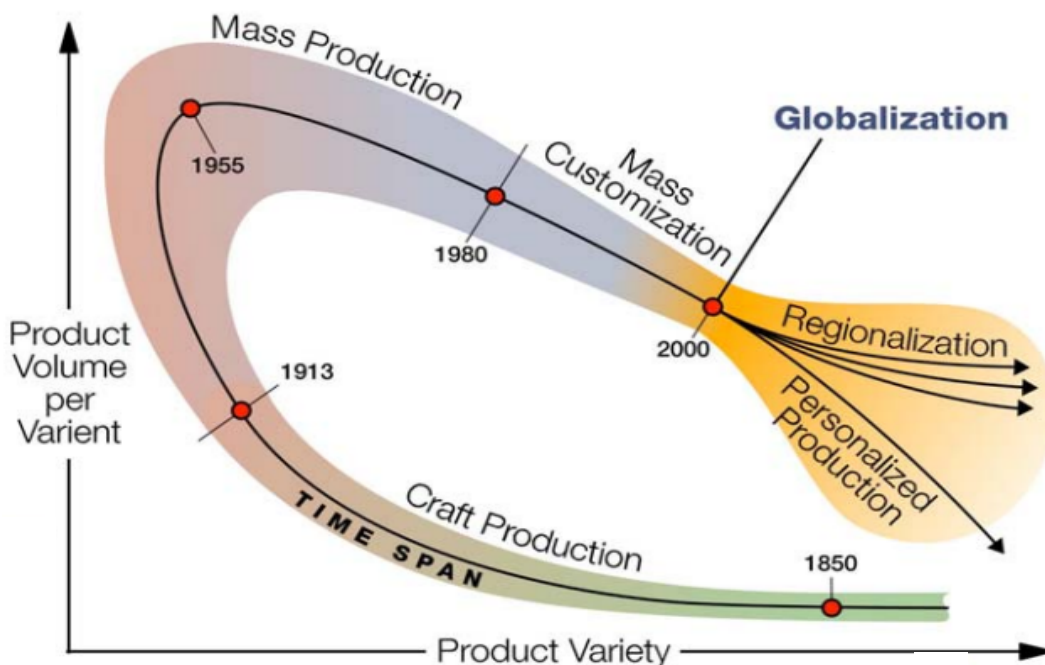
As mentioned above, the strategic paper that was published by the city of Vienna in 2015 that we are referring to, is a strategy that defines innovation in a very broad sense. The reason for this broad conceptualisation of innovations is the inclusion of as many areas as possible. From our point of view this is an opportunity, since we can link our activities as a Fab Lab to most of the objectives listed in the smart specialization strategies for Vienna.

5. Involving new actors and outreach

Stakeholder Group	Objective	Tools and Activities
Academic Students	Provide students with an affordable infrastructure to realize their personal projects and giving them the possibility to deepen and expand their knowledge in addition to the demands of their study program	providing them with infrastructure, cooperation's with universities
Start-ups	awareness for opportunities of digital prototyping for start-ups	Offering workshops that meet the needs for professional production and prototyping
Traditional manufacturing and craftsmanship	introduction to new technologies (Industry 4.0) and dismantling barriers, showing new possibilities of production	guided tours, building up a network – connection between traditional craftsmanship and digital fabrication, providing insights and new target groups for them
Students and teachers	imparting relevant knowledge and future skills	Pop-up Fab Lab, guided tours for classes, cooperation's with schools
Society	bringing general awareness to possibilities of digital production and new professions that are accompanied by that	Pop-up Fab Lab, cooperation's with science and research institutions

6. Conclusion

The city of Vienna aims to become an attractive location for research and businesses and wants to promote state-of-the-art manufacturing (smart manufacturing and production) as is explained in the S3 paper “Innovative Vienna 2020” to safeguard local jobs. Within the 10 years at Happylab we experienced how important the access to digital prototyping was for some of the members that managed to grow their own business after starting to work on prototypes and ideas in the Fab Lab. Their concept is supporting the trend towards regional & personalized production (Tab 2.) Several articles have been published on the “how the Maker Movement is creating jobs” topic. Therefore, a place like Happylab, a collaborative network that provides access to new possibilities for production and innovation, can support the vision of Vienna to become a “City of opportunity” (p.16) that “provides optimal conditions for innovation potential” (p.16). Fab Labs, their interdisciplinary community, their open access and their new knowledge approach are exactly providing the kind of networks and platforms described in the paper “Innovative Vienna 2020”.



Tab 2: Yoram Koren “The Global Manufacturing Revolution”

INNOVATION POTENTIAL & SPECIALIZATION STRATEGY PAPERS

Deliverable D.T.1.2.2
Drafting strategy paper
PP 3 / FabLab Budapest

Version 3
07 2017



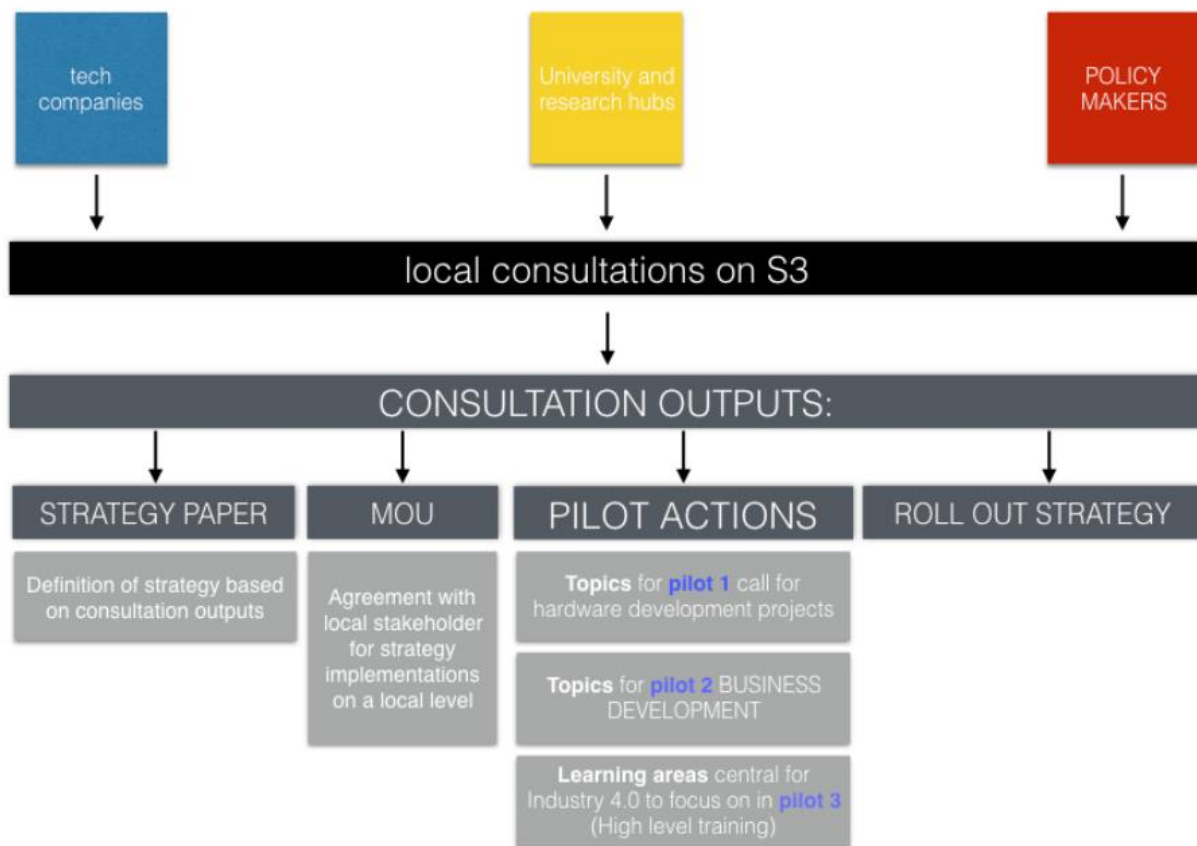


T1	Capacity Building and Networking of FabLabs
AT1.2	Creating links to Smart Specialisation Strategies and relevant policy players
D.T.1.2.2	Innovation Potential & Specialization Strategy Papers



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1. Characteristic of the Hungarian local innovation ecosystem

Following the severe 2008 recession, Hungary's economy has expanded strongly, based on export recovery and macroeconomic stimulus. However, Hungary's income per capita remains among the lowest in the OECD area. This partly reflects a low level of productivity (productivity growth has decelerated since the crisis) and weak business investment in capital and human resources.

While growing in recent years, R&D intensity in Hungary, at **1.22% of GDP (Gross Domestic Product) in 2016**, is still significantly below the OECD average, due to a lack of both private and public investment. Hungary has a strong industrial sector, however, business innovation capacities are mostly concentrated in foreign-owned companies and some large domestic companies. Public investment in research displays 33% of GERD (Gross Expenditure Research Development) - comparable to other European countries, and the national priorities are strongly influenced by EU programmes, especially structural funds.

Presently the Government is committed to strengthen the research and higher education system by building a strategic framework and implementing reforms. In June 2013, the government adopted the National Research and Development and Innovation Strategy (2013-20). This Strategy aims to **stimulate STI (Short Term Incentive) demand**, establish an **efficient support and funding system**, and develop an ecosystem for **start-ups**.

Given the importance of EU programmes in Hungary, the National Smart Specialisation Strategy and all documents related to structural and social funds also have a key structuring effect on STI activities. The 2014 Higher Education Strategy also sets ambitious targets in terms of improving teaching and learning, developing world-class research, and enhancing higher education's contribution to innovation and economic development.

"Investment into the Future - National Research and Development and Innovation Strategy 2020" (RDI strategy) was approved by the Hungarian Government in June 2013. The strategy aims to raise RDI investments, and as a result, to mobilise the Hungarian economy and to strengthen its competitiveness. The strategy set the target to raise the amount of total R&D expenditures to 1.8% of GDP and the amount of business enterprise R&D expenditures to 1.2% of GDP by 2020.



1.1. Position of the Central Hungarian Region

Central Hungary (regional capital: Budapest) is the economic, commercial, financial, administrative and cultural centre of Hungary. Its economic, social, institutional, educational and R&D related performance indicators are far above the national average. With a high concentration of research capacities in the capital, its innovation performance is outstanding among all Hungarian regions, albeit meagre in comparison to other capital regions in Europe. Central Hungary (CH) has an area of 6,916 km² and a population of 2,993,948 inhabitants (2016).

1.2. Research and development in the Region, Innovative Business

Similar to its economic performance, Hungary's innovation performance is also concentrated in Central Hungary (CH). CH hosts the Hungarian Academy of Sciences (HAS) and the majority of HAS-affiliated research institutes. Being the centre of higher education, there is also a high concentration of university-based research. The headquarters of the European Institute of Innovation and Technology is also located in CH. **R&D-intensive multinational enterprises (MNEs) are mostly located in CH**, or in some cases have research centres in CH and production facilities in convergence regions. The value of regional innovation performance indicators reflects this concentration, with 53.8% (1,467) of all research organisations in 2016; and 69.4% (17,900) of all researchers (full-time equivalent - FTE). The R&D expenditures in the region have been increasing and were €909.48m in 2014 (Eurostat, 2017), corresponding to 1.8% of the regional gross domestic product (GDP), being above the national average (1.4%) and below the EU-28 average (2.0%). Private companies were responsible for 74.2% of the R&D expenditures in the region in 2014 (Eurostat, 2017), which was slightly above the national average (71.5%).

CH hosts a number of accredited innovation clusters in the field of ICT, health industry and medical instruments, creative industries and sustainable construction. Cooperation between the science and business communities is much more intensive than in other Hungarian regions. Universities in Budapest have developed knowledge clusters, and due partly to huge EU co-financed investments in the upgrading of their



research infrastructure, they provide contract research services to business enterprises.

In 2012, 38.7 patent applications per million inhabitants were filed to the European Patent Office (EPO), which is far above the national average (17.1 per million inhabitants) (Eurostat, 2017). The percentage of persons aged 30-34 with tertiary educational attainment is also high in CH. 45.7% of the population aged 30-34 had this level of education in 2016, being above the national average (33.0%) and the EU-28 average (39.1%) (Eurostat, 2017). However, this value has slightly decreased since 2014.

The **high-tech sector is largely concentrated in CH** which accounts for more than half (54.1% in 2016) of the national high-tech sector employment in Hungary (Eurostat, 2017). This corresponds to 120.7 thousand employees (8.6% of the total regional employment, against the EU-28 average of 4.0%), which has substantially increased since 2009 (83.5 thousand employees).

In terms of broadband diffusion, 99% of households in CH had internet access in 2016 (Eurostat, 2017), matching the national average.

1.3. Main Stakeholders

The extraordinary concentration of Hungary's innovation activities and innovation performers in Central Hungary (CH) produced a unique situation for policy-makers, namely **that policy levers in CH are more or less identical to those at the national level**. According to CH Research and Innovation Strategy for Smart Specialisation (RIS3 Strategy of Central Hungary), and to the Integrated Development Strategy of Budapest, overall policy objectives include the enhancement of business innovation, and particularly SMEs' innovation activity, improvement of universities' R&D infrastructure, creation and development of knowledge clusters, improvement of human resources, and improvement of energy efficiency.

The RIS3 Strategy is driven by the vision that CH becomes an outstanding region by 2020 from the perspective of innovation. The RIS3 Strategy aims to contribute to the region's and nation's inclusive and intelligent growth by fully exploiting the economic and societal



excellence of Budapest and Pest county and by actively involving the local and international innovation stakeholders.

- *The RIS3 Strategy highlights the following key sectors and technologies:*
- *Pharmaceutical industry;*
- *Information technologies;*
- *Green technologies;*
- *Creative industries;*
- *Bionics.*

The RIS3 strategy indicates that financial support for its priorities is provided through European and national funds, as well as tax and fiscal incentives and the abolition of certain tax burdens. The European funds specified in the RIS3 strategy are:

- *European Regional Development Fund (ERDF);*
- *European Social Fund (ESF);*
- *European Agricultural Fund for Rural Development (EAFRD);*
- *Horizon 2020.*
- *The national fund specified in the RIS3 strategy is: National Research, Development and Innovation Fund (NKFI Fund).*

The sectors and technologies identified as drivers of regional innovation-driven growth include ICT, creative industries, health industry, biotechnology and environmental technologies. Policy measures addressed these strategic objectives through promotion of SMEs' investment in technology upgrading, support to basic research and innovation excellence in universities, and to enterprises' applied research. Innovation collaboration was promoted through support provision to enterprises' cluster-based joint innovation undertakings, to industry-university collaboration and indirectly, through the funding of universities' investment in research infrastructure. Some policy measures targeted innovation intermediaries: incubators, technology parks and innovation clusters, supporting the improvement of services and to the development of these organisations' infrastructure. Policy measures also focused on the development of tertiary education, improvement of curricula and of higher education institutions' student services.



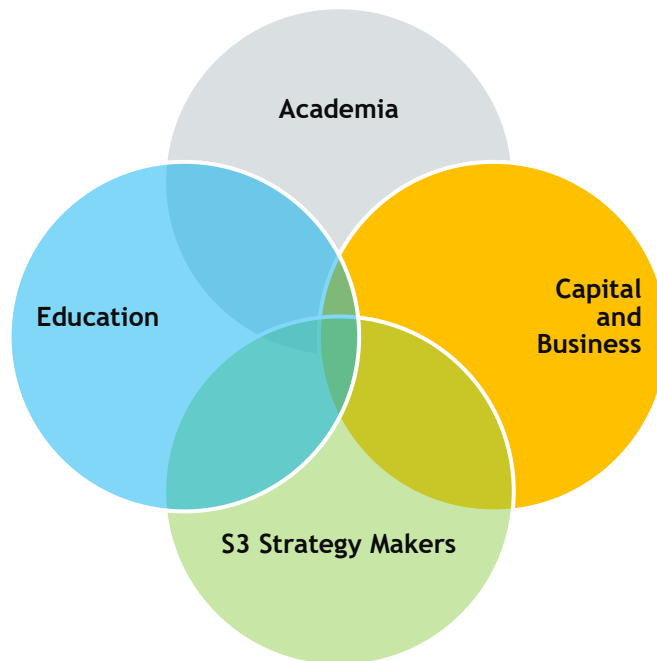
In the current development period support to RTDI is allocated from the Competitive Central Hungary Operative Programme (VEKOP) and the National Research, Development and Innovation Fund (NKFI Fund). Neither the key target groups, nor the purpose of support or the form of funding is expected to change compared to the prior financial perspective.

The full spectrum of interested stakeholders has been involved in the design of the National Smart Specialisation Strategy. During the mapping of possible participant organisations, the designers set out from the so-called classical triple helix grouping and its improved version, the quadruple helix grouping. The four types of organizations below have been involved in the national RDI management, and the proposal for the new management system also calculates with the participation of these types of organizations:

Quadruple helix elements	Groups	Organisation
Science	Higher education institutions	Universities
		Colleges
	Research institutes	Academic and sectoral (public or private) research institutes
	Knowledge centres	Regional and sectoral knowledge centres
Government	Government and local government organisations	Ministries
		National government offices
		County governments
		County government offices
		Local governments of cities of county rank
Economy	Innovative enterprises	Large enterprises
		SMEs (including micro, start-up and spin-off businesses)
		Non-profit companies
	Technology transfer organizations and accredited clusters	Innovation and technology transfer offices
		Clusters
Civil organisations		Trade associations
		Interest representation bodies (e.g. national and county chambers of commerce and industry)
		Other non-profit organisations

We have defined eight groups of stakeholders in the CH ecosystem:

- *S3 strategy makers;*
- *Education (Schools and Universities)*
- *Clusters;*
- *RDI Companies*
- *Business Accelerators, Venture Capital;*
- *Start-up companies and Entrepreneurs;*
- *Co-working and Co-making Spaces;*
- *Academia;*



In a top-down or a bottom-up approach all of them have relevant touch on the innovation ecosystem and its strategy making. The following stakeholders have been interviewed in single or group session interviews.



No	Name	Institution	Strategy maker	Education	Clusters	RDI Companies	Accelerators, Capital	Start-ups, & Entrepreneurs	Co-working & Co- making	Academia
1.	Máté PECZE	National Research, Development and Innovation Office	X							
2.	Barnabás MÁLNAY	SmartWare.tech; MMCulster			X		X	X		
3.	Balazs VARGA	MechatroMotive				X	X	X		
4.	Peter LANGMAR	GreenFox Academy; LabCoop		X			X	X		
5.	Pál HONTI	FreeDEE	X			X	X	X		
6.	Gergő NÁDORI	AKG		X						
7.	Panni KLEMENTZ	LOFFICCE				X			X	
8.	Máté VARGA	Science Meetup		X						X
9.	Balázs ZEITLER	SIEMENS					X	X		
10.	Zsolt BAKÓ	COLABS					X	X	X	
11.	Tamás TURCSÁN	STARTUPPER					X	X		
12.	György BÖGEL	CEU BUSINESS		X				X		X
13.	Orsolya FORSTER	KIBU				X	X	X	X	
14.	László BACSA	DEMOLA	X							
15.	Ákos LIPÓCZKI	MOME		X						
16.	Kitti MAYER	DESIGN TERMINAL					X	X		
17.	Marcell MÁRK	MAKERSPACE		X				X	X	
18.	Adam LIPÉCZ	SHOKA	X	X		X	X	X		
19.	Péter KÁDAS	Traction Tribe	X			X	X	X		
20.	György SUREK	DEMOLA		X		X	X	X		
21.	Melinda Kis-Babják	CRAFTUNIQUE		X		X		X		

2. Thematic specialisation and “areas of change” of S3

The Smart Specialisation Strategy (S3) is developed in every member state in the framework predefined by the EU. Hungary’s smart specialisation strategy has been approved in November 2014. It sets the directions for the entire country, along which research, development and innovation are planned to be supported in the most sustainable way, with the greatest social profit and the promise of the best financial utilisation rate.

The Strategy sets up six sectoral and two horizontal research and innovation priorities.

These priorities encompass domains, areas and economic activities where Hungary has a competitive advantage or has the potential to generate knowledge-driven growth.

Sectoral priorities are:

- *Healthy society and wellbeing*
- *Advanced technologies in the vehicle and other machine industries*
- *Clean and renewable energies*
- *Sustainable environment*
- *Healthy local foods*
- *Agricultural innovation*

2.1. Horizontal strategy of RIS3

Horizontal priorities are:

- *ICT (info-communication technologies) & Services*
- *Inclusive and sustainable society, viable environment*



3. Fablab specialization in line with regional innovation strategies

There is an “Open Laboratory” in the national S3 Strategy. This is a pilot which hasn’t implemented yet. Stakeholders suggest to propose a work plan how FabLabs could become part of this pilot or could fulfil it completely.

In the Strategy: an “open lab” and - for the use of it - a so-called “voucher” system will be introduced in the framework of the “pilot” project to be established along the national priorities developed in the smart specialisation process. A laboratory with a research direction or technological tools specified in the national priorities can become an “open lab”.

The essence of an “open lab” is that a laboratory or research infrastructure operating at a public research site³⁰ or a big company, and the associated research services, can be used by anyone, ranging from private individuals through private entrepreneurs to SMEs. This allows an optimized access to the equipment, where new technologies, products and services can be developed. The “pilot” would be created by opening an existing laboratory or research infrastructure. The “open laboratory” promotes the networking and partnering between higher education institutions, academic research organisations, public non-profit research organisations, other public research organisations, research and technological centres, large enterprises and micro-, small- and medium-sized enterprises. They support the innovation activities of undertakings (mainly SMEs) that are either inadequately or not equipped with modern equipment. The introduction of “open laboratories” will significantly increase the number and success of undertakings and organisations engaged (also) in R&D and innovation. “Open laboratories” enable a local content, which is higher than the current one, and the increase in Hungarian value-added deliveries to multinational companies.

Furthermore, “open laboratories” could be an implementation site for “open innovation” efforts (they can also play the role of a so-called “living lab”). This includes in particular the cases where a company opens up a problem to be solved or a research and

development task. The SMEs can carry out their research and development tasks in the innovative "open lab".

Another aim of the "open laboratories" is to support the studies and researches and contribute to the education and training of the "personnel" working in the laboratory, i.e., the talented students, doctoral students carrying out their research there. As a result of the research and development made in the "open lab", new undertakings, spin-offs and start-ups can be set up.

The "open labs" should operate on the basis of a public and transparent operation method and management. The operation of the "open labs" is controlled by a professional supervision. The "open laboratories" will continue to satisfy the needs of the owner/maintainer institution (e.g., research, education, etc.). In addition, external partners, in particular micro-, small- and medium-sized enterprises can use their research and development services. This could be the use of tools or causing the performance of a research project. Any micro-, small- and medium-sized enterprise can apply to use RDI services; it is the aim that this opportunity will be available to the broadest possible target group.

The small- and medium-sized enterprises could win vouchers by tendering procedure, which would serve as a means of payment in order to obtain various RDI services (order of R&D, measurements, support for the development and market introduction of a new prototype, ensuring technical/engineering background) from the "open laboratories". The resources necessary for the expansion and maintenance of the "open lab" would be covered from the operating income from the voucher system.

Open laboratories induce the following positive changes:

- *the R&D infrastructures become more widely visible,*
- *the SMEs are given an access (in a regulated and transparent manner) to tools of adequate capacity and quality, which they could not afford so far,*
- *a partnership is built between the different actors of RDI, thus promoting open innovation processes.*

4. S3 alignment through pilot action implementation

Within the FabLabNet project, we are the responsible partner for Pilot 2. This Pilot supports mentoring and training of business development and entrepreneurship within the FabLab and the FabLab users as well by providing a supportive business environment to assist entrepreneurs to grow and develop small companies. One way of doing this is through expanding support for business incubation.

These are the Pilot aims, providing access to facilities and resources and collaborating on events and initiatives with other business incubators. The overriding aim is to extend the network cooperation with local business incubator, companies, deliver an effective national capacity for digital manufacturing ensure shared best practice. The Pilot 2 is deliberately flexible to reflect and build upon the varying local offers for business incubation. Our Pilot will be open to individual entrepreneurs and early stage startup teams who already had developed a prototype, a MVP. We will focus on projects on high growth potential, scalable businesses who already have traction and have a team spirit. Our aim is to accelerate projects which have an added value to the open innovation scene and the FabLab world.

5. Long term strategy deriving from pilot action and S3 consultations

We defined the following long term strategic aims in accordance with S3 consultations and Innovation Ecosystem acknowledgment:

- *We should focus to address the needs of RDI intensive small and medium sized companies with new services not just in the field of advanced manufacturing but providing consultancy as well;*
- *We need to create a linkage to venture capital. Presently more and more hardware start-ups receive seed capital or venture capital. We need to engage these businesses. This can support our long term sustainability.*
- *We need to go regional. In Hungary we have at least 7 big university campuses which could benefit from a FabLab and it's services. We should focus on how to start a network within the country.*



- *The FabLab 4 Designers program and the FabLab Ambassador program needs to be continued.*

6. Involving new actors and outreach

6.1. Education (Schools and Universities)

Education stakeholders suggested the following:

- **Provide mobile manufacturing infrastructure devices for students;**
- **Host after-school STEAM¹ clubs or programs;**
- **Create STEAM curriculum;**
- **We should launch again our ambassador programme;**
- **Try to open new labs at universities and schools;**

6.2. Clusters

Barnabás MÁLNAY suggested **becoming member of Mobility and Multimedia Cluster (MMCLUSTER)** where bottom-up innovation is not yet represented. It was formed in 2007 with the purpose of bringing together the most dynamic actors in the field of mobile technology and new media in Central Hungary, mix and match their R&D and innovation capacities, and help the fruits of their cooperation succeed on the market. Their main objective is to foster innovation and entrepreneurship. By today, MMCluster has grown to be one of Hungary's most significant institutions in the digital industry with close to 70 members. They have connections to Hungarian and international fellow business clusters, companies, NGOs, and government agencies.

6.3. RDI Companies

FabLab has a competitive infrastructure for prototyping and small scale manufacturing. Presently we are providing 3D printing and CNC milling services for SIEMENS.

¹ STEAM is an educational approach to learning that uses Science, Technology, Engineering, the Arts and Mathematics as access points for guiding student inquiry, dialogue, and critical thinking. The end results are students who take thoughtful risks, engage in experiential learning, persist in problem-solving, embrace collaboration, and work through the creative process.



Business stakeholders suggested the following:

- Be more visible for companies;
- Do marketing and presales;
- Cooperate with their RDI units;
- Create special membership for those company employees you are working for;
- Clarify IPR at the FabLab;
- Team up with Hungarian equipment manufacturers;

6.4. Business Accelerators, Venture Capital

Business Accelerator and Venture Capital stakeholders suggested the following:

- Look for strategic partnership with one business accelerators or venture capital firm who invests into hardware start-ups or and try to convince them that FabLab is a great place for those projects they have invested;
- Try to be part of their selection process by validating applicants;
- Understand their investment requirements and input and prepare project within the FabLab for investments process;
- Use the international FabLab Network more;

6.5. Start-up companies and Entrepreneurs

Start-up stakeholders suggested the following:

- Create special incubation programme for hardware start-ups;
- Works as a think-tank and expert pool for project;
- Do more education regarding development processes;
- Do better marketing for FabLab visibility;

6.6. Co-working and Co-making Spaces

Co-working spaces are part of sharing economy. In other countries co-working spaces and FabLabs are often under one roof. Co-workers have an easy access to the Fab Lab, which is perfect for quickly developing their prototypes. Presently in Budapest located Co-



working spaces there are few hardware developer or designer start-ups or entrepreneurs. The reason behind is that without an access to prototyping or manufacturing infrastructure they won't benefit from moving to a Co-working office. It is also true that there are possible makers and users of the FabLab at these offices and we should attract them somehow.

Co-working stakeholders suggested the following:

- **Launch cooperation with the Co-working players by offering special packages and discount to their users;**
- **Find a strategic partner and be their “white label service” for prototyping and education so they could attract hardware developers;**
- **Promote yours services (especially education) and products developed/manufactured in the FabLab “bellow the line” to the co-workers;**

6.7. Academia

Academia stakeholders suggested the following:

- **Try to promote science and engineering in the education**
- **Scientists need often instruments for their research, which does not exist. They are makers without access for manufacturing equipment. FabLab should consider them as possible users!**

7. Conclusion

The collaboration-oriented model of FabLabs value creation process embeds a real potential into the innovation system. It is a trivia that every FabLab has a strong effect on this system by facilitating research, development and innovation (RDI), product development, education and creation of an entrepreneurial ecosystem. This bottom-up approach meets the top-down strategy of innovation stakeholders and the needs of the business and investment sector.



Our major conclusion is that the not yet implemented “Open Laboratory” initiative in the national S3 Strategy gives FabLab Budapest the chance to convince our stakeholders that how FabLabs could become part of this pilot or could fulfil it completely.

On the other hand our innovation ecosystem needs and FabLab Budapest should not just focus more on the already existing partnerships with the education, the business and the capital sector, but **should offer new services and be more visible.**



INNOVATION POTENTIAL & SPECIALIZATION STRATEGY PAPERS

Deliverable D.T.1.2

Drafting strategy paper PP 5/ BUT Brno
strojLAB

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T1

Capacity Building and Networking of Fablabs

AT1.2

Creating links to Smart Specialisation
Strategies and relevant policy players

D.T.1.2.2

Innovation Potential & Specialization
Strategy Papers

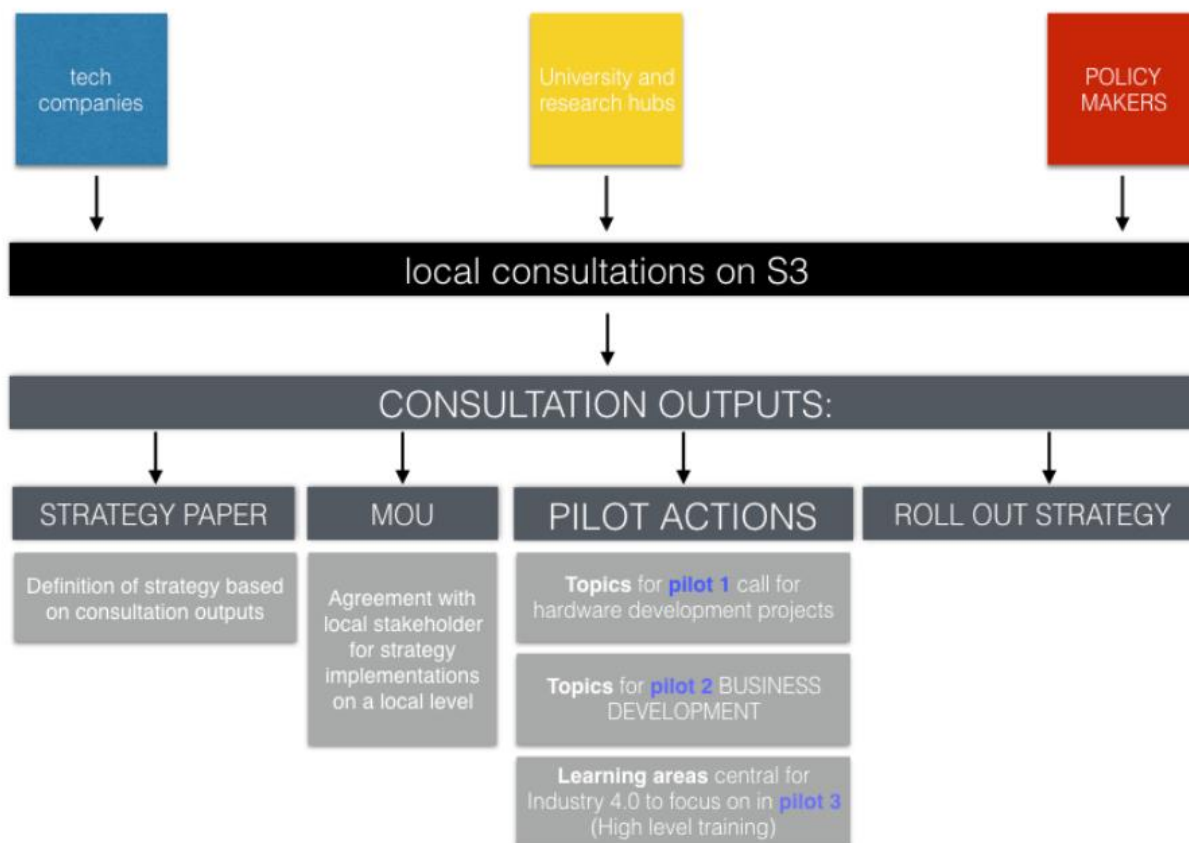


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FabLabNet frame





1. Characteristic of local innovation ecosystems

1.1. Position of the Region

The South Moravian Region (hereinafter "SMR") is one of the biggest regions in the CR. Its 1,168,650 inhabitants¹ rank it the **fourth most populated** region in the CR. It represents 11.1% of the population of the CR, and its share of GDP is 10.5%. The region has the highest GDP per inhabitant in the Country. The efficiency and position of SMR² is based, in particular, on the economic power of Brno and its broader surroundings. Brno is the **second most important control and economic centre of the CR** with a high concentration of activities with an added value (ICT, specialised services, research organisations, etc.). In terms of the Czech Republic, the region can be characterised as developed, however, there are **big internal differences** in terms of economic efficiency and the local labour market.

In terms of international competitiveness and with regards to the local economy generating income from abroad, the main specialisations of SMR are, according to NACE classification:

- engineering industry - NACE 29,
- electrotechnical - NACE 27 and electronic - NACE 26 - industry.

1.2. Research and development in the Region, Innovative Business

Based on the scope of R&D capacities, SMR has the second best suitable conditions for the development of knowledge economy after Prague. Its share of total R&D expenditure (GERD), in 2012, amounted to 20.3% of the total expenditure in the CR. Based on the number of employees in R&D, the SMR share is 18.8% when compared to the rest of the country. The regional innovation system can be, in principle, divided into the creators of new knowledge (most often research organisations) and their users (in particular, companies but also other parties of the application sphere - e.g. hospitals). In terms of research organisations, SMR is the second most important region in the CR, following Prague. Within the CR, SMR share of R&D capacities in the "University" sector reached 27.4%, in 2012, by employees and 33.8% by R&D expenditure. The big difference in the share of expenditure and employment in R&D in the university sector is connected to the extraordinary investment in new research centres supported from the structural funds in between 2007-2013. In addition to universities, there are also 8 institutes of the Academy of Sciences of the CR. SMR share of R&D capacities in the "government sector" is 12.3% by employees and 12.9% by R&D expenditure.

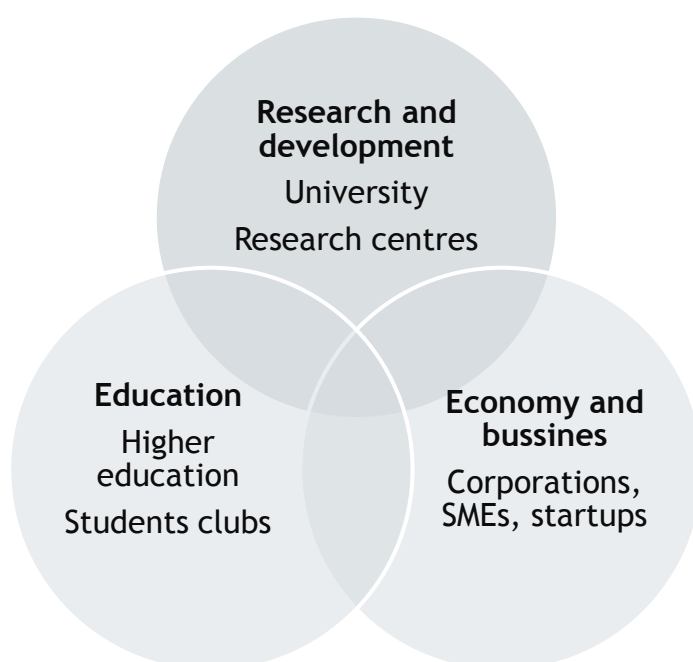
¹ as of 31.12. 2012, in accordance with the Czech Statistical Office data

² <http://www.businessinfo.cz/en/articles/south-moravia-region-7951.html>



1.3. Main Stakeholders

The SMR regional innovation strategies, 2009-2013, and the existing analysis made in order to state RIS, 2014 - 2020, defined the following priority economic sectors for SMR: **engineering** (NACE 25, 28); **electrical engineering** (NACE 26, 27, 33), **ICT** (NACE 61, 62, 63), and **life sciences** (NACE 01, 10, 21, 86).



The innovation ecosystem is described in SMR RIS3 and is formed and characterized by private corporations, universities and research centers. For clarity, we have divided the main players into six categories:

- **Mechanical Engineering**

Královopolská RIA, Unis, Ekol, Alta, ABB, Zetor, Minerva, OTIS, BMT, LAC, RoMill, T-Machinery, TOS Kuřim, Šmeral, Walter, ČKD Blansko, MetalPres, Gemax, Aroja, Jihomoravská armaturka, ZKL, Královopolská, Fritzmeier, Signum, AG Wateew, Kovolit, Metaldyne Oslavany, Železářny Veselí, Šroubárna Kyjov, Ferex, Feramo, DSB-Euro, Slévárna Kuřim

- **Electrotechnics**

FEI, Tescan, VF, Metra, DeLong Instruments, PSI, Mesing, ABB, JM montáže, ESB rozvaděče, Siemens, Daikin, Alstom, Startech, DI Industrial, Siemens, Kollmorgen, ABB, EMP, Franklin electric, EM Brno, VUES, JULI Motorenwerk, kabely, svazky, konektory, zdroje: Tyco, Egston, Griller Kabeltechnik, Maehler, RME - spoj

- **Software development**

Y Soft, Cígler Software, Kentico, Vema, NetSuite, AIS Software

- **Universities**

Masaryk University, BUT Brno, Mendel University in Brno



- Research centers

AdMaS, AdmireVet, ALISI, CMV VUT Brno, CEPLANT, CV VOZE, CETOCOEN, Dopravní VaV centrum, NETME Centrem, RECAMO, SIX Research Centre

- Centers of excelent

CEITEC, CzechGlobe, FNUSA-ICRC, IT4Innovations

2. Thematic specialisation and “areas of change” of S3

2.1. Thematic specialisation and “areas of change” of S3

The National RIS3 strategy concept focuses on interventions aimed at completing the innovation system of the Czech Republic (i.e. horizontal interventions) and interventions aimed specifically at strengthening selected specialisation domains (i.e. vertical interventions). In other words, “vertical interventions” means gradual prioritisation, i.e. the narrowing of interventions to themes that are defined within each smart specialisation priority, whereas horizontal interventions will support the given activity without thematic restrictions.

2.2. Horizontal strategy of RIS3

RIS3 defines six key horizontal areas in which the Czech Republic must achieve significant changes in order to strengthen the knowledge-intensity of the economy and to facilitate the development of the selected specialisation domains and their gradual refinement.

- Higher innovation performance of companies
- Improved quality of public research
- Improved economic benefits of public research
- Better Human Resources, in both quality and quantity, for innovative enterprise, research and development
- The development of eGovernment and eBusiness for increased competitiveness
- Improvement and better utilisation of social capital and creativity in addressing complex social challenges

These key areas of change are further structured into **strategic and specific objectives**, the results of which will contribute to achieving changes at the level of the key areas.



2.3. Vertical Strategy of RIS3 of the Czech Republic

The Vertical Strategy can be best demonstrated by the table 1. RIS3 defines Advanced Manufacturing Technologies and Materials as two of the five thematic (vertical) research priorities (generic knowledge domains) of the Czech Republic. The contents of these vertical interventions are defined relatively broadly and are necessarily viewed mostly as a framework than as concrete areas within this knowledge domain. However, fablab provides an open platform to enable the introduction of advanced manufacturing technologies and new materials to the wider public, students and future researchers in general.

Table 8: The matrix of innovation and research needs of smart specialisation – knowledge domains vs. application sectors

		Key application sectors and application themes – national										Key sectors of knowledge application – regional ¹⁸⁰				
		Manufacture of transport	Advanced and cost-effective mechanical engineering and automation	Cost-effective solutions in electronics and electrical engineering	IT services, software and IT security	Sustainable and safe production and distribution of electricity	Drugs and medical products and methods for healthy ageing	Natural resources, sustainable agriculture and food safety and sufficiency	Chemistry and chemical industry	Glass, ceramics	Rubber and plastic industry	Media	Textile			
Generic knowledge domains (KETs + non-technological domains)	Advanced materials															
	Nanotechnology															
	Micro- and nanoelectronics															
	Advanced manufacturing technologies															
	Photonics															
	Industrial biotechnologies															
	Knowledge for digital economy ¹⁸¹ , cultural and creative industries ¹⁸²															
	Social-science knowledge for non-technical innovations															

Tab.1 The matrix of innovation and research needs of smart specialization.

3. Fablab specialization in line with regional innovation strategies

What follows is a brief identification of the alignment of the fablab specialization with both horizontal and vertical interventions of the national RIS3 and relevant objectives of the project addressing the RIS3 strategy. The key four horizontal interventions which the fablab project aligns with in general are:

- Higher innovation performance of companies
- Improved quality of public research
- Improved economic benefits of public research
- Better Human Resources, in both quality and quantity, for innovative enterprise, research and development



3.1. Entrepreneurship and innovation - Area of Change A: Higher innovation performance of companies

The Smart Specialisation Strategy of the Czech Republic in the field of enterprise and innovation focuses on the following two strategic objectives:

1. Increasing the innovation demand in the business and public sectors. The ambition of fablab is support in general innovation demand in the business and public sectors. As such, fablab Czech Rep. would strengthen already active university business activities in assisting and providing opportunities to test their innovations in a supportive infrastructure. Secondly, the fablab summer courses will improve the technical and non-technical competencies of its graduates, which will have the necessary skills to further increase the demand for hi-tech innovative solutions in companies. Lastly, fablab will strengthen multi-faceted open-innovation trends in the local environment and hence increase innovation demand.

2. Increasing the level of enterprise in society, with an emphasis on establishing knowledge-intensive companies in fast growing areas. Entrepreneurship is at the core of the fablab vision and the pillar of the associated-partner JIC strategy with the creation of new start-ups as a key performance indicator (not to be confused with fablab VUT, JIC is an associated partner organization). Due to VUT fablab access to a large pool of technically oriented research staff and students, we modestly estimate this partnership of fablab JIC and VUT will help with creating [ef](#)-at least three hi-tech start-up companies originating as a result of the fablab project. Further to this, fablab has the potential to act as an Innovation HUB by providing a coherent innovation ecosystem with high-quality consulting and infrastructure.

3.2. Research and development - Area of change B: Improved quality of public research

Strategic objective relevant to fablab activities in this key area of change is:

1. Providing stable conditions for the long-term development of high quality research facilities. Fablab provides the potential to improve research infrastructure further by helping the students and research staff to “make” things on demand previously unachievable by available infrastructure.

3.3. Research and development - Key area of change C: Increasing the economic benefits of public research

The Specific objective C.1.1. is to increase the interaction between research organization and public.

With typical activities, such as summer schools in cooperation with research organization and private sector; educational programmes focused on additive manufacturing and digital technologies and industry 4.0 or building up an educational centre in additive manufacturing the fablab project ideally fulfils the required objectives of this area of change “C”. It is also important to note, that our analysis came with the conclusion that the necessary condition for the increased economic benefits of fablab is better motivation based on success stories, medialization and PR activities.



3.4. Human resources - Key area of change D: Improved availability of HR, in terms of both quality and quantity, for innovative enterprise, research and development

This area of change has a number of subcategories and specific objectives which fablab complies with accordingly; however, due to space limitations, provided here is a general statement complying with this area of change. VUT Czech academic partners of this consortium educate 4,500 mechanical engineers annually (38% of the whole country of Mechanical Engineers) and thus is the primary source of the qualified workforce in this field. VUT also serve as the country's source of HR resources both in terms of quality and quantity. RIS3 identifies three HR levels as a key determinant of competitiveness in a knowledge-intensive economy.

Firstly, HR with a general level of education and skills realistically translates into the ability to create commercially useable innovation; however, availability of soft-skills such as entrepreneurship, co-operation, flexibility or customer orientation are identified as largely missing in the qualified population. Here fablab provides a clear platform for change in two of its three key objectives. Educational activities at the fablab will be strongly focused on entrepreneurship, co-operation and flexibility. Regarding the entrepreneurial objective of fablab we would work very closely with associate partner JIC with an emphasis on the creation of new hi-tech businesses and business education.

Secondly, RIS3 specifies the need for identification and development of natural talents, where the entrepreneurial talent, technical talent and the talent for research and development work are the most important for the key area of change. This is possibly the main area of focus of the Czech partner and our fablab is planning a programme for the identification of new talents to embark on their own early academic or entrepreneurial carrier. The selection process would be based on tools such as summer school, educational programmes, project and problem based learning activities and non-frontal form of learning. We aim for the identification of a number of talents from the above discussed activities.

The fablab model for innovation and education could provide an open platform based on an individual approach. One of the key instruments is access to shared fablab facilities.

3.5. Vertical alignment of Fablab project with vertical strategies of the CR

Importantly, fablab not only provides direct horizontal interventions, but also vertical intervention in R&D infrastructure in the defined Advanced Manufacturing Technologies and Materials priority areas by ensuring high-quality graduates that are able to develop their skills and knowledge in the long term. This concerns both the quality of graduates in the respective fields and also providing an entrepreneurial ecosystem enabling those graduates to create new companies and jobs.

In conclusion, these detailed consultations with relevant stakeholders has shown that fablab has exceptional alignment with the strategic and specific objectives of national and regional RIS3 strategy.

4. S3 alignment through pilot action implementation

In the framework of the project, strojLAB BUT Brno is involved in contribution to implementation of 2 pilot actions: one focused on rooting actions in local community and one action focused on connection to an education, research and development system at the University.

Pilot on rooting fablabs in local communities

Pilot to validate new Fab Lab service targeting the local communities: jointly develop and test a mentoring program through which people /(to be) entrepreneurs from the local communities can be engaged in a “making” process - ideas 2 prototypes 4 manufacturing - as a source of grass-root innovation and a possible entry point for future business creation.

S3 alignment activities related to local communities

- Support of awareness of the opportunities that digital skills offer for employment and employability
- Mentoring program for talented students
- Support of new ideas via bachelor and diploma thesis
- Cooperation with JIC Fablab Brno (fablab platform)
- Cooperation with Czech Republic fablab and makerspace community (labs in Brno)
- Cooperation with student organisations:
 - STUDENT`S CHAMBER OF THE ACADEMIC SENATE
 - ISC - INTERNATIONAL STUDENTS CLUB
 - BEST BRNO (BOARD OF EUROPEAN STUDENTS OF TECHNOLOGY)
 - IAESTE (THE INTERNATIONAL ASSOCIATION FOR THE EXCHANGE OF STUDENTS FOR TECHNICAL EXPERIENCE)

Pilot on testing fablabs in education

Pilot to link new fablab service with education: jointly compile a modular training portfolio targeting universities and lifelong training that enables them to profit from fablab infrastructure and promoting innovation culture. The training portfolio will be further developed and customized to the target groups of students.

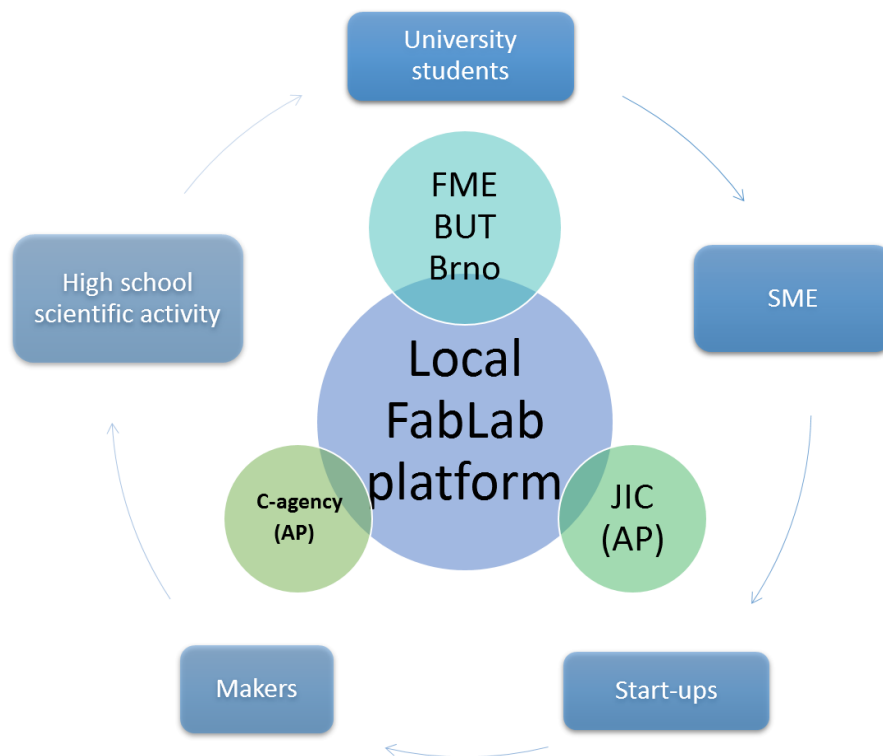
S3 alignment activities related to research and education

- Learning system for industry partner
- Support of “Advanced Manufacturing Technologies” such as additive manufacturing in faculty courses
- Support of students semester and personal projects
- Non-frontal system of education
- Learning by doing and DIY

5. Long term strategy deriving from pilot action and S3 consultations

Further long term strategic actions happening as a result of FablabNet in accordance with S3 consultations and Innovation Ecosystem acknowledgment will consist of:

1. Support of project and problem-based learning system
2. Cooperation with student organizations and community
3. Support of talented students for personal projects
4. Increasing interest among students about the development and support of fablab's thinking
5. Transfer of FablabNet project to local student's club
6. Involve student to active leading of fablab (strojLAB BUT Brno)
7. Support of new platform establishing (Local fablab's platform)





6. Involving new actors and outreach

Fablab BUT Brno (strojLAB) has started to support all BUT students and offers special technology equipment for research and student projects. To widen the cooperation with industry the students are invited to cooperate via summer or part-time jobs and also industrial partners are welcome to strojLAB laboratories and workshops.

Stakeholder Group	Objective	Tools and Activities
Companies, SME's	To engage business in the fablab activities, support long term sustainability	Presenting in Industrial Conferences and Trade Shows. For students: <ul style="list-style-type: none"> - summer job - holiday job - part-time job - voluntary job
Academic community and faculties	Awareness of fablab opportunity for academics	Projects cooperation, equipment sharing
Students of Master degree programmes	Provide students with an affordable infrastructure to realize their personal projects and semestral projects To offer opportunity to use the fablab equipment in research and study activities	Project based oriented learning system Workshops, courses within official study curriculum
Students of bachelor's study programmes	To support and encourage interest of student in digital fabrication and teach them to use the equipment. To offer opportunity to use the fablab equipment in research and study activities	Non-frontal system of project and problem based learning
Startups	To support new businesses with opportunity to create prototypes	Workshops, consultations, equipment sharing, development of products



7. Conclusion

Fablab BUT Brno (strojLAB) is located in the South Moravian Region on one of the largest technical universities in the Czech Republic. Fablab is open for all university students, academic staff and also supports cooperation with industry. Within the 8 years of project based learning system of education we experienced how important the access to digital prototyping and crafting was for students. Prototyping of real products is the best way of obtaining practical feedback and also the possibility of starting one's own business. Fablab is a strong tool for development acceleration and support of grassroots activities.



INNOVATION POTENTIAL & SPECIALIZATION STRATEGY PAPERS

Deliverable D.T1.2.2

PP6 PL

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**T1 | Capacity Building and Networking of
FabLabs**

**A.T1.2 | Creating links to Smart Specialisation
Strategies and relevant policy players**

**D.T1.2.2 | Innovation Potential & Specialization
Strategy Papers**

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1. Characteristic of local innovation ecosystems

1.1. Position of the Region

For the size of the area (which is 12 333 km²) Śląskie Voivodeship is located in the second half of rate in the country, however taking into account the amount of the inhabitants, with its 4 635 900 (in 2011) it ranks second. It is the voivodeship with the highest degree of urbanization (about 78 % of inhabitants live in the cities) and population density. The total GDP of the region accounted for about 13 % of Poland's GDP. The GDP per inhabitant is on level of about 105 % of the country scale. It is one of the strongest economically and demographically developed regions in Poland. It is the structurally diverse area, except well-developed industry, Śląskie Voivodeship has also rural areas and nature and landscape values which are favorable for tourism development.

Taking into account the Fifth European Commission report on economic, social and territorial cohesion (2010) regions are broken into categories according to their innovative potential. The Śląskie Voivodeship is regarded to be a region with good results and it had the

highest category among Polish regions - none of the others was included in the so-called strong generators group.

In the Śląskie Voivodeship the time of economic transformation was well employed. In the 90's in the XX century the focus was on supporting entrepreneurship. On the local level infrastructure was developed in this scope and a lively structure of institutions surrounding business and local development was created. It was on their basis that in the beginning of the XXI century foundations of pro-innovative policy were created in the voivodeship. Research and development sector was involved in those works. Pre-access means and financing from structural funds were used for developing many instruments of regional policy - both those referred to as "soft" and the infrastructural ones.

Having in mind the above and the position of the region, in conducting analyzes for the purpose of creating a RIS3 strategy of Śląskie Voivodeship, there were three main smart specializations indicated: power industry, medicine and information and communication technologies¹.

1.2. Research and development in the Region

The Śląskie Voivodeship ceased to be an industrial monoculture region and became a multi-industry region, created not only by companies in the region's traditional fields, but also by firms in completely new areas and specialized entities, offering niche products and thus included in global supply chains. Restructuration of economy became an impulse for changes in the research and development sector. Region's research institutes adapt their offer and the scope of performed works to the changing reality and also intensify international cooperation as well as their participation in European research and expert networks. Similar transformations pertain to the academic activities of universities, which additionally develop education in numerous new faculties and specializations.

Śląskie Voivodeship is the second largest scientific and didactic center in Poland with a wide spectrum of research and development and academic activities. Acquisition of knowledge and skills of its practical use in 2011 was offered by 45 higher education institutions and universities and 47 other educational units, representing total of 12,3 % of all higher education in Poland.

In 2011 on the area of Śląskie Voivodeship there were 286 R&D units, which accounted for 12,9 % R&D potential of the country. The activity of R&D units is focused such economy sectors like: environmental protection, power energy, automation and electronics, medical market,

¹ On the base of strategy Slaskie 2020+; <https://www.slaskie.pl/zalaczniki/2013/07/04/1372921202/1372921250.pdf>

construction. In Śląskie Voivodeship there were 9,1 % employed in R&D in 2011 - which was third place in a country scale. Total inputs on a R&D sector (GERD), which are one of the most important when thinking of innovations, in 2011 were on a level of around, 1,03 million PLN, which is about 223,3 PLN per inhabitant.

However, noteworthy is the fact that in a wider, European scale, such a R&D inputs (GERD) level shows a weakness of a polish R&D sector. As reported by EUROSTAT in 2010 expenditures in EURO per inhabitant were 491,8 € in the European Union, with about 45,8 € in a Śląskie Voivodeship².

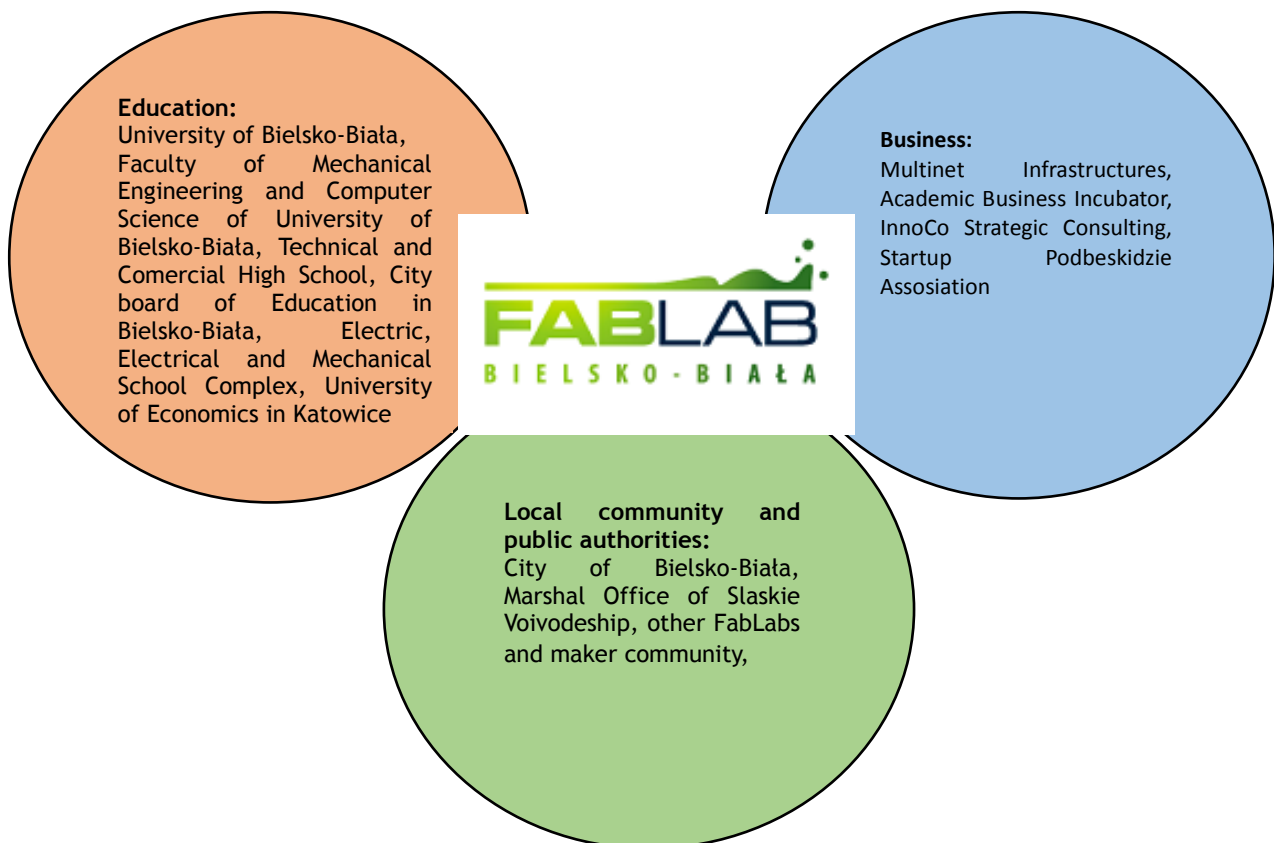
1.3. Main Stakeholders

Main Stakeholders, who have impact on the actions carried out by FabLab Bielsko-Biała and with whom laboratory can potentially cooperate in future in line with realization of strategic assumptions of Slaskie Voivodeship, are:

- local authorities - The Department of Strategy and Economic Development of the City of Bielsko-Biała
- Multinet Infrastructures - ICT company
- Academic Business Incubator - ATH Bielsko-Biała
- Startup Podbeskidzie Association
- University of Bielsko-Biała
- Faculty of Mechanical Engineering and Computer Science of University of Bielsko-Biała
- Technical and Comercial High School
- City board of Education in Bielsko-Biała
- InnoCo - strategic consulting (Regional RIS consultant)
- Innovation and Technology Transfer Centre
- University of Economics in Katowice
- Marshal Office of Śląskie Voivodeship
- Other FabLabs and maker community

² Ibidem

Key stakeholders of FabLab Bielsko-Biała:



2. Thematic specialization and main goals of S3 strategy

Regional Innovation Strategy of Slaskie Voivodeship 2013-2020 is the first innovative strategy in Poland, which is in line with Europe 2020 strategy. This document includes latest European Commission regulations about development programming in period 2014-2020, concerning necessity of identification of regional smart specializations.

Main goals of RIS are concentrated on two priorities of innovative development of the region, which are:

1. Increase and integration of existing potential of the region
2. Creating smart markets for technologies of the future

Assumption of RIS for years 2013-2020 is strengthening of regional system of innovations and its conversion to ecosystem of innovations.

Moreover, in line with the idea of smart specializations, regions are supposed to concentrate their resources on few key areas and based on them, they should develop their competitiveness.

As a strategic areas of interventions following had been identified:

1. Creation of knowledge and innovation communities
2. Development of networks of innovative public services
3. Modern infrastructure as a base for scientific and R+D activities
4. Inclusion of SME into the global innovation chains
5. Talent creation and competence building as a driving force of all innovative processes in the region³

2.1. Horizontal strategy of S3 strategy

The key strategic challenges of the Śląskie Voivodeship innovative development are:

- risk management in financing innovative activity of businesses,
- stimulating innovative potential of capital groups and industrial corporations,
- information asymmetry elimination and knowledge management in public innovation support system,
- diffusion of innovation concentrated on the user in public services sector,
- knowledge economy infrastructure development,
- creating smart markets for future technology,
- designing innovation culture.

The deadline for facing the above challenges scheduled in the innovation strategy is the year 2020.

2.2. Vertical Strategy of S3 strategy

Technology foresight for Śląskie Voivodeship altogether with Śląskie Voivodeship RIS is a guide for development of specific sectoral technologies which are:

1. Medical technologies
2. Technologies for energy and mining sectors
3. Environmental technologies

³ On the base of RIS3: Regional Innovation Strategy of Śląskie Voivodeship,
http://www.slaskie.pl/strona_n.php?jezyk=pl&grupa=3&dzi=1248434862&id_menu=545

4. ICT technologies
5. Production and processing technologies
6. Transport and infrastructural technologies
7. Technologies for mechanical, mining, aviation and automotive sectors
8. Nanotechnologies and nanomaterials.

RIS identifies three main key smart specializations of Slaskie Voivodeship:

1. Power industry - which is an important economy sector of the region and of national economy. Due to existing infrastructure equipment and high density of population and localizations of industry in region, Slaskie Voivodeship is a perfect background for testing and full-scale implementation of innovative solutions
2. Medicine - which is one of the factor differentiating the Slaskie Voivodeship from the rest of the country for its perfection in numerous fields of prevention, therapy, rehabilitation and recognition of medical engineering products
3. Information and communication technologies - that have a horizontal meaning for technological, economic and social development thanks to the increase of knowledge accessibility and enabling the creation and distribution of goods and services.

RIS opens development perspective for SME's, research and development institutions, support organizations as well as organized and individual users of innovations focused on specific topics, regardless of field. Key is the ability to join the value chains characteristic of particular thematic solutions, both on the regional and most importantly on the global scale⁴.

3. Key area of changes indicated in S3 strategy

3.1. Area of change A: Increase and internal integration of the region's innovative potential of strategy objectives

One of the two main ideas of S3 strategy is to improve potential that we as a region already have. It is very important to support changes in innovative communities. Regarding this, the S3 strategy refers to international cooperation as a crucial aspect and an investment for the future that helps to improve region's innovation potential and to include regional entities into world technology markets and creation of technological perfection poles.

The second way to increase regions innovative potential is to concentrate the efforts on the smart specializations mentioned above - f. ex. Reaching perfection in the field of medical services,

⁴ Ibidem

support synergy between existing clinical background and the network of scientific and R&D institutions.

There is no way to improve the innovative potential of the region without specific background. As it was mentioned at the beginning of the report, Slaskie Voivodeship is the second scientific and didactic center in Poland, also in the field of R&D (however in the European scale it isn't still an impressive level). Having a rich institutional background in the field of science, it is easy to attain negative purchase doubling effects and a mutual "cannibalizing" of region-initiated projects, applications for the financing of which are submitted to country and international agendas. In this aspect it is desirable to undertake the following in the region: common "low-threshold" activities regarding better information about the possibilities to make use of the already installed infrastructure and common investment enterprises, directed for the creation of shared fundamental research infrastructure⁵.

As S3 strategy says, the activities that will help to increase the innovative potential are also the multiplication of knowledge skills and competences of entities creating the innovation ecosystem and the internationalization of SME sector via specialization of innovativeness support institutions' services, especially financed or co-financed from the EU programs, thanks to which staff of those innovativeness support institutions have significantly developed their competences.

3.2. Area of change B: Creating smart markets for future technologies

The second main goal of S3 strategy is to create smart markets for future technology. According to the assumptions of operation of competence centers in the world their role is being underlined in building long-term cooperation in the field of research, technology, development and innovation among academic circles, industrial community, public sector and civic society. Those aim at diminishing the gap between the ability to create ideas and the ability to implement as well as commercialize them. The activity of centers offer a wide range of: gathering knowledge, concentrate infrastructure, create new knowledge by conducting various research (pre-competition and competition), trainings and knowledge dissemination into target groups. The sectors on which the smart market should be focused on are of course in line with the regional smart specializations, such as: environmental conservation, power industry, automotive and electronics, construction and medical market.

Today's economy is a knowledge economy, and a region's competitiveness is determined by its potential in the field of ability to create knowledge on the one hand and to absorb innovation and knowledge transfer by enterprises on the other hand. Innovative activity in the region mainly

⁵ Ibidem

concentrated on ensuring appropriate infrastructural solutions in the area of research and development. The activity is directly linked to the education process, covering all levels of education, and with development of a base of research laboratories in enterprises as well as in academic research entities.

The main role of competence centers and all entire surroundings that is supposed to create a smart market, is to facilitate further activation of actors innovation ecosystem such as: local authorities, business environmental institutions or social circles⁶.

4. FabLab specialization in line with regional and local innovation strategies

The key areas in which FabLab should take actions in, are in line to those indicated in regional innovation strategies and also to local smart strategies, characteristic to south sub-region of Slaskie Voivodeship - Podbeskidzie.

There are great opportunities of use actions provided by FabLab Bielsko-Biała in medical industry (use of 3D printing, f. ex. modeling of bone structure and their three-dimensional printing in the purposes of post-traumatic reconstruction, printing orthosis etc.) and also in terms of ICT.

There is also a possibility of use new composite materials, support process of modeling, prototyping and testing, in range of automation and robotics as well as smart creative technologies, including design.

Besides regional specializations indicated above, there are also local specializations, where actions provided by FabLab could be useful. First of all, it is automotive sector, which plays a key role in the sub-region, but also air industry and recovering after a temporary pause - but historically connected to the city - textile manufacture.

As mentioned above, in Silesian regional innovation strategy we can found two key areas of change - increasing existing potential and creating new smart markets in a field of modern technology and innovation.

The activities provided by the FabLab - supporting design, rapid prototyping and 3D modeling are in line with both of topics indicated above. As a place where we join together different society groups, from pupils and students, through enthusiasts and amateurs, to the innovative business environment we are a significant part of the regional ecosystem - both as a place where existing potential is increasing and new innovation actors from a smart technology market are created.

One of the meta-measures of Silesian regional innovation strategy also indicates that design for innovation “is particularly the process of introducing ideas into the market and transferring them to the product” - this is exactly what FabLab can provide to achieve the goals of S3 strategy.

⁶ Ibidem

5. Fab Labs as an efficient tool for increasing of regional competitiveness

Selecting the appropriate directions of development, in line with RIS and on the base of the experience in supporting and creating innovative ideas gained so far, activity of the FabLab can contribute to eliminating development differences between the sub-regions.

However, to make it possible, the idea of FabLab should be disseminate properly and as many stakeholders as possible should be involved.

An important aspect of the promotion of FabLab is the dissemination of its activities to the widest range of recipients. For this purpose, an efficient Internet and social media marketing will be useful.

Cooperation with appropriate institution - as indicated above, both local and national, joint organization of open workshops, participation in thematic meetings and events, conducting pilot projects with the use of FabLab infrastructure, exchange of good practices both local and abroad - those are main tasks which FabLab has to fulfill to become a competitive innovation center in the region

Moreover, FabLab should be open to everyone. There should be organized courses of the practical use of 3D design, both for children and youth and for students and lecturers, to promote vocational training in this direction.

Courses of 3D design should also be available for entrepreneurs, who can contribute increase of the competence in broadly defined planning, design and prototyping, before providing the product on the market.

In the FabLab offer, besides those mentioned above, should also be training courses for all participants of local innovation ecosystem. For Local authorities, showing how 3D design can be used in municipal economy and prototyping spatial plans and for R+D companies - special, dedicated offer about how can they use FabLab infrastructure in their activities.

FabLabs are becoming an interdisciplinary knowledge exchange centers, which

6. Involving new actors and outreach

<i>Stakeholder Group</i>	<i>Objective</i>	<i>Tools and Activities</i>
<i>Local authorities, policy makers</i>	<i>To interest local authorities with the idea of FabLab; to encourage them to support and promote digital fabrication</i>	Participating in local events, individual meetings and discussions



<i>SME's, start-ups and business environment</i>	<i>To raise the awareness of opportunities that rapid prototyping gives to SME's and start-ups</i>	<i>Open Makers events, providing specialized trainings and workshops – even personalized, individual trainings; mostly in line with regional smart specializations listed in S3 strategy</i>
<i>Other national FabLabs</i>	<i>To create a national network, exchange knowledge and experiences; to promote each other</i>	<i>Making common events</i>
<i>Students and academic teachers – especially from local technical university</i>	<i>To provide students with useful knowledge, to improve their competences</i>	<i>Workshops, Open Makers events, FabLabNet Pilot Action</i>
<i>Community; Makers and potential makers</i>	<i>To show common people the possibilities of rapid prototyping, to create a place, where they can train their skills, even if they are amateurs</i>	<i>Training programs of different levels of hardness, Open Makers events, presentations, especially on thematic events; FabLabNet Pilot Action</i>

7. S3 alignment through pilot action implementation

FabLab Bielsko-Biała as a FabLabNet project partner is involved in contribution to implementation of 2 Pilot Actions - one in the field of connecting FabLab to communities and one in the field of formal education.

7.1. Pilot Action Community

Firstly, FabLab Bielsko-Biała is going to implement pilot action for communities, which assumes testing mentoring programmes, through which local communities can be introduced into FabLab environment. In our case, regarding this pilot action, its participants will practice 3D modeling and rapid prototyping, what helps them to find themselves in an innovation market.

S3 alignment activities related to local communities:

- Open trainings and workshops for local communities - mobile FabLab - We want to reach people who do not have access to innovation every day - social inclusion
- Mentoring program
- Open Makers Day - cyclical event in FabLab Bielsko for everyone who would like to learn something about 3D printing and rapid prototyping
- Close cooperation with other national FabLabs, also from outside our region - to exchange knowledge and experiences which will be helpful in creating innovation

communities

- Talent creation and competence building - trainings on different levels of difficulty
- Cooperation with local authorities - organizing workshops in subregion municipalities

7.2. Pilot Action Education

Later this year we will be implementing second Pilot Action regarding the FabLabNet project. This Pilot Action will be in the field of formal education and it is focused on challenging educational systems to open up for new approaches promoted by FabLabs, on introducing rapid prototyping and problem solving by making. We are going to compile a database of trainings and workshops which will be dedicated to universities and schools. The trainings will be customized on the base of comments provided by participants and then tailored to their needs.

S3 alignment activities related to education:

- Trainings and workshops for students - beginners as well as advanced - students with no experience with 3D printing will be able to gain basic knowledge in 3D modeling and rapid prototyping, but there will also be a possibility to take part in a course for the advanced, where they will be able to make individual projects and create a their own prototype - designing innovation culture
- cooperation with local universities and schools, local authorities (Board of Education) and private sector - creating an local ecosystem of innovation
- special program for technical schools
- to provide students and pupils with usefull knowledge and improving their cmpetences
- FabLab trainings as a supplement and fill in the gap in local formal system of education.

8. Conclusion

FabLab Bielsko-Biała is located the multi-industrial region, second scientific and didactic center with biggest innovative potential in Poland. We are a place where ideas are introducing to the market and becoming a product - by open trainings and workshops we are going to show it to a wider community. Thanks to innovators and makers our FabLab is providing to reach the main goals of S3 - both increasing existing innovative potential and creating new smart markets. In its activities, FabLab Bielsko-Biała, is mostly concentrated on the regional smart specializations. One of the FabLabs main topics is use of 3D printing in medical industry. We have experience with



prototyping and 3D printing of aorta and orthesis equipped with ultrasounds that speeds up the healing process.

Moreover, FabLab Bielsko-Biała raise the awareness on digital fabrication, rapid prototyping and innovative technologies in different sectors - education, business, local authorities and local community - and that's what makes it an important component in process of creating local and regional innovation ecosystem, merging all its parts.

INNOVATION POTENTIAL & SPECIALIZATION STRATEGY PAPERS

DT1.2.2 PP7 (SI)

Version 1
03 2017





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FabLabNet Project Partners:

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FabLab Budapest (HU),

Brno University of Technology (CZ),

Regional Development Agency in Bielsko-Biala (PL),

RogLab - Ljubljana (SI),

Slovak Scientific and Technical Information Centre - FabLab Slovensko (SK),

FabLab Zagreb (HR),

UnternehmerTUM MakerSpace GmbH - Garching bei München (DE).



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1. Characteristic of local innovation ecosystems

1.1. Position of the Region “Zahodna Slovenija”

The region “Zahodna Slovenija” (ZS) forms the western part of the country and includes the cities of Ljubljana - Slovenia’s capital city- , Koper - significant Adriatic port - and Kranj - concentration of electronics industries. SZ is the richer of the two regions of Slovenia but is part of the 30 regions among the 276 NUTS2 regions, that have the most suffered from the financial crises¹. During the period 2008-2013, its GDP has decreased by more than 10%¹. Despite of this the GDP per capita of ZS is ranked 117 /276 and is slightly above the EU average². Unemployment rate is within the EU average, at 7.5%. But young people (15-24 years-old) are particularly affected, with 25% of them being unemployed³. Employment in High-tech sectors represents 7,6% of total employments, which places the ZS regions within the top 15 of the NUTS2 regions, together with London, Brussels, Stockholm or South-Ireland⁴. For what concerns Education, ZS is highly educated with a 66% of pupils and students being enrolled in a general and vocational education programme.

1.2. Research and development in the Region, Innovative Business

The below-given table summarises the key strengths, weaknesses, opportunities and threats (SWOT analysis) of Slovenia’s economic, research and development innovation system⁵.

Strength	Weakness
<ul style="list-style-type: none"> ■ 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 value 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. 	<ul style="list-style-type: none"> ■ 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

¹ http://ec.europa.eu/eurostat/statistics-explained/index.php/GDP_at_regional_level#Regional_GDP_per_capita

² https://en.wikipedia.org/wiki/List_of_European_regions_by_GDP

³ <http://ec.europa.eu/eurostat/cache/RCI/#?vis=nuts2.education&lang=en>

⁴ <http://ec.europa.eu/eurostat/cache/RCI/#?vis=nuts2.scitech&lang=en>

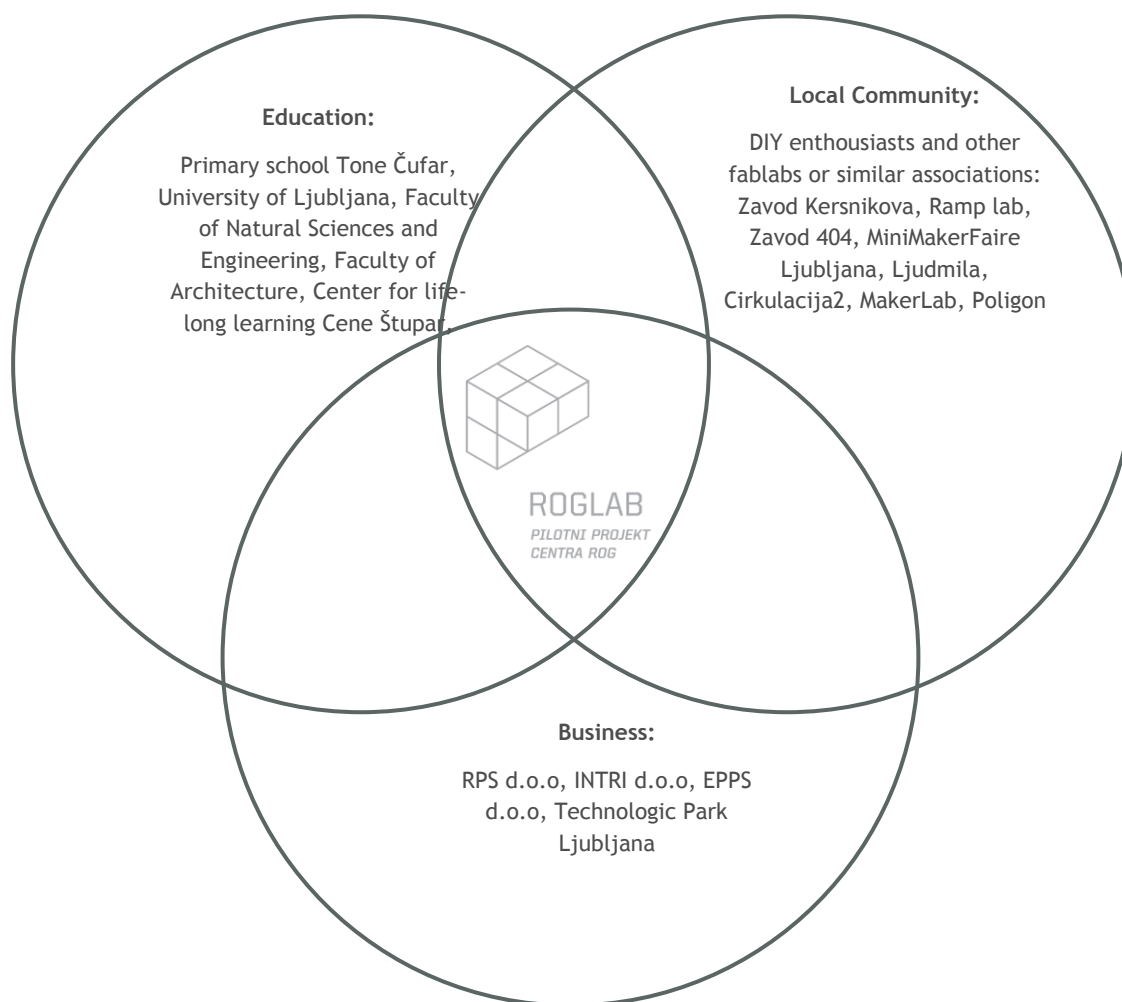
⁵



<ul style="list-style-type: none"> ■ 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: <ul style="list-style-type: none"> □ security □ clean and healthy living environment, preserved biodiversity, natural resources □ 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). 	<p>higher education.</p> <ul style="list-style-type: none"> ■ Innovation-related activity and performance of companies. ■ Despite the extensive scope of inventions the transition to innovation is not sufficient due to: <ul style="list-style-type: none"> □ Weak development departments in companies □ Weak <i>cooperation</i> (a) between knowledge institutions and the economy; (b) between companies; (c) between knowledge institutions □ (absence of) systemic incentives within knowledge institutions (career systems and mobility, rehabilitation procedures, etc.) □ 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 □ Fragmentation of support institutions lacking sufficient critical mass □ Orientation in developing products based on the development of technologies (push factor) with too little emphasis on the development of services/experiences (pull factor) □ Underutilised potential of culture and creative industries
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1.3. Main RogLab stakeholders



2. Thematic specialisation and “areas of change” of S3

Nine area of changes have been identified within the Slovenia’s Smart Specialization Strategy (S3)⁶:

I. Healthy working and living environment	II. Natural and traditional resources for the future	III. (S)industry 4.0
1. Smart cities and communities 2. Smart buildings and homes, including wood chain	3. Networks for transition into circular economy 4. Sustainable food production 5. Sustainable tourism	6. Factories of the future 7. Health - medicine 8. Mobility 9. Development of materials as products

3. Fablab specialization in line with regional innovation strategies

3.1. Mapping the areas of changes

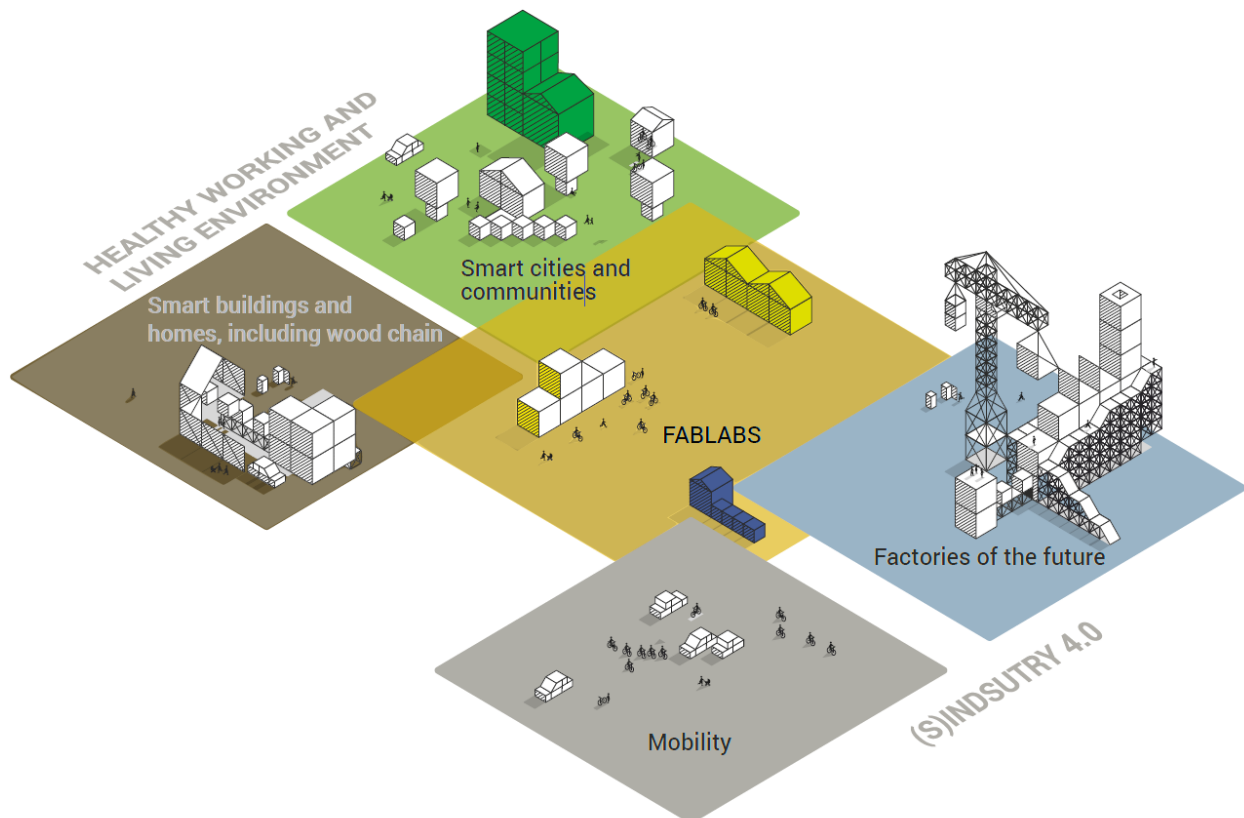


Figure 1: Mapping of S3 areas of changes and fablabs activities

In the following paragraphs are listed all keys areas of change from the Slovenia's S3 which can be linked to FabLab activities.

3.1.1. Smart cities and communities

The objectives of this area includes at least two pilot projects, in particular in the area of energy, urban mobility and safety .

Some of the focus areas and technologies are:

- Internet of things and future internet
- Embedded smart systems



3.1.2. Smart buildings and homes, including wood chain

Objectives:

I. developing 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

Focus areas and technologies

1. Smart housing units
2. Smart environment using intelligent building management systems
3. Smart appliances

3.1.3. (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, including what concerns modernisation and digitalisation of production processes and production cycle management

Focus areas and technologies includes the optimisation and automation of production processes: smart machines and equipment, mechatronic systems, actuators and smart sensors.

3.1.4. Mobility

Focus areas and technologies for the Mobility area includes Systems and components for security and comfort (interior and exterior).

3.2. Policy Mix

Within the measures foreseen to support the implementation of the Slovenian S3, many of them can be linked to FabLab's activities. Here is their compilation:

3.2.1. . Human resources

Of the key challenges addressed by the measures is to provide sufficient number of qualified staff meeting the needs of the economy

3.2.1.1. 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).

3.2.1.2. 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.

Some of the key instrument includes “Competence centres for human resources development 2.0” focusing on, among others:

- 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

3.2.2. 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.

3.2.3. Newly established enterprises and knowledge transfer

Some of the measures concerning this subject include the support of such 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

3.2.4. Growth and development of SMEs

Innovation, introduction of new technologies and models are important factors of growth and development for all types of companies.



Some of the measures concerning this subject include the support of such infrastructure: entrepreneurial hubs and supportive environment; knowledge sharing platform (open innovation) as a form of promoting innovation in companies; creativity centre

4. Fab Labs as an efficient tool for increasing of regional competitiveness

All Fablabs activities have their place within the Slovenian S3: dealing with new technologies, supporting companies and local community by providing new skills, fostering innovation spirit among young people, acting as a hub mixing talents from different professions.

5. Involving new actors and outreach

Since end 2016 and within the STRATEGIC RESEARCH AND INNOVATION PARTNERSHIPS (SRIP)⁷, each of the nine areas of the Slovenian S3 has a contact point in charge of focusing and coordination all partnerships of the concerned area. The four areas of change identified as mapping with fablabs activity shall be New actor with whom fablabs should establish contact.

Stakeholder Group	New Actor	Outreach
Smart cities and communities	Jožef Stefan Institute, doc. dr. Gregor Papa gregor.papa(at)ijs.si, m.pecar(at)ijs.si	Invitation at the next Cycling tour among Ljubljana's Fablabs
Smart buildings and homes, including wood chain	TECES mag. Matej Gajzer matej.gajzer(at)teces.si	Invitation at the next Cycling tour among Ljubljana's Fablabs
Factories of the Future	Jožef Stefan Institute doc. dipl.- ing. dr. techn. Igor Kovač - igor.kovac(at)ijs.si	Invitation at the next Cycling tour among Ljubljana's Fablabs
Mobility Economic Interest Grouping	Automotive Cluster of Slovenia Dunja Podlesnik - dunja.podlesnik(at)acs-giz.si, tanja.mohoric(at)acs-giz.si	Invitation at the next Cycling tour among Ljubljana's Fablabs

6. Conclusion

By 2020, the region "Western Slovenia" will have received about 800 millions € in the frame of the cohesion policy. A clear strategy in which areas should be allocated these funds has been clearly defined by the State in cooperation with Stakeholders. All of traditional fablabs activities can be found in four of these nine areas of changes.



INNOVATION POTENTIAL & SPECIALIZATION STRATEGY PAPERS

Deliverable D.T.1.2.2

Version 1

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T1 | **Capacity Building and Networking of Fab Labs**

A.T1.2 Creating links to S3 strategies

D.T.1.2.2 | Drafting strategy paper



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1. Characteristic of local innovation ecosystems

1.1. Position of the Region

The innovation ecosystem is described in RIS 3 by characteristics of the innovation environment in Slovakia, evaluation of innovation performance, funding of research and innovations and tools of funding of research and development as well as by characteristics of representatives of innovation ecosystem, which are (p.21-38): Business sector and innovations, represented mainly by Small and medium enterprises which presents 99.9% of Slovak enterprises and creates more than 70 % of the jobs, large companies, clusters (mainly 2 types of clusters are formed in Slovakian regions, based on bottom up approach: organizations - in tourism and technological cluster organizations), venture capital and incubators. On the other hand, The RIS 3 describes the research and development potential of the Slovak republic represented by the Slovak Academy of Science, Universities, Sectoral research organizations (established by Slovak ministries), Business R&I institutions.

Bratislava region where FabLab Bratislava is situated, is the key region within the Slovak Republic within the Slovak Republic, with highest innovation performance compared to the regions in Slovakia. Bratislava region has 628 686 inhabitants¹ which presents about 11,5 % of all inhabitants of the Slovak republic.

1.2. Research and development in the Region, Innovative Business

Bratislava region where FabLab Bratislava is located as well has the largest scientific-research base based on the absolute number of employees according to the innovation strategy for the Bratislava Region and about 1,2 % GDP of the Bratislava Region were allocated for research and development in the year 2009.² In Bratislava research institutions important to Fablab are located, such as:

- Comenius University in Bratislava
- Slovak University of Technology in Bratislava (STU)
- Slovak Academy of Science

Innovation support in Bratislava Region is also ensured by services in form of consultations, mentoring, financial tools provided by various business and innovation supporters institutions. Research and Innovation Strategy for Smart Specialization of the Slovak Republic³ concludes that Bratislava region is very important for the R&D ecosystem of the Slovak republic and highlight that:

- Bratislava region belongs to moderate innovators with high performance (according to the Regional Innovation Scoreboard 2012, (RIS 3, page 14)
- 50% of personnel and technical research capacities are located in Bratislava (RIS 3, page 32)
- High concentration of employment in the creative sector is present in Bratislava region (5.01 % of the labor force) (RIS 3, page 25)

¹ Bratislavský samosprávny kraj: Informácie o kraji. [online]. [cit. 2017-05-15]. Available at: <<http://www.region-bsk.sk/clanok/informacie-o-kraji.aspx?q=Y2hudW09Mg%3d%3d>>, Note: figure is from year 2010

² BIC Bratislava, spol. s r.o.: Inovačná stratégia BSK: Rozvoj výskumno-vývojovej a inovačnej základne Bratislavského samosprávneho kraja v období 2014-2020, 2012. [online]. [cit. 2017-05-15]. Available at:

<https://www.google.sk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=2&ved=0ahUKEwi8kKn-x_bTAhUoG5oKHSmlCZkQFgggMAE&url=http%3A%2F%2Fwww.region-bsk.sk%2FSCRIPT%2FViewFile.aspx%3Fdocid%3D10047807&usg=AFQjCNETdGwWYJptTfYvsvUv0-NwsNlItw&sig2=8ZBHqtHyNUd1dnFnCI2rSA&cad=rja> page 8

³ RIS 3 Research and Innovation Strategy for Smart Specialisation of the Slovak Republic. 2013. (english version) [online]. [cit. 2017-05-15]. Available at:

<http://www.google.sk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.economy.gov.sk%2Fext_dok-en_ris%3F142231c%3Fext%3Dorig&ei=HFqJVMPJYPxUt6JhOgJ&usg=AFQjCNFBx6E4g0kkr8g72QQO1Z78l7dq-g&bvm=bv.81456516,d.d24>



1.3. Stakeholders of the FabLab Bratislava

The main stakeholders from point of view of FabLab Bratislava are:

- NGOs
- Students of universities and institutions of higher education
- Pupils and students of high schools and elementary schools
- Interest groups (focused on youth, creativity, scientific skills, improving quality of life)
- Hobby groups (robotics)
- Professional groups (IoT)
- Representatives of universities and institutions of higher education
- Innovative companies
- Innovation support organizations.

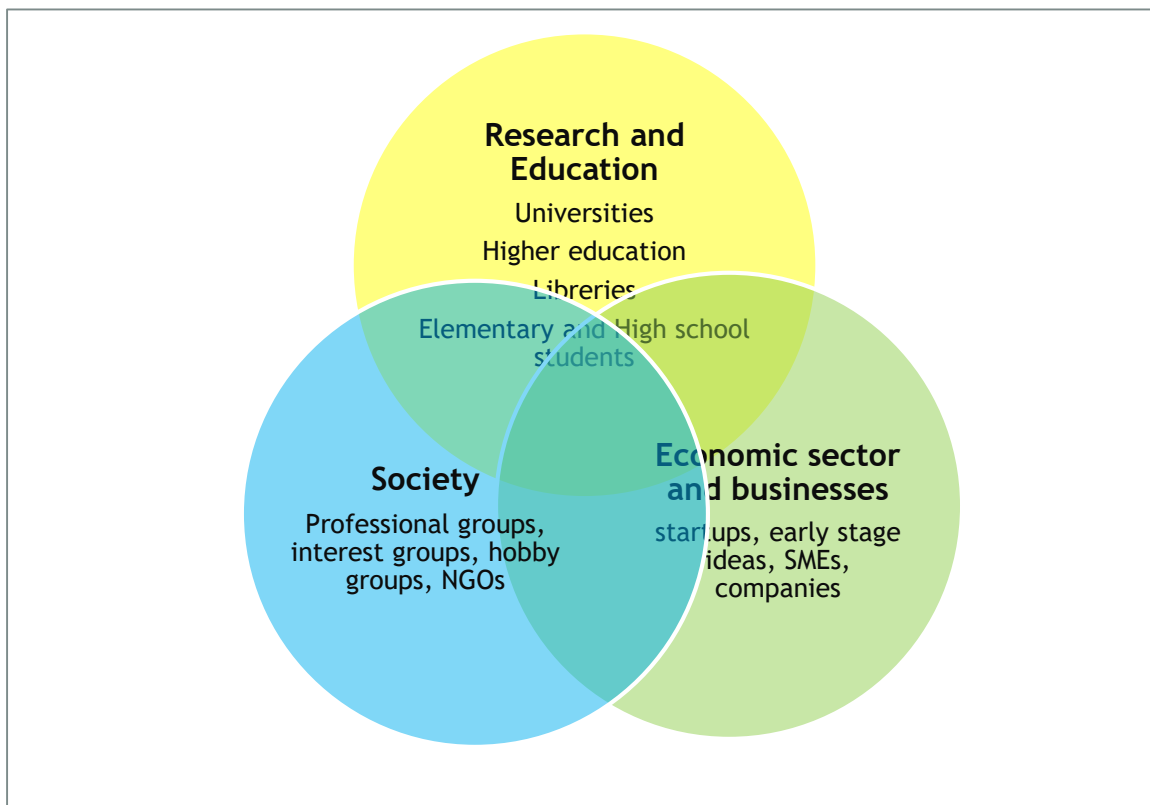


Figure 1: Stakeholders of the Fablab Bratislava



2. Thematic specialisation of S3

IDENTIFIED AREAS OF THE SLOVAK SPECIALISATION IN RIS3: ⁴

AREAS OF SPECIALISATION FROM THE POINT OF VIEW OF AVAILABLE SCIENTIFIC AND RESEARCH CAPACITIES:

- Research of materials and nanotechnology,
- Biomedicine and Biotechnology,
- Environment and agriculture,
- Sustainable energy.

AREAS OF ECONOMIC SPECIALISATION:

- Automotive and mechanical engineering industries
- Consumer electronics and electrical equipment
- ICT and Services
- Production and processing of iron and steel

PROSPECTIVE AREAS OF SPECIALISATION:

- Automation, Robotics and Digital Technology,
- Processing and increasing the value of light metals and their alloys,
- Production and processing of plastics,
- Creative industry,
- Increasing the value of domestic raw material base.

RIS3 Strategic objectives:⁵

„1. Deepening integration and embeddedness of key major industries increasing local value added through the cooperation of the local supply chains and turning local supply chains into embedded clusters,

2 Increased contribution of research to the economic growth via global excellence and local Relevance,

3. Creating a dynamic, open and inclusive innovative society as one of the preconditions for the increase in the standard of living,

4. Improving the quality of human resources for an innovative Slovakia. “

⁴RIS 3 Research and Innovation Strategy for Smart Specialisation of the Slovak Republic. 2013. (english version) [online]. [cit. 2017-05-15]. Available at:

<http://www.google.sk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.economy.gov.sk%2Fext_dok-en_ris3%2F142231c%3Fext%3Dorig&ei=HFqJVMPJIYPxUt6JhOgJ&usg=AFQjCNFBx6E4g0kkr8g72QQO1Z78l7dq-g&bvm=bv.81456516,d.d24 > pages 48-49

⁵ RIS 3 Research and Innovation Strategy for Smart Specialisation of the Slovak Republic. 2013. (english version) [online]. [cit. 2017-05-15]. Available at:

<http://www.google.sk/url?sa=t&rct=j&q=&esrc=s&source=web&cd=1&ved=0CB8QFjAA&url=http%3A%2F%2Fwww.economy.gov.sk%2Fext_dok-en_ris3%2F142231c%3Fext%3Dorig&ei=HFqJVMPJIYPxUt6JhOgJ&usg=AFQjCNFBx6E4g0kkr8g72QQO1Z78l7dq-g&bvm=bv.81456516,d.d24 >, pages 61-66



3. Fablab specialization in line with regional innovation strategies

Based on desk research of RIS 3, overview of Fablab Bratislava activities and consultations we identified the possible inputs and areas where Fablab can contribute. FabLab can support the knowledge and skills in areas of use of technology of the 21st century by organizing workshops and personal consultation on use of different technologies that can be used for creating new products, support business by make the rapid prototyping accessible, contribute to development of human resources of all ages.

FabLab Bratislava key roles in RIS 3 can be characterized as:

- Focus on activities on cooperation to high schools, and introduction of technologies to young people,
- Be involved in activities focusing on active aging (workshops, tools development, etc...),
- Promote rapid prototyping, prototypes created in fablab
- Prepare or be involved in development of handouts; concepts for courses at colleges and universities as the R&D representatives see the potential of use of all technologies available in Fablab in teaching process.
- Fablab can create links between the scientific-research institutions and businesses.

The role of Fablab Bratislava can be used in following areas of RIS 3 Specialization:

AREAS OF ECONOMIC SPECIALISATION: Automotive and mechanical engineering industries, Consumer electronics and electrical equipment, ICT and Services. And also **PROSPECTIVE AREAS OF SPECIALISATION:** as Automation, Robotics and Digital Technology,

Therefore, we assume the Fablab can contribute to following strategic objectives and their partial objectives:

3. Creating a dynamic, open and inclusive innovative society as one of the preconditions for the increase in the standard of living

Partial objectives:

- a) Creating conditions for enterprises (especially SMEs) to increase their innovation capacities - by supporting creation of prototypes and rapid prototyping and so support the development of spinoffs and startups.
- b) Increase the share of creative industry in GDP creation - by providing space for creativity, production and crafting, as well as organizing workshops and lectures
- c) Increase the share of KIBS in total production of business sector - by providing the society with possibility to gain skills in work with advanced Technologies and develop their technical skills and creativity.
- d) Support for the implementation of various kinds of innovations into practice for the needs of society - by support of professional communities and NGOs providing them with space for cooperation, knowledge sharing and technical equipment.

4. Improving the quality of human resources for an innovative Slovakia.

Partial objectives:

a.) Increase the employability of secondary school and university graduates - by development of technical oriented skills and knowledge and social abilities as team work are required on job market. Fablab offers: Development of skills to work to machines of 21st century and programming, learning work with new technologies, exchange of experience in community (facilitate team work), fostering the problem solving skills, possibility to foster creativity.



- b) Improve linkages between educational system and practice - by organizing workshops, and provide space for meeting of students and representatives of innovation system.
- c) Lifelong learning - by providing workshops, lectures, attend conferences and exhibitions to promote the use of new Technologies and well as foster creativity and development of technical skills in any age.

4. S3 alignment through pilot action implementation

Based on consultation to stakeholders which took place in November 2016 in the Fablab Bratislava the overall opportunities for cooperation are workshops and personal consultation/guidance on work to various machines, design and production of advertising materials, teaching workshops focused on 3D software and digital fabrication, research workshops.

Possible cooperation was also identified in developing contacts with universities focused mainly on technical and design areas in Slovakia and abroad, identification and evaluation of innovations, assessing the novelty and uniqueness of the idea and its competitiveness, presentation of supporters of start-ups and incubators in Slovakia.

Possible areas of cooperation are in areas as: development of human resources by expansion of non-formal education, use of technologies and services for active life and aging and improving the quality of life, local support activities, and support of start-ups and spin offs by rapid prototyping.

Most of partners who were involved in consultations were also interested in transfer of best practices from other EU participating countries in the project FablabNet.

For education and research institutions development of a new course which would be focusing on work to technologies placed in Fablab for students of technical studies and research, and increasing of e-skills of preschool children in symbiosis with seniors. For praxis oriented entities and SMEs workshops focusing on 3D software and digital fabrication, design and research workshops, lectures and conferences, networking, international activities would be interesting, as well as prototyping and producing artistic and design objects and minor architectures.

Within the project FablabNet, Fablab Bratislava is involved in contribution to implementation of 2 pilot actions: one focused on actions connection to business and one action which is focused on connection to education and development of cycle of trainings and courses. Within this pilot action and taking into account the consultations to main stakeholders, FabLab Bratislava would develop its pilots and implement them with focus on added value for education and research institutions in the field of technical studies and research to enhance the skills of university students with the new technologies and for support of business activities fablab focuses itself on support of rapid prototyping and design.

5. Involving new actors and outreach

FabLab Bratislava offers various services and activities which are open to new actors:

1. **workshop and personal consultation/guidance on digital production equipment for people of all ages**
2. **Transfer of the best practices**
3. **Technology transfer and protection and of intellectual property**
4. **Development of human resources (Extension of the formal and informal education)**
 - a. Support of development of digital skills in less developed regions
 - b. Technologies and services to active living and aging
 - c. assist in achieving a positive effect and addressing societal issues, such as: involvement of young people in changing circumstances, aging of the population and quality of life, marginalized groups and social inclusion.
5. **Support for start-ups** by support of Rapid prototyping and opportunity for design production



Stakeholder Group	Objective	Tools and Activities
Policy makers	<i>To encourage policy makers to support the idea and activities of digital fabrication to promote technical skills of students</i>	<i>Presentations, discussions to representatives of public institutions, municipalities.</i>
Libraries	<i>To revitalize libraries and show them opportunities how to use 3D printer in their activities</i>	<i>Presentations, lectures,</i>
Students	<i>To support and encourage interest of student in digital fabrication and teach them to use the equipment. To offer opportunity to use the fablab equipment in research and study activities</i>	<i>Workshops, courses within official study curriculum</i>
Pupils	<i>To raise awareness on digital fabrication and support the interest of young people in technical studies</i>	<i>Workshops, fablab tours, presentations on exhibition and national events</i>
Startups	<i>To support new businesses with opportunity to create prototypes</i>	<i>Workshops, consultations</i>
Research institutions	<i>To support research and development by offering tools for digital fabrication, and model creation</i>	<i>Presentations, discussions to representatives of R&D institutions, cooperation on joint projects</i>
NGO's	<i>To improve the quality of life and social inclusion</i>	<i>Workshops, tours in fablabs, tailor-made workshops, support in development of innovations</i>
Professional groups	<i>To support the professional groups and learn from their experience</i>	<i>Offering space for meetings, creativity and fabrication</i>

Table 1: Stakeholders groups of FabLab Bratislava and activities to outreach them

6. Conclusion

Fablab Bratislava is located in the most innovative region of the Slovak republic and cooperates to various representatives of the innovation ecosystem in the area of R&D, education, business as well as society. FabLab Bratislava tries to support the Slovak smart specialization by supporting the interest of student in digital fabrication and teach them to use the equipment, offering opportunity to use the fablab equipment in research and study activities as well as creating prototypes for early stage business ideas, and also by awareness on digital fabrication and support the interest of young people in technical studies. FabLab Bratislava will within the project Fablabnet implement pilot actions with focus on added value for education and research institutions in the field of technical studies and research.

A.T.1.2 CREATING LINKS TO SMART SPECIALISATION STRATEGIES AND RELEVANT POLICY PLAYERS

Deliverable D.T.1.2.2
Drafting strategy paper
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Executive Summary

FabLab S3 strategy document will bring our vision how we contribute to Smart Specialisation issue on national level with our knowledge, experience, networking and expertise to actually perform implementation of Smart Specialisation on regional and national level. With FabLab.hr limited resources, but knowledge about S3 as strategic document and quad helix stakeholders as mechanism to achieve this we see Fablab.hr for the moment as context manager in this process. Our vision and mission support goals and actions from S3 documents, and Fablab activities and missions are inline with Croatian Smart Specialisation.



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Conclusion

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1. Characteristic of local ecosystem

‘Smart Specialisation’ is defined by the European Commission as “a strategic approach to economic development through targeted support to Research and Innovation (R&I)”. It is a basis for European Structural and Investment Fund interventions in R&I as part of the current Regional and Cohesion Policy's contribution to the Europe 2020 jobs and growth agenda. More generally, Smart Specialisation involves a process of developing a vision, identifying competitive advantage, setting strategic priorities and making use of smart policies to maximise the knowledge-based development potential of any region, strong or weak, high-tech or low-tech.

Development of the S3 for Croatia, a new EU member state, comes at a time of intensive national reforms and policy changes. A number of major strategies have recently been adopted or are in a process of elaboration and/or revision. The S3 seek to unify all the relevant aspects from the various sectoral strategies in a framework that has a long-term perspective (2020) and will be basis for smart growth. Croatian S3 document is just recently in April 2016 accepted in Croatian Government.

Croatian Strategy for Smart Specialization is integrated, place-based economic transformation agenda with the following features:

- Focused policy support and investments on key national priorities, challenges and needs for knowledge-based development;
- Assessment of strengths, competitive advantages and potential for excellence in R&D;
- Instruments aimed to support technological and practice-based innovation with aim to stimulate private sector investment and to promote structural changes of Croatian economy;
- Instruments aimed on fostering synergies and identifying complementarities between public support mechanisms for RDI, industrial promotion and human capital and training;
- Detailed plan how will stakeholders involved in innovation development become co-operative in decision-making mechanism and development of innovation in key priority R&D intensive economic sectors

Presently, Croatian economy faces major challenges and new approach that country will take in solving these through S3 proposed measures is essential. Through S3 Croatia is addressing several major obstacles preventing its higher economic growth:

1. Croatia's innovation performance over the last decade has fallen short of expectations. The innovation system is operating below its potential, whether measured by the system's inputs, outputs or by the contribution of innovation to economic growth.
2. Croatia is significantly below EU-average in innovation and belongs to a group of countries considered as moderate innovators.
3. Croatia is performing below the EU average in most dimensions but above the EU average in human resources, due to above average performance in new doctorate graduates and youth with upper secondary level education.
4. There are three factors that impede innovation: tax regime, lack of early stage financing (first and second round of investment), and business environment. One structural problem that Croatia faces is that the volume of business R&D is low, despite the generosity of existing tax breaks.
5. High-value products and services remain a negligible part of exports, and the country's skills and technological capabilities have remained stagnant. This trend is reflected in Croatia's export and technological performance and competitiveness rankings, as benchmarked against comparator countries.

Due to the limited resources and capacities, the strategy concentrates on a limited number of priority sectors that are defined based on strengths and R&D potential for innovation development with basis for export. Proposed measures in S3 are focused on avoiding fragmentation of research, on concentration of structural funds, public budgets and private resources on priorities with competitive advantage and with the highest development potential.

Recently, Croatia initiated **National project for development of Innovation Network for Industry - INI**, Project **"Science and Technology Foresight"** and **"Smart skills foresights"**. The main result of these activities will be focused on RDI strategies for business sector related to each selected Thematic Priority Area, long term science & technology foresights for science sector and smart skills foresight related to development of human capital needed for development of those R&D intensive sectors identified in Thematic and Sub-thematic Priority Areas in this document.

1.1. GDP and economic growth

In 2014, Croatian GDP per capita measured in purchasing power standard (PPS) was around 15.900,00 EUR (59.0 % of the EU28 average) and the nominal GDP value was 43,084.90 million EUR.

In the period 2003-2008, growth in income and the country's economic expansion were fueled by a growth pattern based on domestic consumption, growing current account deficit and increasing dependence on international finance. High and sustained rates of economic growth, at a time when the size of population was declining, resulted in consistent growth in per capita income. As a result, per capita income converged, partly as a result of the catch-up effect after the dramatic drop in the early 1990s, with levels in the richest economies: GDP per capita rose from 22.84% of the EU average to 37.8% between 2000 and 2008. Since the beginning of global recession in 2008, the Croatian economy has been contracting steadily. Starting from 2008, the cumulative GDP decrease is estimated to be 12 %. The most evident obstacle for the sustainability of the current growth path is the related large and growing external financial account.

Conclusively, Croatia stands much better in terms of productivity, measured by GDP per person employed than GDP per capita towards the EU countries. So, this suggests that the firm level productivity is probably not the major constraint and that firms that have survived transition process are relatively competitive.

Twelve Croatian Competitiveness clusters were formed in the first half of 2013, for the following industrial sectors: **Automotive, Wood-processing, Food-processing industry, Defense, Health, Chemical, Electro and production machinery and technologies, ICT, Maritime, Construction, Textile and Creative and cultural industries (Table 7.)**

1.2. Position of the Region

FabLab.hr is located in Zagreb, capital of Republic of Croatia. Its about 800.000 inhabitants makes one fifth of total population in Croatia. It represents aprox 19% of the population of the Croatia with density of 4200 inhabitants per sqkm, and its GDP of 24.000 USD per capita. Zagreb GDP is twice of Croatia average. The efficiency and position of Zagreb. In terms of the Czech Republic, the region can be characterised as developed, however, there are **big internal differences** in terms of economic efficiency and the local labour market over all country.

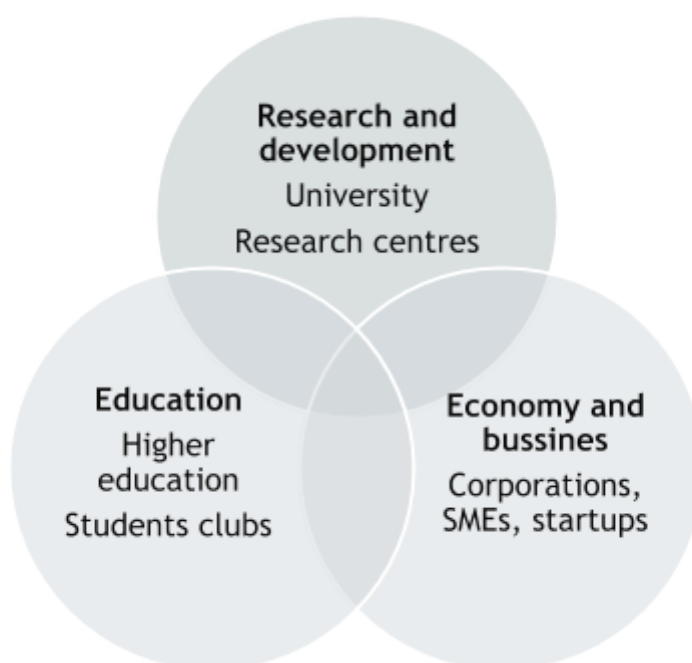
1.3. Research and development in the Croatia, Innovative Business

Based on the scope of R&D capacities, SMR has the second best suitable conditions for the development of

knowledge economy after Prague. Its share of total R&D expenditure (GERD), in 2012, amounted to 20.3% of the total expenditure in the CR. Based on the number of employees in R&D, the SMR share is 18.8% when compared to the rest of the country. The regional innovation system can be, in principle, divided into the creators of new knowledge (most often research organisations) and their users (in particular, companies but also other parties of the application sphere - e.g. hospitals). In terms of research organisations, SMR is the second most important region in the CR, following Prague. Within the CR, SMR share of R&D capacities in the "University" sector reached 27.4%, in 2012, by employees and 33.8% by R&D expenditure. The big difference in the share of expenditure and employment in R&D in the university sector is connected to the extraordinary investment in new research centres supported from the structural funds in between 2007-2013. In addition to universities, there are also 8 institutes of the Academy of Sciences of the CR. SMR share of R&D capacities in the "government sector" is 12.3% by employees and 12.9% by R&D expenditure.

1.3. Main Stakeholders

The SMR regional innovation strategies, 2009-2013, and the existing analysis made in order to state RIS, 2014 - 2020, defined the following priority economic sectors for SMR: **engineering** (NACE 25, 28); **electrical engineering** (NACE 26, 27, 33), **ICT** (NACE 61, 62, 63), and **life sciences** (NACE 01, 10, 21, 86).



2. Thematic specialisation and S3 “areas of change”

True Smart Specialisation is about the process of transformation towards an inspired vision of the future, based on inherent competitive advantages and nurtured human capital. However, inspired vision is notoriously hard to achieve.

Rather than a linear growth process Smart Specialisation should be seen as a pivoting from the present towards the desired future state around an axis of core competencies originating from human capital with momentum being supplied by opportunity and optimism. **Smart Specialisation should be a true paradigm shift, with the present state being collapsed and then expanded into the new form.** Aspects of the old may be identifiable, scattered or embedded in the new state like an echo of a familiar voice, a well known mannerism or a personality trait rather than simply as a larger and stronger version of the old.

Aspects of a successful Smart Specialisation Strategy are easy to recognise. We expect to observe multidisciplinary research teams working together to offer ground breaking and sophisticated solutions to complex problems. We anticipate new products, processes and services that will improve many aspects of our lives. There should be a plethora of new companies exhibiting entrepreneurial spirit. And, observed from a distance, it should capture the ‘spirit of place’, signalling clearly its location as a region in the EU. We expect to recognise the DNA and fingerprints of the region, embedded and imbued in the Smart Specialisation Strategy. We will all ‘know it when we see it’ but creating it remains a huge challenge even in EU.

Ground breaking scientific research as well as great industrial R&D is coming more and more to be recognised as group or teamwork being used to realise brilliant individual contributions. Environments that promote exchange of ideas and interdisciplinary team-working as well as a mix of basic science and industrial R&D are therefore key to developing competitive advantage and in their turn, a successful Smart Specialisation Strategy.

How can we achieve transformational change and create this environment in Croatia and in particular in Zagreb where the greatest concentration of young people and entrepreneurial spirit is located as well as the presence of existing companies undertaking R&D and the seeds of the venture capital industry that attracts entrepreneurs? Even eager and enthusiastic MBA graduates armed with ‘Force Field Analysis’ tools or seasoned change practitioners have found it hard to effect much change in well established companies and their systems. Achieving true transformational change requires an organisation to identify driving forces that will overcome the restraining forces attempting to maintain the status quo. Removing existing barriers, both visible and invisible, physical and virtual can prove hard in an established physical space with embedded and well established norms, practices and processes. Creating a new environment often benefits from a new location and a new design of buildings and surroundings that will naturally break down barriers and remix the vital constituents. Perhaps nowhere is this truer than at non-integrated Universities such as the University of Zagreb.

FabLab.hr is located in Zagreb, and close connected to University of Zagreb, founded in 1669, one of the oldest and largest universities in South-Eastern Europe with 29 highly autonomous faculties and over 76.946 students. It contributes over 50 % of the country's total research output and represents a huge potential for human capital development. However, the very size and tradition of the Faculty structures works against the development of an environment of multi-disciplinary teams, chance encounters and blending of academic advancement and private sector entrepreneurship. Somehow an environment needs to be created where students and researchers will naturally work and study and socialise together and

where private enterprise can meet deliberately and fortuitously with public research.

While no other spaces available, FabLab.hr is trying to compensate need for other significant space like Campus Borongaj which holds the key to the transformational change needed to create an environment for Smart Specialisation in Zagreb. Only by mixing students, scientists, researchers, nascent and established business and providing constant opportunities for them to meet and develop relationships can we move toward our future desired state. Shared facilities - libraries, eating rooms, lecture halls, laboratories along with meeting rooms and conference facilities will enable the seeds needed for smart, sustainable and inclusive growth to be germinated. Shared space and resources will remove existing barriers and support a natural migration towards interdisciplinary and cross sectoral research and business development. The result would be an environment that would enable and unleash smart, sustainable and inclusive growth.

Smart growth from smart people. Young and energetic people with vision and determination. Young people who need to be retained by the country and who would be provided with the environment they need to realise their dreams and ideas in Croatia.

Inclusive growth by using the design of Campus Borongaj to help break down the existing barriers that causes inequalities in education and as a result incomes, health outcomes and well-being. Ensuring that productive future employment rather than direct income redistribution becomes the means of increasing incomes for excluded groups.

Sustainable growth by ensuring that Borongaj provides a platform for multi-disciplinary, cross-sectoral and broad-based growth, inclusive of a larger part of the country's labour force and with a direct link between the macro and micro determinants of growth.

Acting as a magnet for the country, region and ultimately the rest of the Western Balkans and wider Europe Borongaj has the potential to nurture and develop the human capital that will fuel economic growth and future prosperity in Croatia.

A successful transition to an open, market-based economy and institutional reform underpinned fairly strong pre-crisis growth and convergence and culminated in Croatia's accession to the EU. However, the financial and economic crises have exposed structural weaknesses of Croatia's economy and its pre-crisis growth model.

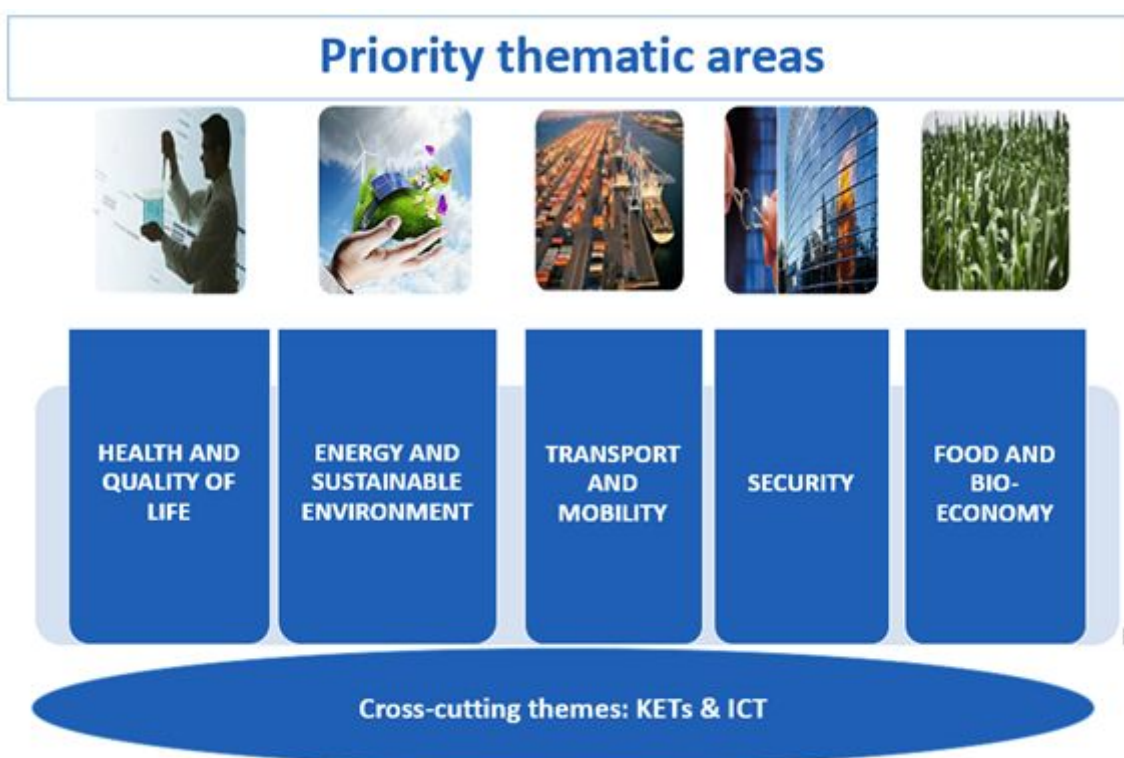
To achieve sustainable income and employment growth and strengthen international competitiveness, Croatia needs to become more competitive and innovative. Sectoral specialization, market orientation, and domestic supply-side factors, all concurred to the negative performance. Facing critical international and domestic challenges, Croatia needs to produce and export innovation-based products, as well as move towards higher value added economic activities. Croatia's exports have to become sufficiently sophisticated to stand global and regional competition.

The Croatian economy is dominated by traditional and low technology sectors and production and adoption and diffusion of KETs is low. However, there are several globally competitive industry segments, which coincide with also a strong research capacity. Most notably these are in the fields of electronics and advanced materials, energy, digital technologies, biotechnology, food processing and health. Corresponding industry segments (niches) where Croatian companies successfully translated R&D into manufactured products are in transport equipment and specialized vehicles, electrical machinery and products, special machine tools, plastic products, chemicals, healthcare and medical products.

2.1. Thematic specialisation and “areas of change” of S3

For the purpose of selection and narrowing of the thematic and sub-thematic priority areas (STPAs) within

S3 strategy of the Republic of Croatia, a number of expert working groups composed of public and private R&D experts, as well as a working group composed of state officials, were established. The end result of these processes is the selection of 5 TPAs with relevant technological and production fields as the main focus for the S3 in Croatia: (1) **Health and quality of life**, (2) **Energy and sustainable environment**, (3) **Transport and mobility**, (4) **Security** and (5) **Food and bio-economy**. Additionally, Croatia has identified two *cross-cutting* themes able to create the biggest added value and foster the emergence of new economic activities, rising of the productivity of the Croatian economy and the creation of new and sustainable job opportunities. Cross-cutting themes are KETs and ICT.



2.2. Horizontal strategy of RIS3

RIS3 defines six key horizontal areas in which the Czech Republic must achieve significant changes in order to strengthen the knowledge-intensity of the economy and to facilitate the development of the selected specialisation domains and their gradual refinement.

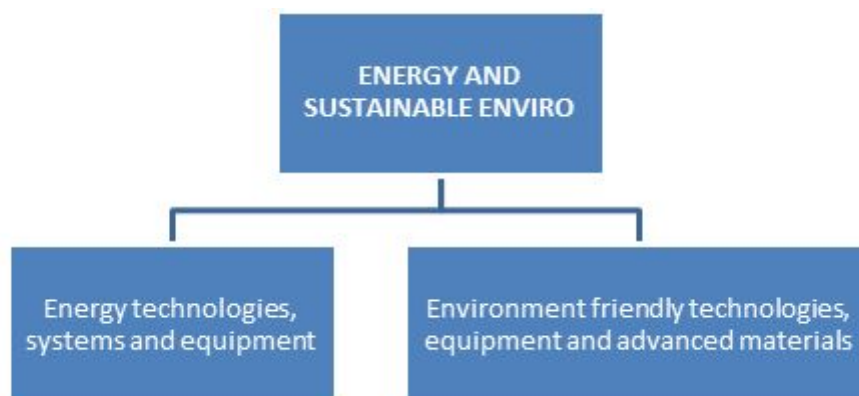
- Higher innovation performance of companies
- Improved quality of public research
- Improved economic benefits of public research
- Better Human Resources, in both quality and quantity, for innovative enterprise, research and development

- The development of eGovernment and eBusiness for increased competitiveness
- Improvement and better utilisation of social capital and creativity in addressing complex social challenges

These key areas of change are further structured into **strategic and specific objectives**, the results of which will contribute to achieving changes at the level of the key areas.

2.3. Vertical Strategy of RIS3 of the Croatia

Energy and Sustainable environment in many ways presents and emerges as an important area of specialization in Croatia, on the basis of strong statistics, indicators, analysis and the process of entrepreneurial discovery.



Indicative RDI topics relevant for this STPA have been selected:

- development of new and improvement of existing primary and secondary equipment for electrical energy systems (primary equipment: turbines, generators, motors, transformers, switchgears, transmission lines and cables, secondary energy equipment: management, measurement, protection, supervision, guidance);
- new technologies and improvements related to power plants, substations, components and systems connected to renewable energy sources;
- new researches connected to increasing efficiency and production capabilities of industrial, agriculture and forestry plants and machines;
- advanced energy storage systems;
- diagnostic and better management of energy equipment;
- energy management systems for planning, investment, real time management and monitoring of energy efficiency and CO2 reduction;
- process and embedded computer automation and control processes;
- .
- systems for energy management and support for the functioning of energy markets at levels of

microgrids, smart grids and smart cities;

- advanced conventional energy solutions;
- application of smart grids and complex energy systems;
- energy-efficient interconnected and universal lighting;
- sustainable conversion of biomass into energy;
- biogas technology for production of electricity and heat;

Related indicative RDI topics under cross-cutting themes KETs and ICT are:

- Energy-to-gas and gas-to-energy conversion technologies;
 - Process and embedded computer automation and control processes;
 - Robot technologies as systems for autonomic supervision of energy infrastructures;
 - KET – photonics
 - Micro and nano electronics for high efficiency power control and conversion electronics.
 - Solutions for Smart Metering and Internet of Things;
 - ICT solutions connected to energy sector (Smart Cities and regions, Utilities, Smart Mobility and Smart Living, inventory of power plants, systems and equipment in the environment and connected process of management and supervision of energy assets, Physical and logical network inventory, Service inventory, energetic dimensioning when designing supply networks)
 - Energy Efficient Appliances;
 - Efficient grid and energy systems;
 - Innovative ICT Solutions for increasing energy efficiency consumption and solutions for production forecasting for support to energy management and market operations in micro-grids and smart grids;
 - Advanced solutions for increasing energy efficiency in buildings (architectural, construction, engineering, electrical, control and their synergic combinations);
- Computer vision and machine learning with application in energy technologies, systems and equipment;

The Vertical Strategy can be best demonstrated by the table 1. RIS3 defines Advanced Manufacturing Technologies and Materials as two of the five thematic (vertical) research priorities (generic knowledge domains) of the Croatia. The contents of these vertical interventions are defined relatively broadly and are necessarily viewed mostly as a framework than as concrete areas within this knowledge domain. However, FabLab provides open platform to enable introduction of advanced manufacturing technologies and new materials to wider public, students and future researchers in general.

3. Fablab.hr specialization in line with national innovation strategy

What follows is a brief identification of the alignment of the FabLab specialization with both horizontal and vertical interventions of the national RIS3 and relevant objectives of the project addressing the RIS3 strategy. The key four horizontal interventions which FabLab project aligns with in general are:

- Higher innovation performance of companies
- Improved quality of public research
- Improved economic benefits of public research
- Better Human Resources, in both quality and quantity, for innovative enterprise, research and development

3.1. Entrepreneurship and innovation - Area of Change A: Higher innovation performance of companies

The Smart Specialisation Strategy in the field of enterprise and innovation focuses on the following two strategic objectives:

1. Increasing the innovation demand in the business and public sectors. The ambition of FabLab support in general innovation demand in the business and public sectors. As such, Fablab would strengthen already active university businesses activities in supporting and providing opportunities to test their innovations in a supporting infrastructure. Secondly, the FabLab summer courses will improve the technical and non-technical competencies of its graduates, which will have the necessary skills to further increase the demand for hi-tech innovative solutions in the companies. Lastly, FabLab will strengthen multi-faceted open-innovation trends in the local environment and hence increase innovation demand.

2. Increasing the level of enterprise in society, with an emphasis on establishing knowledge-intensive companies in fast growing areas. Entrepreneurship is at the core of the FabLab vision and the pillar of the associated-partner JIC strategy with the creation of new start-ups as a key performance indicator (not to be confused with FabLab, JIC is an associated partner organization). Due to FabLab access to a large pool of technically oriented research staff and students, we modestly estimate this partnership of FabLab will help with creating of at least three hi-tech start-up companies originating as a result of the FabLab project. Further to this, FabLab has potential to act as an Innovation HUB by providing a coherent innovation ecosystem with high-quality consulting and infrastructure.

3.2. Research and development - Area of change B: Improved quality of public research

Strategic objective relevant to FabLab activities in this key area of change are:

1. Providing stable conditions for the long-term development of high quality research facilities. FabLab provides the potential to improve research infrastructure further by helping the students and research staff to “make” things on demand previously unachievable by available infrastructure.

3.3. Research and development - Key area of change C: Increasing the economic benefits of public research

Specific objective C.1.1. is to increase the interaction between research organization and public. With typical activities, such as summer schools in cooperation with research organization and private sector; educational programmes focused on additive manufacturing and digital technologies and industry 4.0 or building up an educational centre in additive manufacturing FabLab project ideally fulfils required objectives of this area of change “C”. It is also important to note, that our analysis came with conclusion, that necessary condition for increased economic benefits of FabLab is better motivation based on success stories, medialization and PR activities.

3.4. Human resources - Key area of change D: Improved availability of HR, in terms of both quality and quantity, for innovative enterprise, research and development

This area of change has a number of subcategories and specific objectives which FabLab complies with accordingly, however, due to space limitations, provided here is a general statement complying with this area of change. The Czech partner VUT Czech academic partners of this consortium educate 4,500 mechanical engineers annually (38% of the whole country of Mechanical Engineers) and thus is the primary source of the qualified workforce in this field. VUT also serve as the country’s source of HR resources both in terms of quality and quantity. RIS3 identifies three HR levels as a key determinant of competitiveness in a knowledge-intensive economy.

Firstly, HR with a general level of education and skills realistically translates into the ability to create commercially useable innovation; however, availability of soft-skills such as entrepreneurship, co-operation, flexibility or customer orientation are identified as largely missing in the qualified population. Here FabLab provides a clear platform for change in two of its three key objectives. Educational activities at the FabLab will be strongly focused on entrepreneurship, co-operation and flexibility. Regarding the entrepreneurial objective of FabLab we would work very closely with associate partner JIC with an emphasis on the creation of new hi-tech businesses and business education.

Secondly, RIS3 specifies the need for identification and development of natural talents, where the

entrepreneurial talent, technical talent and the talent for research and development work are the most important for the key area of change. This is possibly the main area of focus of the Czech partner and our FabLab is planning a programme for the identification of new talents to embark on their own early academic or entrepreneurial carrier. The selection process would be based on tools such as summer school, educational programmes, project and problem based learning activities and non-frontal form of learning. We aim for identification of number of talents from the above discussed activities.

The FabLab model to innovation and education could provide an open platform based on individual approach. One of the key instruments is access to shared FabLab facilities.

3.5. Vertical alignment of Fablab project with vertical strategies

FabLab not only provides direct horizontal interventions, but also contribute to vertical intervention in R&D infrastructure in the defines Advanced Manufacturing Technologies and Materials priority areas by ensuring high-quality graduates that are able to develop their skills and knowledge in the long term. This concerns both the quality of graduates in the respective fields and also providing an entrepreneurial ecosystem enabling those graduates to create new companies and jobs.

In conclusion, these intense consultations with relevant stakeholders has shown that FabLab has exceptional alignment with strategic and specific objectives of national and regional RIS3 strategy.

4. S3 alignment through pilot action implementation

In the framework of the project, FabLab is involved in contribution to implementation of 2 pilot actions: one focused on rooting actions in business and one action focused on connection to education, but FabLab is very active in local community oriented activities which are not part of the FabLabNet project. However, local communities oriented activities including SSH (Social Science and Humanities) are more and more important even as part of EU program and probably interest of revision of national S3 strategy.

Pilot on testing FabLabs in education

Pilot to link new FabLab service with education: jointly compile a modular training portfolio targeting universities and lifelong training that enables them to profit from FabLab infrastructure and promoting innovation culture. The training portfolio will be further developed and customized to the target groups of students.

S3 alignment activities related to education and research

- Support of “Advanced Manufacturing Technologies” such as additive manufacturing in faculty courses but also on secondary level education
- Support of students semestral and personal projects
- unlocking potential in primary schools
- impact on national curriculum for education
- promoting Design Thinking, Learning by doing, DIY, DWO to improve STE[A]M skills

Pilot on rooting FabLabs in local communities

Pilot to validate new Fab Lab service targeting the local communities: jointly develop and test a mentoring programme through which people /(to be) entrepreneurs from the local communities can be engaged in a “making” process - ideas 2 prototypes 4 manufacturing - as a source of innovation and a possible entry point for future business creation.

S3 alignment activities related to local communities

- Support of awareness of the opportunities that digital skills offer for employment and employability
- Support of new ideas inspired by local communities
- Cooperation with local oriented SME
- Learning by doing, DIY and DWO

Pilot on testing FabLabs in business



Pilot to link new FabLab service with education: jointly compile a modular training portfolio targeting universities and lifelong training that enables them to profit from FabLab infrastructure and promoting innovation culture. The training portfolio will be further developed and customized to the target groups of students.

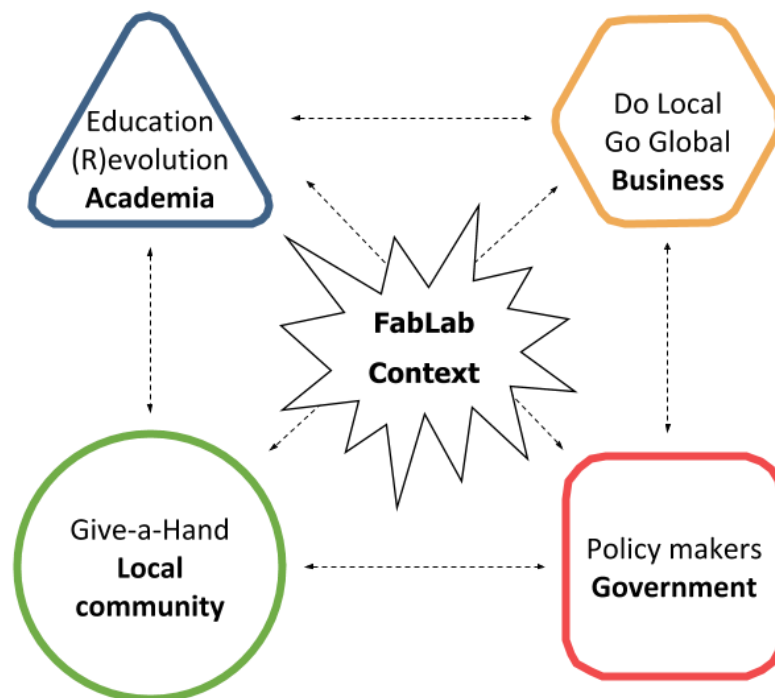
S3 alignment activities related to business

- Support of “Advanced Manufacturing Technologies” such as additive manufacturing in faculty courses, but also unlocking potential from primary schools
- Support of young entrepreneurs
- Learning by doing, DIY and DWO

5. Long term strategy deriving from pilot action and S3 consultations

Three FabLab.hr missions are already oriented to (a) education, (b) local community, (c) entrepreneurship. Long term strategic actions would provide more systematic approaches provided and confirmed inside pilot actions of FabLabNet in accordance with S3 consultations and Innovation Ecosystem acknowledgment.

5.1 Fab Labs as an content manager between Quad Helix stakeholders for increasing of regional and national competitiveness



6. Involving new actors and outreach

Fablab.hr was funded as civil association, therefore local community oriented. It has strong bonds with education institutions of all levels, from primary, to secondary and university. Local community inspired projects with focus to people with special needs solutions provided by digital fabrication. Support for business clients, with focus on SME is important mission of FabLab.hr.

Stakeholder Group	Objective	Tools and Activities
Education Primary & Secondary	Engage young population in schools with state of the art technology, unlock creative potential. Support long term sustainability by making community.	Design thinking process and project based learning. Presenting in schools: - presentations - basic workshops
Academic community and faculties	To support and encourage interest of student in digital fabrication. Teach students to use the equipment.	Projects cooperation, equipment sharing. Presenting at faculties: - presentations - basic workshops - summer workshops - voluntary job
Local community	To support and encourage interest of local community in digital fabrication. Teach members to use the equipment. Provide community with an affordable infrastructure to realize their personal projects. To offer opportunity to use the fablab equipment in research and study activities	Design thinking process and project based learning. Projects cooperation, equipment sharing. Presenting in fablab: - presentations - basic workshops - advanced workshops - summer workshops - voluntary job
Startups	Ideas to prototype and prototype to business	Workshops, consultations, equipment sharing, development of prototype and products

7. Conclusion

Fablab.hr is located in capitol City of Zagreb, in north Croatia, most developed city and region in Croatia. It is close to University, local community, and provide support to business sector, primary SMEs. Fablab.hr is local community fablab with strong connection to education, open to everyone. FabLab.hr has strong connections with international partners and networks.

Build upon S3 consultation, FabLab slightly refocused his strategy, but since it is still only official Fablab in Croatia, it is not oriented, but demonstrate wide range of opportunities where FabLab institutions can contribute to both, local and global economy, but also to society, working on education and engage local communities.

Notice

This document is prepared based on experiences on other EU and national project including research project Campus Living Lab, where two key persons collaborate and lessons learned from Mrs. Lisa Cowley, S3 consultant for national S3 strategy, and Mr. Jörgen Eriksson, expert on Quad Helix and consultant in Quad Helix implementation in Croatia.



INNOVATION POTENTIAL & SPECIALIZATION

Deliverable D.T1.2.2

PP10/ MakerSpace

Version 2

06 2017





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FabLabNet Project Partners:

MUSE FabLab - Trento (IT),

HappyLab - Vienna (AT),

FabLab Budapest (HU),

Brno University of Technology (CZ),

Regional Development Agency in Bielsko-Biala (PL),

RogLab - Ljubljana (SI),

Slovak Scientific and Technical Information Centre - FabLab Slovensko (SK),

FabLab Zagreb (HR),

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1. Characteristic of Munich's innovation ecosystem

1.1. Position of the Munich Regionⁱ

Bavaria is considered one of the economically strongest region in Europe. Reaching peak values in nearly all economic key indicators nationally as well as internationally.

Compared to other member states in the European Union Bavaria is ranked 7th in terms of absolute economic power.

An industry export rate of 48.8% in 2009 (Germany: 42.4%) shows the strong international competitiveness of Bavaria.

Powerful alliances of globally operating corporations and medium-sized world market leaders as well as efficient small and medium sized enterprises enable the production of internationally competitive products and offers to the world. Bavaria's employment dynamic is above-average with around 50% (2009: 50.3%) of the people employed in the free market and an excellent self-employment rate of 12%.

The figures in the 2016 industry report show that Bavaria is pursuing a strong long-term trend. In 2015, the turnover growth in the manufacturing industries in Bavaria was at 4.3%, which is twice as high as the documented number for all of Germany. There is a clear economic focus on automotive and automotive supply industries as well as mechanical engineering with a share of 30% of industrial workers in Bavaria.ⁱⁱ

Bavaria is home to two of Germany's elite universities (Ludwig-Maximilians-Universität (LMU) Munich and the Technical University Munich (TUM)) with the TU campus in Garching near Munich developing into the largest science and high-tech campus in Europe. Within the framework of the digitalization campaign there will be 20 new professorships developed in Bavaria covering key topics in the field of digitalization in order to train more specialists.



In 2008 Bavaria was ranked second in Germany, after Baden-Württemberg, with 108 patent applications per 100,000 inhabitants in Bavaria showing that Bavaria truly can be considered a place of innovation potential.

Bavaria has been internationally recognized as a high quality location. Microsoft founder Bill Gates once praised Bavaria as a “high-tech mecca” in Europe and, now after conducting a study on top ICT-locations has also chosen Munich before London and Paris. 40% of German IT-companies are based in Bavaria.

1.2. Research and Development in the region, innovative businessⁱⁱⁱ

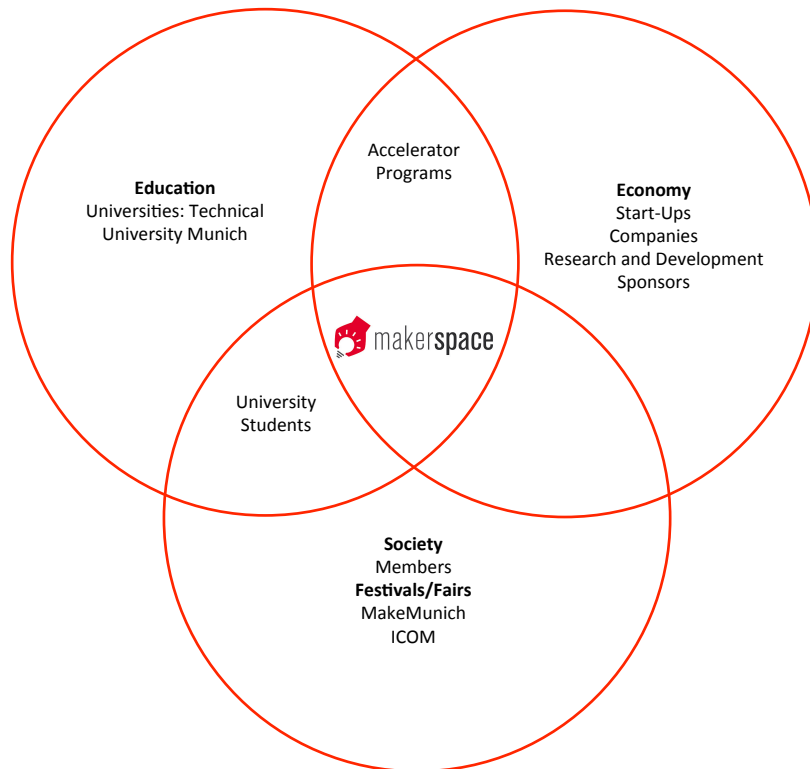
Research, technology and innovation are indispensable foundations for shaping the future of society and the economy. Bavaria needs a lively and excellent research landscape in order for it to be able to react quickly and effectively to the diverse social challenges (long-term social developments, globalization, climate change, energy-generation, distribution, rational use of energy and health). Research-oriented universities represent the main pillars of the research system giving Bavaria the potential to quickly react to unforeseen developments and follow innovative research directions.

Renowned research and science institutions in Munich, such as the Max Planck Society, the German Aerospace Center, Fraunhofer Institutes, the Helmholtz Association and the Leibniz Association, are world-wide driving forces and attract scientists from a variety of different disciplines and topic areas.

Globally successful technology regions and states are characterized by particularly high research and development (R&D) expenses. R&D expenditure relative to economic output, measured in terms of gross domestic product (GDP), is an important measure of technological competitiveness.

In 2009 Germany invested 2.8% (2008: 2.6) of its gross domestic product in research and development with the German economy financing 72%. The GDP share contributed by the economy and the state in Bavaria was 2.97% in 2008, with the Bavarian economy contributing an above-average share of 80%, which equals €12.2 billion. This leaves Bavaria above the national average, but still remaining significantly behind Baden-Württemberg (4.62%) and Berlin (3.53%).

1.3. Main stakeholders of UnternehmerTUM MakerSpace



2. Thematic specialization: Bayern Digital II (2018-2022)^{iv}

Bavaria's state government is starting its second stage of BAYERN DIGITAL through a broad-based 10-point master plan, which will set the course for Bavaria's digital future and will secure digital opportunities for the Bavarian people. BAYERN DIGITAL is a comprehensive five-year (2018-2022) investment program concretely focusing on key issues of digitalization.

Above all, BAYERN DIGITAL is aimed at supporting medium enterprises and the middle class with their digital transformation efforts. Additionally, the government provides impulses for topics such as continuing education, consumer protection, climate change and accessibility in the digital world.

The minister announced that the expected volume of the entire BAYERN DIGITAL II master plan will be around 3 billion euros and will create over 2,000 jobs between 2018 and 2022.

2.1. Objectives: DIGITAL II

- 1) Creating the digital infrastructure for the Gigabit-Society
- 2) Make Bavaria the European stronghold for and with IT security.
- 3) Setting new standards for digital core disciplines.
- 4) Strengthen academic youth in digital core disciplines.
- 5) Strengthen digital competencies throughout Bavarian middle-class.
- 6) Conquer key fields in digital technology and applications.
- 7) Leading region for intelligent digital mobility-concepts.
- 8) World's leading location for digital medicine and care.
- 9) Leader in modern and digital administration through E-Government
- 10) People represent the center of digital world.

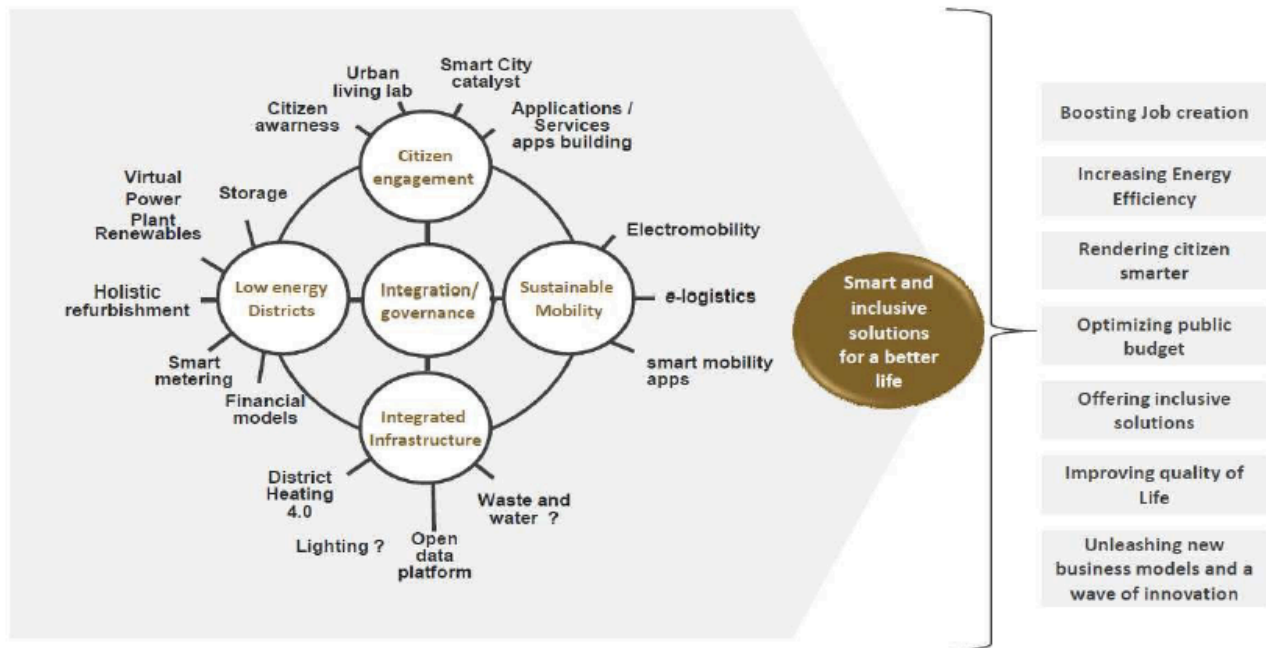
2.2. Objectives: Munich Smart City^y

There are already more than half of the people (1.5 million inhabitants) living in urban areas today. In 2050 it will be two out of three people (1.8 million inhabitants). The increasing urbanization is changing the lives of people and presents cities with a number of major challenges such as networking, mobility, renewable energy and energy supply, as well as the design of public space. Creating sustainable solutions to these challenges will largely depend on new technologies and will open up entrepreneurial opportunities, above all for innovative start-ups and founders.

Together with Lyon and Vienna, Munich will be a European flagship location for the development and implementation of smart city solutions. The European Commission selected the three cities out of more than 40 applicants for 'Smarter Together', an EU project that aims to develop smart and inclusive urban solutions to improve quality of life for citizens.

Over the next three years, Munich will therefore invest the EU funds in a particular district in Munich named Neuaubing-Westkreuz, which is home to 30,000 inhabitants.

The measures include upgrading the integrated infrastructure by using smart data-managed platforms and smart service offers, such as intelligent lampposts, distributor stations for goods, and service and accommodation related sharing economy solutions and apps. Other measures will support sustainable transport solutions, including car sharing, electric bikes for freight, and mobility stations with information panels as well as a comprehensive renovation of existing public and private housing stock, including energy renovation of 42,000m² of living space and consulting with tenants, all while guaranteeing the rental price of the apartments.



3. Culture and Creative Industry^{vi}

The Cultural and Creative Industries are of high relevance to us when it comes to spreading the idea of the Maker Movement. It is important for the Maker Movement to not only get perceived as a purely technically motivated trend but, more general, as a movement for creatives and Do-It-Yourself makers and inventors.

In the past the Cultural and Creative Industries have shown that traditional economic areas can be linked and connected to new technology and modern ways for information- or communication transmission (e.g. the internet paved the way for creative sub-branches like web-development or UX-design). Since the 80s the development within the fields of Cultural and Creative Industries have been developing to become one of the most dynamic economic sectors in the world's economy. In 2015, the industry obtained around €150 billion in turnovers. This makes up for about €65 billion (2.2%) of the national accounts (gross value added) in Germany, making it comparable to big industry sectors like the automobile, mechanical engineering, chemistry, financial services or energy supply sectors. What differentiates the two sectors is that the Cultural and Creative Industries can be described as rather small-scale when comparing it to the others. This means that a company with 100 employees would be considered one of the bigger ones.

The metropolitan area Munich has, in comparison to others, developed impressively: within just three years the cultural and creative economy of the metropolitan area has not only reached its benchmark, Amsterdam, but has overtaken it. This result can be attributed to the disproportionate growth that the region's cultural and creative industries have experienced in the period between 2009 and 2012 during which the gross value added has increased by 27 per cent and the number of employees by 18 per cent.

The potential of the industry lies in the fact that the culture and creative industry is not easy to grasp mainly because of its heterogeneity and therefore leaves it with great and still undiscovered opportunities. The industry is also characterized by openness and flexibility and offers a wide range of professions and qualifications.



4. MakerSpace in line with regional innovation strategies

MakerSpace is part of the unique UnternehmerTUM accelerator program infrastructure, which offers founders and start-ups a complete service-infrastructure from the initial idea to IPO. Equipped with versatile manufacturing and digital technologies, MakerSpace provides facilities for exploring “commons-based, peer-production” and emphasizes bringing people together into collaborative DIY projects where they innovate and learn together. Through our comprehensive course catalogue MakerSpace gives makers the necessary skills to work on their ideas and empower potential entrepreneurs with knowledge to create innovation for the region. MakerSpace is offering students a low-threshold access to high-tech equipment through an extensive scholarship program as well as various events in corporation with partners from the economy.

UnternehmerTUM MakerSpace therefore plays an important and central role in contributing to the development of the founding scene in Munich. Already today, entrepreneurs such as Invenox, Navvis and Park Here are working together with established companies creating new technologies and innovative solutions that will make urban infrastructure more sustainable and use the exchange of information in urban areas through networking.

There are plans of creating a central location in the heart of the city, which supports and networks young entrepreneurs in the founding and expansion phase and bundles them all under one roof. Networking with the creative scene open up new possibilities for interdisciplinary collaboration between start-ups and artists, designers and architects leaving enough space and opportunities for radical innovation.

5. Conclusion

Bavaria’s overarching goal of this holistic policy is to reach a leadership position in Germany and Europe when it comes to research, technology and innovation. An excellent research landscape, innovative enterprises, qualified employees as well as an active technological founding scene makes Bavaria an attractive choice for bright minds and creates a creative environment, social security, prosperity and future secure high-quality jobs.

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