DOCUMENT TITLE:

REGIONAL MAPPING REPORT - HUNGARY

Project: Improving RD and business policy conditions for transnational cooperation in the manufacturing industry

Acronym: Smart Factory Hub

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TARGET GROUP ASSESSMENT

Has this deliverable addressed any of the target group indicated in the application form?

Yes / **No**

If yes, please describe the involvement of each individual target group in the table below.

Target group	Number reached by the deliverable	Description of target group involvement
SME		
Regional public authority		
National public authority		
Higher education and research		
Business support organisation		

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1 Leader summary

Industry 4.0 has a huge transforming power to the entire ecosystem. It contributes to productivity growth, transforms our living conditions, changes the forms of employment, it is going to affect even the ownership structures. Through a comprehensive integration suppliers and customers will be connected by a complex system, changing production processes, creating an automated, even self-optimizing artificial intelligence.

Industry is obviously the motor of Europe - gives 80% both of export and research and development expenditures. The challenge for our continent - and also for Hungary in it - is whether it will be able to adapt new manufacturing philosophy and mode of working given by Industry 4.0 in an extension to be able to get back or in some cases to strengthen its determining role in production.

Industry 4.0 clearly provides a new perspective for ICT sector, making it a significant factor in the process of productivity growth.

Strategic thinking, innovation orientation and external environmental pressures all play a determining role in the ability to successfully transform new knowledge into business results. Small and medium-sized enterprises in Hungary therefore need to approach complexly - focusing also on these areas - to stepping forward in digitalization. The previous decade has shown that ICT development is not enough in itself, it has to go along with a holistic approach of development.

Relevant international policy practices represent that now is the time for creating the frame conditions of industry 4.0 on a national level.

Analysing the fields of application of Industry 4.0, it can be stated that there are enterprises offering domestic solutions, which, together with the relatively high industrialization in the European Union, can provide a good base for the effective exploitation of the fourth industrial revolution.

Naturally, there are also challenges connected to Industry 4.0 in many areas, including the question of data security and data ownership, increasing flexibility and speed of legislation, identification of interdisciplinary areas and improving them to an appropriate level.
Overall, Industry4.0 really brings the new industrial change that transforms operating conditions of businesses. Hungarian economy has the right skills to be able to promote a high level of re-industrialization.

2 Introduction

The objective of regional mapping is to provide insight into the current state of the manufacturing sector, particularly functioning of support environment in Hungary from which production oriented small and medium enterprises (SME) can benefit on a long term.

After the introduction, Chapter 3 is providing strategic background for the Smart Specialization Strategy including top-down description of strategies and status of their evolution at a national level, background analyses supporting development of strategies and highlight Smart manufacturing topics.

Chapter 4 is presenting support environment by highlighting the support environment structure, detecting actors responsible for implementation of strategies and other supporting actors like clusters, technology parks, R&D centres, competence centres, University incubators, Business incubators.

Chapter 5 presents Smart Factory support schemes and programmes including list of currently available or future programmes, grants, loans, etc.

Chapter 6 provides national Smart Factory related projects in execution by the project partner or partnering organisations.

Chapter 7 presents list of regional actors relevant for area of Smart Factory whereas actors are grouped by relevance (User, Solution provider or User/solution provider)

3 Strategic background

Europe 2020 is the EU's growth strategy for the coming decade. In a changing world, we want the EU to become a smart, sustainable and inclusive economy. These three mutually reinforcing priorities should help the EU and the Member States deliver high levels of employment, productivity and social cohesion.

Concretely, the Union has set five ambitious objectives – on employment, innovation, education, social inclusion and climate/energy – to be reached by 2020. Each Member State has adopted its own national targets in each of these areas. Concrete actions at EU and national levels underpin the strategy.

National and regional authorities across Europe have designed smart specialisation strategies in entrepreneurial discovery process, so that the European Structural Investment Funds (ESIF) can be used more efficiently and synergies between different EU, national and regional policies, as well as public and private investments can be increased.

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

The industry of the future will be customized, adaptable to changes, resource efficient and internally and externally integrated. In Germany, the process of the introduction of these changes and of the adaptations to them has been called Industry 4.0.

According to the so-called Roland Berger Industry 4.0 maturity index, Hungary's readiness is relatively low, with its relatively higher production sector, as an attribute of post-socialist countries. (Roland Berger, 2016: 23). The fact that Hungary belongs to the group of traditionalists (as Slovenia, Slovakia, the Czech Republic and Lithuania as well), it also conveys the fact that outstanding productive sector can be nutrient of moving towards Industry 4.0. Industry 4.0, that is, the digital industrial ecosystems of domestic producer companies needs more time to be extended. Regarding the digital fundamentals, that is, the readiness for networking, Hungary was the 50th of 139 countries in 2016. We are far from France (24), Germany (15), South Korea (13), Japan (10) and the United States (5). Other countries of the Visegrad Four were also ahead of us (Czech Republic (36), Poland (42), Slovakia (47)). The European Commission's DESI index also warns that the integration level of digital technologies is not only below the EU average, but also lower than the average of the countries below the EU average.

Position of the domestic industry is fundamentally determined by the structure and demographics of domestic enterprise sector, qualification and availability of domestic labour force, capital supply of companies operating in Hungary, etc. The aspects and possibilities of domestic industrial policy are defined by the country-specific characteristics (the importance of agricultural sector and food industry, the manufacturing industries with a long tradition, etc.) and the international context (primarily European industrial policy and within it, "smart specialization", the intelligent specialization).

Hungary began planning S3 Strategy in early 2013, during which a wide range of social reconciliation took place, using a variety of domestic design documents, summarising the objectives of the different territorial levels and intertwining with the design of the operational programmes. Prepared as a result of the work, the national smart specialisation strategy sets the directions for the entire country, along which research, development and innovation are planned to be is supported in the most sustainable way, with the greatest social profit and the promise of the best financial utilisation rate.

3.1 Structure of S3 governance system[1]

The development of the smart specialisation directions is coordinated by an organisational structure involving four bodies, each building on the other. The planning is coordinated by the S3 Management Team functioning under the control of the Prime Minister's Office. The S3 governance system is a three-level system as demonstrated in the below-given figure:

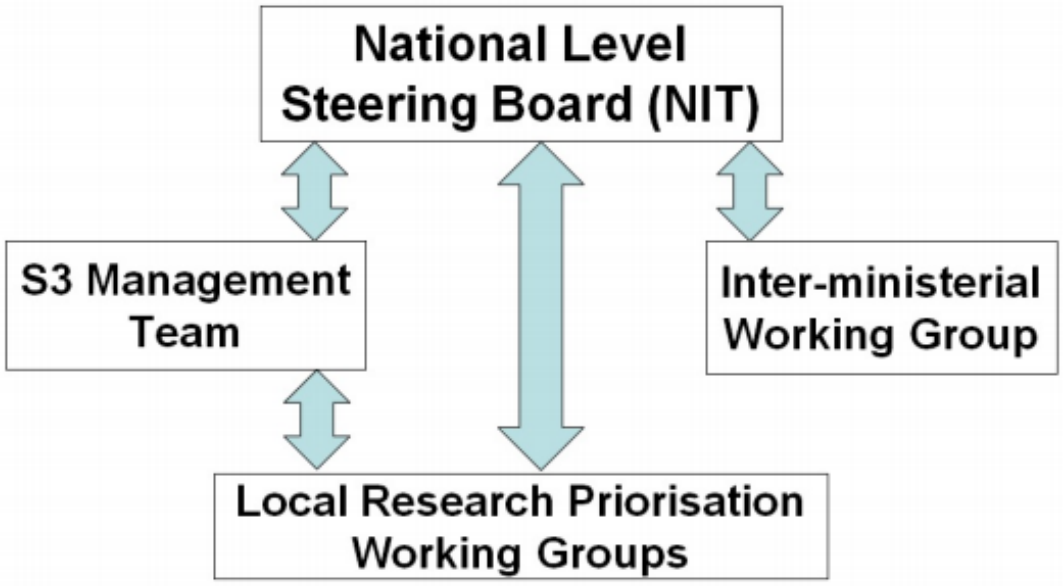

Figure 1: S3 governance system

[1] Source: file:///C:/Users/Renata/Downloads/national_smart_specialisation_strategy_en%20(2).pdf

National Level Steering Board (NIT): It functions as the professional forum embracing the S3 working group involved in the national S3 design, the professional board and the heads of the Local Research Priorisation Working Groups. The presidents of the county general meetings were also invited to the NIT meetings. Expert panel: means the panel of experts from the business and the academic world, civil society and regional development, which gives a technical opinion on the S3 process, especially the main directions of smart specialisation.

S3 Management Team: means a working group operating in the National Innovation Office and the Prime Minister's Office, which coordinates the work of the other organizations involved in the design process, directs and ensures the work of these organizations from the methodological and quality aspects, and prepares the smart specialization strategy for strategic decision-making.
Inter-ministerial Working Group: it was formed in order to ensure the monitoring of the planning process of the S3 strategy-building at the government level, ensure the feedback of the experts and the public administration, support the individual subtasks, and prepare for the implementation of the strategy. Its members are all the competent ministries, as well as the delegates of the relevant managing authorities of the 2014-20 programming period. Its priority task is to harmonise the planning of S3 and the Operational Programmes.

Local Research Priorisation Working Groups: their work is supported by the county government offices under the guide of the S3 Management Team. The county governments are also involved in the work of the Local Research Priorisation Working Groups. Under the leadership of appointed experts, the work organisations are jointly carrying out the organising work which ensuresthe mobilisation and involvement of the local stakeholders. The counties are responsible for establishing the specialisation directions with the involvement of all stakeholders by setting out from the local and regional experience and building on the own knowledge and information of the participants. In developing smart specialisation, the counties are required to present sectors, areas of expertise, methodologies, technologies and measures which can designate the region's sustained and successful R&I development. It may be based on the existing experience, knowledge and infrastructure, and may also contain conscious risk-taking

3.2 Hungary’s Smart Specialisation Strategy (S3)

In Hungary the RIS3 strategy was developed on national level based on the recommendations of the 19 counties of Hungary.

As a result of the two-round EDP ("Entrepreneurial Discovery Process") process, the participants of the county workgroups, organized along the 'quadruple helix', identified the sectors and the technologies and research directions, along which they develop their research, development and innovation strategy and specialization.

Three national smart specializations were formulated in the course of the strategy building:

Systems science	It places the emphasis on systematic approaches in the research. It implements new scientific results on the frontiers of the areas of sciences by using the leading research results of the neighbouring disciplines and renewing the area of research, from or on the basis of which possibilities are provided directly to the economy or the society to use significant applications.
Sustainable society	It provides innovative answers to societal challenges. It promotes the sectors with the instruments of follow-up innovation sectors, making the environment liveable and increasing the retention force of the region through the utilization of the latest research results, the use of modern technologies, equipment, and materials and social innovation.
Smart production	It focuses on product development. It is capable of manufacturing own products or improve existing products through technological renewal in the innovation value chain, which provides a competitive advantage, in particular, by using smart technologies and/or advanced materials.

Figure 2: National Smart Specialization Strategy, Nov. 2014, National Office for Research, Development and Innovation

Six sectoral and two horizontal national research priorities and a limited number of local specialization sectors/technologies were created in order to achieve the vision and objectives to be implemented along smart specialization.

Within the national research priorities, the sectoral priorities and two horizontal priorities are particularly important for all counties:

- Each of the national priorities, even if they have different weights, were determined by all counties when they determined their directions of specialization.
- These national priorities represent directions for specialization which can be formulated by all counties and at the national level.
- Therefore, the individual counties cannot be differentiated.

SECTORAL PRIORITIES

Table 1: Sectoral and horizontal priorities, S3

Descriptions	Capabilities	Target markets	EU priorities
Advanced technologies in the vehicle and other machine industries	1. Manufacturing and Industry 2. Machinery and equipment	1. Manufacturing and Industry 2. Motor vehicles and other transport equipments	1. Key Enabling Technologies (KETs) 2. Advanced manufacturing systems
Sustainable environment	1. Water supply, sewerage, waste management & remediation activities 2. Waste collection, treatment & disposal activities, materials recovery & remediation activities	1. Water supply, sewerage, waste management & remediation activities 2. Waste collection, treatment & disposal activities, materials recovery & remediation activities	1. Sustainable innovation 2. Sustainable land & water use
Agricultural innovation	1. Agriculture, forestry & fishing 2. Crop & animal production, hunting & related service activities	1. Agriculture, forestry & fishing 2. Crop & animal production, hunting & related service activities	1. Sustainable innovation 2. Sustainable agriculture
Clean and renewable energies	1. Energy production & distribution 2. Power generation/renewable sources	1. Energy production & distribution 2. Energy distribution	1. Sustainable innovation 2. Sustainable energy & renewables
Healthy society and wellbeing	1. Human health & social work activities 2. Human health activities (medical services)	1. Manufacturing & industry 2. Basic pharmaceutical products & pharmaceutical preparations	1. Public health & security 2. Public health & well-being
Healthy local food	1. Manufacturing & industry 2. Biotechnology	1. Manufacturing & industry 2. Food, beverage & tobacco products	1. Public health & security 2. Food security & safety

HORIZONTAL NATIONAL PRIORITIES

Descriptions	Capabilities	Target markets	EU priorities
ICT and information services	1. Information & communication technologies (ICT) 2. Computer programming, consultancy & related activities	1. Information & communication technologies (ICT) 2. Information service activities	1. Digital Agenda
Inclusive and sustainable society	1. Services 2. Education	1. Services 2. Travel agency, tour operator & other reservation service & related activities	1. Service innovation

Alignment of the national smart specializations to the S3 strategy

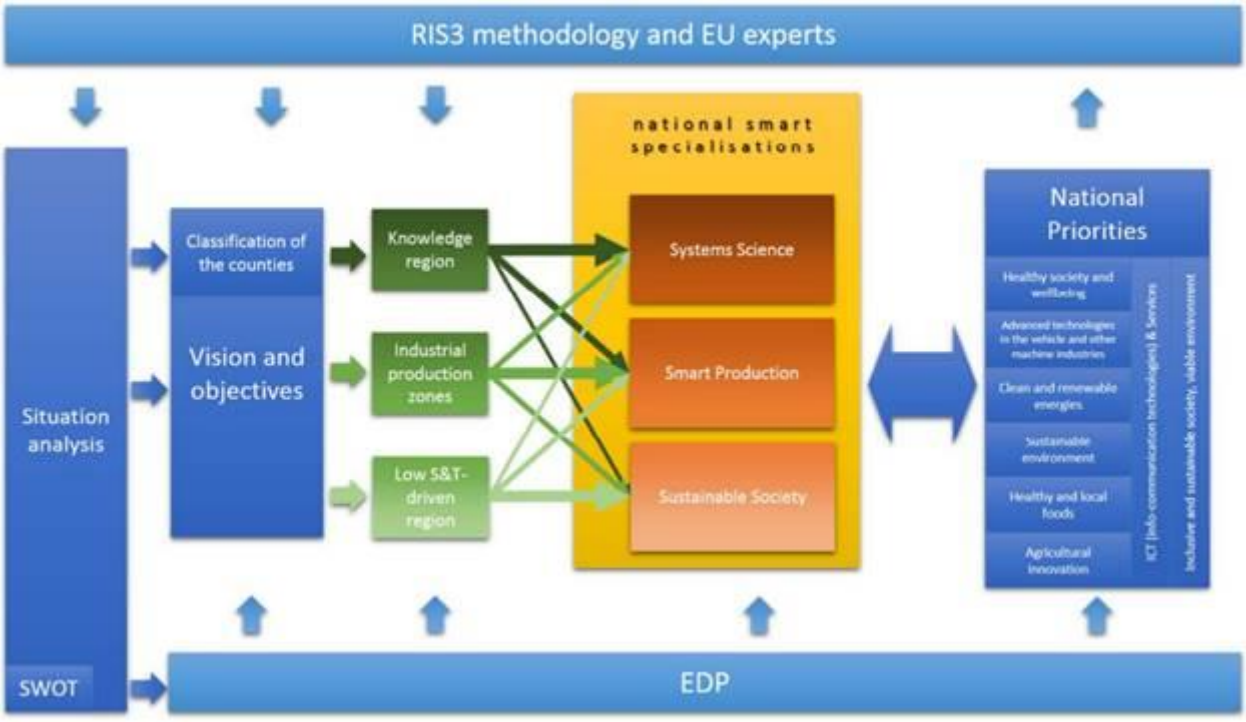

Figure 3: National Smart Specialisation Strategy, Nov. 2014, National Office for Research, Development and Innovation

LOCAL SPECIALIZATION SECTORS/ TECHNOLOGIES

Priorities of the West-Transdanubian region

Based on the positioning of the counties in the innovation space three types of regions can be defined in Hungary:

- Knowledge regions
- Industrial production zones
- Low S&T driven regions

The three types of regions are markedly different from each other in terms of the basic **innovation features**, so instead of formulating a general vision, it is necessary and appropriate to **create an independent vision for all three types** of regions.

Knowledge regions	The knowledge regions of Hungary will become dominant players of the macro-region and Europe in the specialization directions in the selected areas, and gain a competitive advantage through the strengthening of the knowledge centres and the involvement of the business sector which raise the knowledge and the products produced in selected specialization directions to the international level. The forward effect of smart growth at the domestic level will trigger the rise of the other regions as well.
Industrial production zones	In the zones of industrial production, the regions can connect to the innovation chain through the R&D&I activities in the fields designated in the specialisation directions, and become successful vendors through the development of products with a high added value, especially by strengthening the SME sector. By taking the path of sustainable growth, the regions will have the opportunity to set up their own knowledge centres along the specialisation directions and, thus, become a region of knowledge.
Low S&T driven regions	In the Low S&T driven regions, the traditional sectors will be renewed by means of innovative solutions in the fields designated by the specialisation directions (so-called follow-up innovation), and more vivid R&D activities will be launched. As a result of inclusive growth in the regions, the region becomes more liveable, jobs are created and migration ceases.

Figure 4: Regional categories

Links of the **national specializations** and the types of regions – an indicative table of exploitation:

Specialization	Type of region	Exploitation
Systems science	Knowledge regions	about 70%
	Industrial production zones	about 20%
	Low S&T driven regions	about 10%
Smart production	Knowledge regions	about 20%
	Industrial production zones	about 60%
	Low S&T driven regions	about 20%
Sustainable society	Knowledge regions	about 10%
	Industrial production zones	about 20%
	Low S&T driven regions	about 70%

Figure 5: National specializations

2 counties of the West-Transdanubian region – **Vas and Zala** belong to the *'Low S&T driven regions'* and **Győr-Moson-Sopron** belongs to the *'Industrial production zones'.* It is important to mention this classification as the national S3 strategy defined different visions and objectives for the 3 categories.

SMART TECHNOLOGIES:
In determining the county specializations, the participants of the EDP *("Entrepreneurial Discovery Process"*) voted for the **use of several advanced technologies** and the **renewal of some existing traditional industries** which cannot be directly adjusted to the national priorities, but the sectoral interoperability provided by the potential, conscious risk-taking or the technologies existing at the local level (e.g. materials science, nanotechnology, biotechnology, ICT) justify bringing them into the limelight.

In the West-Transdanubian region the following areas were defined as priority:

Győr-Moson Sorpon County:

- special materials, advanced materials, modern materials technologies
- metal fabrication other than machine industry
- building industry (building materials technologies)
- textile industry
- wood and furniture industry
- logistics

Vas County:

- special materials, advanced materials, modern materials, technologies
- electronics and semiconductor technology
- logistics
- cultural and creative industry

Zala County

- special materials, advanced, materials, modern materials, technologies
- modern packaging technologies
- chemical industry (e.g. rubber and plastics industry, production of intermediates, fertilizers and cosmetics)
- wood and furniture industry
- logistics
- cultural and creative industry

Summarizing the facts of the RIS3 strategy of Hungary and the West-Transdanubian region it is important to state:

- The national S3 priorities represent directions for specialization which can be formulated by all counties and at the national level, therefore, the individual counties cannot be differentiated
- the West-Transdanubian region consist of counties of different economic, R&D and smart specialization level
- the region's priorities are mainly determined by the traditional industrial sectors and the natural resources

4 Support environment

Supporting institutions for business oriented SMEs are chambers of commerce, chambers of crafts, centres of excellence, research centres, development centres, competence centres, technology centres, technology parks, incubators and other operating in the eligible program area.

All these institutions promote the emergence of new competitive companies that promise high added value and equitable regional development. Incubators support the realization of entrepreneurial ideas, the creation and development of enterprises, stimulating environment, subsidised leases of premises and administrative, intellectual services and other services for its tenants. Technology parks in one location bringing together business development, research and operations of new technology companies, its members while offering a supportive environment consultancy, easy exchange of information, transfer of knowledge, the necessary infrastructure and the like.

4.1 Clusters

A decisive step in the changing of the world economy during the past decades has been the appearance of network economies and enterprise co-operation. Network members realised that

they can massively benefit from co-operations, significant profit growth can be reached by economies of scale realised by sharing of capacities, networking flexibility and sharing of expenditures.
Establishment and effective operation of network-cooperations and clusters are of utmost importance, especially for SMEs, as a vast majority of them is unable to enter the extra-regional or the international market individually, however, having formed network co-operations they have a better chance to enter the global arena.
It is true that in comparison with Western-European countries, Hungarian cluster development has not got such a rich history yet, nevertheless, it can already be stated that the last decade has seen a major improvement in clustering and cluster developments. Following the appearance of the New Széchenyi Plan, the cluster accreditation system which had been operating since 2008, witnessed a major change.

In Vas county following **clusters** are existing:

Name	Thematic focus
Pannon Business Network Association	Leading NGO in the region
Pananerg Claster	To popularize renewable energy
Vas County Scientific Educational Association	To spread professional and knowledge for intellectuals
Pannon Thermal Cluster	To promote new thermal medicinal and tourism relations
Pannon Textil Cluster	Clothing industry
Pannon R&D in engineering	To foster the R&D activity especially in engineering in Vas and Zala county with particular regard to the cooperation of SMEs

4.2 Centres of excellence[2]

1. **Institute of Experimental Medicine (IEM)**
2.

The social burden and cost of brain disorders are enormous, and no serious progress can be expected in the treatment or in the prevention of these disorders without research and new discoveries. With this watchword the Institute of Experimental Medicine (IEM) of the Hungarian Academy of Sciences, founded in 1952, has undergone a dynamic development over the last 20 years. The IEM is dedicated exclusively to basic biomedical research in the eld of neuroscience. This includes studies on neurotransmission, learning and memory, neuronal development, anxiety, depression, schizophrenia, aggressive behaviours, ischemic and epileptic brain damage, neurodegenerative disorders and the central and peripheral control of hormone secretion.
In the year 2000, the Institute was ranked second from 260 candidates in a competition for the "Centre of Excellence" title and won this recognition for three years by the decision of independent experts of the European Commission.

3. **Alfréd Rényi Institute of Mathematics- Hungarian Academy of Sciences**

The research staff of the Institute forms research teams covering the following research topics: algebra, algebraic geometry, algebraic logic and computer science, approximation theory, differential equations, discrete mathematics, functional analysis, geometry, information theory, mathematical statistics, number theory, probability theory, set theory, statistical physics, topology. The scientific output of the Institute is well certified by the research papers published by its staff in leading international journals. The members of the Institute play an important part in organizing the conferences of the János Bolyai Mathematical Society, the proceedings of which are also well known by the international mathematical community. In 2001 the Institute was granted the title Centre of Excellence of the European Union.

4. **Biological Research Centre of the Hungarian Academy of Sciences (BRC)**

The Biological Research Centre (BRC), Hungarian Academy of Sciences, Szeged is an outstanding institution of the internationally acknowledged Hungarian biological research. The Biological Research Centre was founded in 1971. The 4 institutes of BRC - the Institutes of Biophysics, Biochemistry, Genetics and Plant Biology - employ about 260 scientists whose work is hall-marked by highly appreciated international scientific publications and patents. The research topics include several fields of molecular and cell biology from the industrial utilization of bacteria through controlled improvement of cultivated plants to the problems of human health and environmental protection. BRC is mainly a scientific basic research centre, but scientists of BRC play an initiative role in the foundation and promotion of biotechnological companies, as well as in educational duties. The successful activity and high-level scientific research pursued in BRC were

also acknowledged by the European Molecular Biological Organization (EMBO) and in 2000 the European Union awarded the title of “Centre of Excellence“ to BRC.

5. **Condensed Matter Research Centre (CMRC)**

Interdisciplinary research on complex functional materials and nanometer-scale structures, exploration of physical, chemical, and biological principles, their exploitation in integrated micro- and nanosystems, and in the development of characterization techniques.
Dissemination of the results in international programs, education and industrial R&D, with special attention to the needs of SMEs.
KFKI-Condensed Matter Research Centre was awarded the title „Centre of Excellence” by the European Commission in 2000.

4.3 Competence centres

1. Industry 4.0 National Technology Platform

The Industry 4.0 National Technology Platform was established under the leadership of the Institute for Computer Science and Control (SZTAKI), Hungarian Academy of Sciences, with the participation of research institutions, companies, universities and professional organizations having premises in Hungary, and with the full support and commitment of the Government of Hungary, and specifically that of the Ministry of National Economy.

The background of the initiative is that Hungary, too, is witnessing the advent of the era of a new technological change, when the internet based economy is transforming the very basics of the production and logistic systems. This process requires from all actors of the economy, especially from the key firms in the priority sectors defined in the Government’s Irinyi Terv, from the Hungarian institutional innovation system as well as from the economic policy pursued by the Government, the progressive and well scheduled building of bridges between the physical and digital worlds, a special readiness for innovative adaptation, answers to challenges in a prompter way than any time before, including bold steps to be made concerning innovation. The theoretical and practical problems to be resolved are of such complexity that make the cooperation between the research and university spheres on the one hand and industrial companies on the other hand indispensable, both in the national and the international arena.

Having these factors in view and in order to strengthen the Hungarian achievements attained so far in the field of the global competitiveness, the founders emphasise the necessity of further deepening the existing successful partnership relationships as well as adopting the European best practices, especially the implementation of the German patterns considered as the most advanced in the world. This requires the creation of an action oriented network system fostering intensive cooperation.

The ministry regards in the Platform's future successful activity the catalyser of performing high added value research and development work in Hungary, an essential tool of preparing the industrial sector for, and adapting it to the requirements of innovation and, the organisation assisting to re-focus the education system according to the new needs of the industry. Finally, the Platform is expected to become a key factor to contribute to the success of the national Ipar 4.0 programme.

4.4 Research centres

The ELTE Gothard Astrophysical Observatory (GAO), located in Szombathely, has been the most determining academic center in the county for decades. The aim of the observatory is to become one of the most significant centers of the research based on Big Data, and the ESA and NASA space research in Europe.

GAO has been a significant institution of astronomy, astrophysics and related multidisciplinary science in the Hungarian community. From 1978, the Observatory belongs to the Eötvös Loránd University.

Since 1991, in cooperation with German institutions, the main direction of scientific activity was stellar astrophysics. In the recent years, the GAO included data analysis from space observatories (Kepler) and development activities of new space observatories (CHEOPS, PLATO).
The scientific activity of GAO focused on stellar and galactic astronomy, with wide applications of space observations. In the past 5 years, the Observatory published 120 peer-reviewed scientific papers, which got more than 1.000 citations.

Scientists of GAO are Core Scientists in the CHEOPS space telescope project, Management Committee members of the "Big Data in Earth and Sky Observation" EU-COST Action, External Participants in the Sloan Digital Sky Survey 4 and the APOGEE spectroscopic survey, and work group leaders in the PLATO 2.0 project.

Special expertise covers Big Data handling and analysis, and massive numerical modelling. Besides the projects in which GAO plays a leading role, they have many collaborations worldwide, e.g. the Harvard, Indiana, Texas and Washington universities, the Sydney University, the University of Aarhus, the Diderot University, the Adam Miczkiewicz University and the Max Planck Institute for Astronomy.

4.5 Technology parks

Infopark Budapest - Infopark is the first innovation and technology park of Central and Eastern Europe. It is an innovation centre primarily for IT, telecommunication and software development companies where such multinational companies as Lufhansa Systems, Hungarian Telekom, IT-Services Hungary as well as young innovative companies found a place for their head office. The seat of the European Institute for Innovation and Technology (EIT) is found in the Infopark Building E. The office park has nearly 100,000 m2 space to rent, offering high quality office and working environment for about 7,000 employees.

4.6 Universities

In Szombathely all together five university campuses can be found. One campus of Szombathely until 1st February 2017 belonged to the University of West Hungary, but the number of students constantly decreased, so there was a social and political pressure to stop this progress, and increase the number of students. As a result, the campus has seceded from the University of West Hungary and on 1st February 2017 integrated to Eötvös Lóránd University (ELTE) of Budapest which is the biggest, and the most prestigious university in Hungary.

The main educational areas in the campus of the Eötvös Lóránd University are teacher training and recreation, but since 2015 students have had an opportunity to apply for mechanical engineering both in normal education system, and dual system as well, where students have the possibility to work during their school years at one of the members of the above already mentioned West Pannon Automotive and Mechatronics Center. Recently, about 1.500 students study at this campus, but due to the integration, this number is expected to increase in the next few years. The University has always put big emphasis on teacher training, and recreation manager and health promoter training. From the appearance of engineering, the technical part plays an important role too, and this area will be expanded with other departments in the future. For example, Commerce and marketing, Software Information Technologist as well as Business administration and management departments will start from the next academic year.

The Savaria Campus awaits its prospective students with three types of courses: Bachelor, Masters and Tertiary Vocational Programs, and it makes every effort to provide their students a marketable diploma. When looking at the relevant higher education statistics and rankings it can be safely stated that, in comparison with other universities, the courses offered in Szombathely are of the (as) highest quality (as elsewhere) and can be labelled as competitive both in terms of professional work and financing. Its two faculties, the Dániel Berzsenyi Teacher Training Faculty and the Faculty of Natural Sciences include ten institutes. The former is ranked within the best 36%, whereas the latter is in the best 22% in the country. The modern infrastructure available at the faculties provides excellent conditions for the learning process. Satisfying every demand, a student may have, the library of the University was awarded the “Library of the Year” title in 2007. The other campus located in Szombathely belongs to the University of Pécs, which is the oldest university in Hungary founded in 1367. As regards the campus of the University of Pécs, it is

oriented to Health Science. This institution is smaller than the previous mentioned one, so here the number of the students is lower as well.

These two institutions are the most important ones, but besides these there are other institutions like the department of the Dénes Gábor College, the Theological College of Győr in Szombathely, and the already mentioned ELTE Gothard Astrophysical Observatory.

As far as the secondary and primary education are concerned, there are 14 secondary and 17 primary schools in the city.

5 Smart Factory support schemes and programmes

5.1 Financial environment

4.3.1. Public financing

Relevant players related to the financing of innovation actions:

- The Ministry for National Economy is responsible for the business development; therefore the enterprises (such as SMEs) belong to this organization.
- The National Research, Development and Innovation Office is the national co-ordinator of innovation-related activities, concentrating mostly on strategy. It is the organization responsible for RDI infrastructure, strategic papers, policy setting.
- The regional and local players of the innovation-related ecosystem are significantly cut back, since the relevant competencies are concentrated on national level.

Related strategic documents and subsidy schemes:

- Economic Development and Innovation Operative Program
- It is by far the largest operative program in Hungary, covering nearly 60% of the total 2014-2020 budget. The programme aims to stimulate the economies of the less developed regions in Hungary. Its most important ***priorities are the competitiveness of small-and medium sized enterprises, research and innovation, and employment***. The Programme will focus on different areas:
    - increasing the competitiveness and productivity of SMEs,
    - research, technological development and innovation,
    - infocommunication developments,
    - energy,
    - employment,
    - competitive labour force,
    - tourism,
    - financial instruments.

  The Programme is supported by the European Regional Development Fund (ERDF) and also by the European Social Fund (ESF) what are parts of the European Structural and Investment Funds (ESIF).

- Regional Innovation Smart Specialization Strategy
- In Hungary the RIS3 strategy was developed on national level based on the recommendations of the 19 counties of Hungary.
  As a result of the two-round EDP ("Entrepreneurial Discovery Process") process, the participants of the county workgroups, organized along the 'quadruple helix', identified the sectors and the technologies and research directions, along which they ***develop their research, development and innovation strategy and specialization***.

- Irinyi plan
-

The nationally allocated budget for economic development. This strategy ***aims to generate the driving force required for long-term economic growth, outlining the 7 future perspective industries for Hungary***:

  - motor vehicle manufacturing,
  - manufacturing of specialized machinery and equipment,
  - health industry- and tourism,
  - food industry,
  - green economy,
  - info-communication industry and
  - defence industry.

Funding required for the implementation of this concept will be provided by partly EU and partly state funds.

4.3.2. Commercial financing

The Hungarian banking system has strengthened substantially over the past two years. The shock-absorption capacity of the banking system remains strong. Therefore, significant easing in company lending conditions occurred.

Policy initiatives to boost small business financing start to bear fruits in loan growth.
The Funding for Growth Scheme was substituted by the new Market-Based Lending Scheme designed to boost SME financing. It provides interest rate swaps to participating banks, which cover part of the interest rate risks generated by new loans.

This results on the supply side as low interest rates as 2-3 % in EUR or 4-5 % in HUF.
From the demand side, booming construction industry and automotive industry ensures no-risk business for banks
Therefore innovative, risky clients hardly get financing. The minimum criteria for risky clients is to provide solid business plan with signed orders or at least letters of intents.

The National Bank has expanded its area of action beyond monetary policy and purchased the Budapest Stock Exchange (BSE). The BSE then adopted a new strategy to boost capital market access, growth, liquidity and improve the financial culture in Hungary. The BSE aims to become an alternative to bank financing for local companies. The new BSE management aims to reach market capitalisation of 30 % GDP, build a market for small firms with at least 30 participants, and attract at least 5 stock market launches (IPOs) a year.

Micro financing is still a popular form a financing, the credit can be 10.000.000 HUF (approx. 32.000 EUR) for an interest rate of 3.9 %.

5.2 S3 Support measures

The resources of the Structural Fund, provided in the framework of the EU's Cohesion Policy, and the European Agricultural Fund for Rural Development has represented and will represent a significant part of the state support to the RDI sector both during the past and the coming seven-year EU budget periods. These European Structural Funds and Investment Funds provide funding through 11 thematic objectives (TC), of which first TC, namely Strengthening research, technological development and innovation, involves all funding which can be used for RDI.

In the framework of this 1st TC, 2,234 million EUR is available to Hungary between 2014 and 2020 (for RDI support)33. The amount will be disbursed through the operational programmes, respectively, their priority axes34, which contain R&D targets in varying proportions. The amounts included next to each priority are the amounts in the operational programmes submitted to the European Commission, which indicate the overall budget of the given priority. Since the RDI objectives often constitute only a part of each priority, the priority amounts do not equal resources that can be specifically spent on RDI in every case, but they are a part of the latter amount.

Domestic managed funds Economic Development and Innovation Operational Programme (EDIOP) (source: ERDF, ESF, IKF; a total of 9,004.2 M EUR over 7 years) The Operational Programmes provide access to the instruments of the Structural Fund. The Economic Development and Innovation Operational Programme is one of the most important resource available for the implementation of the strategy. The following priorities are the most important as regards financing RDI programmes among the 7 priority axes of the OP.

Priority 2: R&I, the budget of which is EUR 1687.9 M (85% funding intensity), and Priority 7: Financial instruments, its budget: EUR 2353.2 M (95% funding intensity).

The Operational Programme is territorially limited because it only provides funding in the six so-called “less developed” (former Convergence) regions. The of Central Hungarian region is out of the scope of EDIOP, as a separate OP, namely, the Competitive Central Hungary Operational Programme, manages the source of the Structural Funds to be allocated to the KMR.

Competitive Central Hungary Operational Programme (CCHOP) (sources: ERDF, ESF; a a total 913 M EUR over 7 years) The OP aims to maintain and ensure the long-term economic competitive advantage of the most advanced region of Hungary over other countries, increase its economic competitiveness and reduce the differences of development within the region. Priorities of CCHOP that are relevant to R&D: Priority 1: Improving the competitiveness of businesses and development of knowledge economy; budget: EUR 202.2 M (50% funding intensity); Priority 2: Developing financial instruments and services; its budget: EUR 44.1 M (60% funding intensity).

The operational programme is restricted in territory and is primarily aimed at the regions in the "advanced" category, namely Central Hungary. Two-thirds of the domestic research capacities are concentrated in Central Hungary (RDI strategy). Nevertheless, the Central Hungarian Region receives much less resources dedicated to R&D from the Operational Programmes than it would

be able to use through its RDI potential; this limitation of Union resources is a source of serious tension in the 2014-2020 period.

Human Resources Development Operational Programme (HRDOP) (sources: ERDF, ESF; a total amount of EUR 2,999 M over 7 years) The aim of the Human Resources Development Operational Programme is to contribute to addressing the social inclusion and demographic challenges by improving human capital and social environment. Priorities of HRDOP that are relevant to R&D: Priority 3: Increasing knowledge capital; EUR 898.3 M (85% funding intensity)

The aim of the priority: increasing research, innovation and smart specialisation in human areas; improving the quality, efficiency and openness of education; supporting infrastructural developments; promoting access to opportunities of life-long learning; updating the skills of employees, and matching education and training systems to labour market needs.

Research and Technological Innovation Fund (KTIA) Notified national funding scheme with an the annual income of approx. 50 billion Forints, whose main source is the innovation contribution paid by the medium and large companies. The RDI strategy lays down as regards the use of KTIA that its important purpose is to reduce the disadvantaged position of the Central Hungarian Region, but the elaboration and use of other instruments is also needed.

The Research and Technological Innovation Fund available for RDI purposes primarily provides funding in the Central Hungarian Region (KMR). The additional strategic objectives (such as the public-sector innovation, technology transfer, open pre-competitive and social innovation collaborations) can also be funded from the KTIA (National RDI Strategy).

National Scientific Research Fund (OTKA) OTKA is such an independent national institution which supports internationally outstanding frontier researches, (in other words: basic researches) performed in Hungarian workplaces through tenders, with the involvement of Hungarian and foreign evaluators. The activities of OTKA are mainly borne by the central budget. It provides extra resources to the most excellent researchers and Hungarian research institutions through its tenders. OTKA represents the Hungarian science in the international organisations by playing an active role. It complements the international tender systems with its own resources; it participates in the cooperative research funding programmes launched in collaboration with the European research funds.

The budget of the OTKA programmes is approx. 6-10 bn HUF per year (it was 5.5 bn HUF in 2011). OTKA primarily supports basic research projects of researchers and public research institutes.

European territorial cooperation programmes. There are also international cooperation programmes and cross-border cooperation programmes (one each with our neighbouring countries), and the Intereg VC programme, within the territorial cooperation programmes. These international cooperation programmes contain proportionally less funding for R&D, but it is worth mentioning two invitations:

The Central Europe 2014-2020 Programme is the programme of the European Union supporting international cooperation, which aims to improve innovation capacity, competitiveness, accessibility and environmental condition of the cities and regions of the participating countries. Typically multi- actor international consortia may apply for funding in the programme.

Source of funding: ERDF, project size: EUR 1-2.5 M; a total amount of EUR 300 M over 7 years)

The former South East Europe Transnational Cooperation Programme will not be launched from 2014 and funding will be provided instead to the broadly defined South-Eastern European countries by three other territorial programmes: Adriatic-Ionian Programme, Danube Programme and Balkan- Mediterranean Programme. Hungary can apply for funding in the first two programmes as a full partner. By the time this strategy is being drafted, the programmes are still under development so financial data are not available.

6 Smart Factory related projects

This chapter presents relevant national projects in execution by the partner or partnering organisations. Due to quantity of information in this chapter only an extract table is presented below and more data is included in separate XLS file – sheet “Projects”.

Table 2: Smart Factory related projects - extract

Main applicant country	Project name	Programme name	Year from:	Year to:
AT	InnoPeer AVM	Interreg CENTRAL EUROPE	2017	2020
AT	digitalLIFE4CE	Interreg CENTRAL EUROPE	2017	2020
SI	SMART FACTORY HUB	Danube	2016	2019
IT	3DCentral	Interreg CENTRAL EUROPE	2016	2018
IT	ENTeR	Interreg CENTRAL EUROPE	2017	2020
RO	Brain@Home	AAL (Active and Assisted Living) Program	2015	2019

7 List of regional actors

This chapter presents Smart Factory relevant actors. Production oriented SMEs as potential users of solutions are presented in Table 3. The data is collected in separate XLS file – sheet "Reg. actors".

Table 3: List of regional actors – users

Country	NUTS 2	Name	Institution type	Industry sector	Service type 1	Service type 2	Address	Webpage links
HU	HU33	Silicon Dreams Kft.	SME	OTHER	Services		Hungary, 6000 Kecskemét, Kőhíd u. 12. I/1.	n/a
HU	HU32	SCADA Kft.	SME	Mechanical engineering	Services		Hungary, 4200 Hajdúszoboszló Attila str. 27.	http://scada.hu/
HU	HU23	Delta-3N Kft.	SME	Mechanical engineering	Services		Hungary, 7030 Paks Jedlik Á. str. 2.	http://delta3n.hu/

Potential solution providers for Smart Factories are presented in **Table 4**.

Table 4: List of regional actors - solution providers

Country	NUTS 2	Name	Institution type	Industry sector	Service type 1	Service type 2	Address	Webpage links
HU	HU22	CONTROLSOFT Automatika Szolgáltató Kft.	SME	Mechanical engineering	Engineering		Solution provider	Hungary, 8200 Veszprém, Csillag str. 1.
HU	HU10	MOHAnet	SME	Digital economy	Services		Solution provider	Hungary, 1152 Budapest, Telek str. 7-9.
HU	HU10	G4S Távfelügyelet	SME	Digital economy	Services		Solution provider	Hungary, 1033 Budapest, Harrer Pál str. 3-5.
HU	HU10	Optasoft Kft.	SME	Digital economy	Services		Solution provider	Hungary, 1051 Budapest, Sas str. 10,
HU	HU22	HNS Kft.	SME	Mechanical engineering	Services		Solution provider	Hungary, 9027 Győr, Gesztenyefa utca 4.
HU	HU10	Honeywell Szabályozástechnikai Kft.	SME	Digital economy	Services		Solution provider	Hungary, 1139 Budapest

Country	NUTS 2	Name	Institution type	Industry sector	Service type 1	Service type 2	Address	Webpage links
								Petneházy str. 2-4.
HU	HU10	MODIM Mérnöki Kft.	SME	Mechanical engineering	Engineering		Solution provider	Hungary, 1113 Budapest, Karolina str. 17/B
HU	HU10	Demand Solutions	SME	Digital economy	Services		Solution provider	Hungary, 1023, Budapest, Kolozsvári Tamás str. 4a,
HU	HU22	KAIZEN PRO Kft.	R&D center	OTHER	Research and dev.		Solution provider	Hungary, 9700 Szombathely, Temesvár u. 17/2.
HU	HU22	Szintézis Informatikai Zrt.	SME	Mechanical engineering	Services		Solution provider	Hungary, 9023 Győr, Tihanyi Árpád str. 2.

A number of companies presented in **Table 5** is acting as potential user and also solution provider for Smart Factories.

Table 5: List of regional actors - Users/solution providers

Country	NUTS 2	Name	Institution type	Industry sector	Service type 1	Service type 2	Adress	Webpage links
HU	HU10	Vonalkód Rendszerház Kft.	SME	Electrical and electronic engineering industries	Services		Hungary, 1047 Budapest, Fóti str 56.	
HU	HU10	graphIT Kft.	SME	Mechanical engineering	Engineering		Hungary1027 Budapest, Medve str. 17.	
HU	HU31	Aventics Hungary Kft.	SME	Mechanical engineering	Engineering		Hungary 3300 Eger, Bánki Donát str. 3.	
HU	HU10	SCHUNK Intec Kft.	SME	Automotive industry	Engineering		Hungary, 1113 Budapest, Bocskai str 134-146.	
HU	HU10	3D Printing Zrt.	SME	Mechanical engineering	Engineering		Hungary, 1097, Budapest, Illatos str 9,	
HU	HU10	Future Internet LivingLab Egyesület	R&D center	OTHER	Research and dev.		Hungary, 1093 Budapest, Közraktár str 12/a.	
HU	HU10	eCon Engineering Kft.	SME	Mechanical engineering	Engineering		Hungary, 2051 Biatorbágy, Ritsman Pál str. 42	
HU	HU22	iQor Global Services Hungary Kft.	Large Enterprise	Mechanical engineering	Engineering		Hungary, 9700, Szombathely, Vásártér u. 1, 9700	
HU	HU22	BPW-Hungária Kft.	Large Enterprise	Mechanical engineering	Engineering		Hungary, 9700, Szombathely, Körmendi út 98, 9700	

8 List of annexes

- XLS file “D3.2.1_Regional mapping Database_SFH_PBN.xls