

GAP ANALYSIS FOR WEST TRANDANUBIA

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GAP analysis for West Transadnubia

This document summarises the situation of the individual Industry 4.0 ecosystem components in the West Transdanubia Region. We are building on the general model of the knowledge ecosystem, the analysis of the current components and the SWOT analysis. The document brings a summary of what is already available in the region and how the ecosystem can be extended. The projects were initiated within WPT3 of the ECOS4IN project.

1. GOVERNANCE AND NATIONAL POLICIES

Similarly to other European countries, Hungary, has entered a new technological era. In this era, the Internet-based economy significantly transforms the very basics of production and logistic systems. The theoretical and practical problems emerging from such a change are of a great complexity making Hungary a rather modest performer in digital transformation.

In particular, digital infrastructure is the major challenge to overcome with 38 % disparity compared to the EU average¹. Furthermore, Hungary scores less than 10% below the EU average in investments and access to finance, and supply and demand of digital skills.

An effective digital restructuring of Hungarian industry has a great potential to significantly contribute to the improvement of the situation in the country. In addition, it could help to boost the international competitiveness of production and enhance conditions for job creation.

Against this background, the Hungarian government and industry identified a need for developing a comprehensive policy strategy pushing forward digital transformation. The **Minister of National Economy** introduced the “**Irinyi Plan**” in **February 2016**. The plan outlines the main directions of innovative industrial development in Hungary.

Main objectives of the plan are:

1. increase the industrial output-to-GDP ratio from the current 23.5% to 30% until 2020;
2. increase the level of R&D expenditures to 1.8% of the GDP by 2020;
3. reinforce the growth, export and innovation potential of the domestic companies;
4. decrease standardised low-skill activities;
5. increase high-skill activities, embracing planning, control and IT-related tasks;

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.

The funding for the implementation of the plan is partially earmarked from Hungary's EU funds and partially from the state's budget.

The Industry 4.0 National Technology Platform was established in May 2016 under the coordination of the Institute for Computer Science and Control, Hungarian Academy of Sciences (MTA SZTAKI) and with the support of the Ministry for National Economy (NGM) comprising about 40 research institutions, high-education institutions, professional organisations and companies having premises in Hungary.

I4.0 NTP is part of the national strategy as defined in the "Irianyi Plan". The plan seeks to fundamentally re-arrange the manufacturing systems based on digital modelling.

The overall goal of the Platform is to foster knowledge sharing on the basis of exchange of information and the developments - being the key issues of Industry 4.0 - in the digitalisation and production, as well as to offer professional consulting services and formulate recommendations to the government but also to all stakeholders of the Industry 4.0 ecosystem.

The importance of its existence and the attention arisen around it is clearly shown by the fact that the Platform that has in the meantime been transformed into the legal form of an Association has today about 100 members and membership figures increase continuously.

The platform members perform their tasks and pursue cooperation in 7 Work Groups:

- Strategic Planning
- Employment, Education and Training
- Production and Logistics
- ICT Technologies (safety, reference architectures, standards)
- Industry 4.0 Cyber-physical Pilot Systems
- Innovation and Business Model
- Legal Framework

The expected results: innovation acceleration, realisation of industrial solutions, a new generation of trained and highly-qualified professionals and the development of a sustainable and competitive manufacturing ecosystem in Hungary.

1.1. 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.
- Ministry for Innovation and Technology: new Ministry, established in 2018, main decision-making body, responsible for the implementation of national innovation and Industry 4.0 policy.

- 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.

2. REGIONAL POLICY

The Hungarian regional innovation system is characterised by ‘façade regionalism’: strategy design is bottom-up (since 2014 it is made at the national level), but implementation is centralised and bottom-up strategies are ignored. Following a complete overhaul of the institutional system that managed EU co-financed regional development and regional innovation programmes, strategy implementation became separated from regional planning and programming and was completely centralised. West Transdanubia (WT) Regional Innovation Agency’s (Pannon Novum) experts prepared the regional Research and Innovation Strategy for Smart Specialisation (RIS3) strategy that identified the main sectors, technologies and scientific disciplines bound to become the engines for innovation-based growth of the region. Otherwise, Pannon Novum has limited autonomy: it is constrained to the representation of the region in innovation-specific discussions and to the design of various regional awareness raising activities. RIS3 and the additional county-level development strategies do not influence the content of the support measures that are launched, implemented, administered, and evaluated centrally. Innovation policy measures embodied in the Economic Development and Innovation Operative Programme (GINOP) are uniform across the Hungarian regions except for Budapest and Pest. This programme channels European Funds for regional research, development and innovation (RDI) activities and investments.

The main **objectives** of West Transdanubia (WT) regional Research and Innovation Strategy for Smart Specialisation (RIS3) are improving the region’s:

- 1) innovation potential;
- 2) innovative economic actors’ competitiveness, innovation and commercialisation performance;
- 3) strengthening the institutional basis of regional innovation;
- 4) and increasing the amount of resources available for regional innovation.

More specifically, the strategy’s overall aim is the innovation driven **development** of key sectors in the region through:

- Renewing R&D infrastructure;
- Knowledge creation and exploitation;
- Network building and internationalisation of small- and medium-sized enterprises (SMEs);
- Strengthening the social aspects of innovation and creating an innovation-oriented mentality.



The **RIS3 Strategy of WT** defines the following **key sectors**:

- I. Automotive industry;
- II. Wood and eco-industries, including industries related to the exploitation of renewable energies;
- III. Health tourism;

These key sectors are supported by the following **key areas**:

1. Agro-innovations;
2. Information technologies, electronics;
3. Creative industries (design and marketing);
4. Logistics;
5. Creation of a liveable environment;
6. Promotion of local products.

To attain its overall objectives, the RIS3 Strategy of WT outlines the following main horizontal priorities:

- Priority 1. Identification and development of regional excellence;
- Priority 2. Development of innovation services and their institutional system;
- Priority 3. Improvement of the competitiveness of the region's innovative business and the increase of their knowledge base.

In Hungary the RIS3 strategy was developed and approved on national level based on the recommendations of the 19 counties of Hungary. (West Transdanubia consists of 3 counties: Győr-Moson-Sopron, Vas, Zala)

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

1. Knowledge regions
2. Industrial production zones
3. 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.

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.

2.1. 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

3. ACTIVITIES LINKED WITH ADVANCED MANUFACTURING

Specialised in automotive, electronics, machinery and metal processing and casting industries, advanced manufacturing (AM) is highly relevant in West Transdanubia (WT), for both technology users and producers.

Flagship companies have implemented considerable investments in AM-solutions with the purpose of achieving operational excellence rather than simple cost reduction.



High-performing domestic-owned companies have also made good progress towards the adoption of selected applications. Several companies, including medium-sized ones, rely on advanced measurement technologies for testing and/or have implemented industrial automation solutions. Some firms apply 3D modelling techniques for prototyping. Some processes in selected firms are up to 90% robotised, and some companies also apply automated material handling systems, enabling material transport from one machine to another. Flagship companies apply cyber-physical production systems for process optimisation, predictive maintenance, reduction of throughput time, improvement of production scheduling and so forth. The results of investigations suggest that far more enterprises are engaged in AM-related R&D than what the official R&D statistics suggest. WT's companies collaborate (in AM-specific solutions) with the Széchenyi University, the Institute for Computer Science and Control of the Hungarian Academy of Sciences and the Budapest University of Technology and Economics. Altogether, despite a relatively good average performance with respect to the diffusion of AM-technologies, there are large intra-regional and size- and ownership-related differences in this respect. The main source of public support to West Transdanubian companies' AM-specific investments is the Economic Development and Innovation Operative Programme. Targeted calls include: 'Support to business enterprises' investment in ICT-based process development and in e-commerce solutions'; 'Support to the establishment and the development of corporate SAAS centres'; 'Support to manufacturing SMEs' investment in digital conversion and industrial automation: industry 4.0 pilot and demonstration applications'. There is one key sector defined in the RIS3 Strategy of WT that can be related to the thematic areas included in the Smart Specialisation Platform for Industrial Modernisation. This is:

- Wood and eco-industries, including industries related to the exploitation of renewable energies (related to Bio-economy).

3.1. SCIENTIFIC RESEARCH POTENTIAL

Most of the region's research centres are university-based. The key universities are: Széchenyi István University in Győr and Mosonmagyaróvár, University of West Hungary in Sopron, ELTE Savaria Campus in Szombathely and the Pannon University in Keszthely. Industry-academia collaborations are concentrated at the Széchenyi University which has several (automotive industry related) knowledge centres, and at the University of West Hungary (wood- and eco-industry related centres).

3.2. SZÉCHENYI ISTVÁN UNIVERSITY

West Transdanubia's scientific research potential and, in particular, the activities of its science centres are aligned with its specialisation in advanced manufacturing. **Széchenyi University** is the key public scientific research centre. Széchenyi University has developed its research potential (research infrastructure and intangible capabilities) in collaboration with some of the major manufacturing companies in the region. Due to large-scale public support programmes, the university has kept investing

in the extension and upgrading of its research infrastructure. Some pieces of its research infrastructure are unique in Central Europe.

The main areas of Széchenyi University's scientific research competence that are at the same time the main technology areas of West Transdanubia, include, but are not limited to:

- Applied mechanics (e.g. solving problems in engineering statics, dynamics, vibration and thermodynamics; development of modelling and experimental methods of mechanics of fibre-reinforced composite materials; numerical analysis of mechanical and thermodynamic behaviour of viscoelastic materials);
- Development of internal combustion engines (e.g. optimisation of mechanical systems of internal combustion engines; tribology-related research);
- Vehicle engineering (e.g. technology optimisation through computational simulations and advanced optimisation methodologies; fuel efficiency (energy management) related research; vehicle acoustics related research);
- Vehicle manufacturing (e.g. process simulation, technology development, measurement, testing);
- Materials science (e.g. properties of metallic alloys, nano-structured materials, polymer composites, polymer nano-composites, metal-ceramics composites; laser technology of powder coating with powder metals, properties of powder coated technologies);
- Automation: (e.g. research and development of programmable logical controllers (PLCs); electromagnetic field calculation; design of delay-insensitive logical circuits; research of cooperation and communication of robots based on computational intelligence; R&D of energy storage and recuperation systems, fuzzy model identification and evolutionary algorithms, architecture of embedded systems, numerical analysis of electromagnetic fields);
- Information technology (e.g. verification and validation of safety-critical computer systems, development of electric and hybrid vehicles, development of decision supporting methods, robotics);
- Mechatronics and machine design (e.g. research on digitally controlled dynamic systems, development of optical sensors);
- Mathematics and computational sciences (e.g. finite element methods, computational fluid dynamics and their utilisation for industrial purposes, theory and application of operations research; optimisation of production systems, data mining, high performance computing).

A new actor that is bound to add to the region's scientific research potential is the **Automotive Industry Centre of Excellence (J3K)** at the premises of Széchenyi University. J3K was established in 2015 by the Institute for Computer Science and Control of the Hungarian Academy of Sciences (SZTAKI), Audi Hungária and the University. J3K will be specialised in: computing and control technologies; mathematical modelling; materials science.

Science Park at the campus area of Széchenyi University is under preparation.

3.3. UNIVERSITY OF PANNONIA/ FACULTY OF ENGINEERING INSTITUTE OF MECHATRONICS TRAINING AND RESEARCH IN ZALAEGERSZEG

The mechatronics engineering programme in Zalaegerszeg hosted by the Faculty of Engineering of the University of Pannonia provides excellent professional education in the field of engineering in the Transdanubian region. The Institute of Mechatronics Engineering and Research in Zalaegerszeg offers undergraduate courses in full time, part-time, and dual education form as well. The Institute takes great pride in the productive and sustained collaboration with a wide range of industrial partners of the region. These long-standing partnerships not only enable the mechatronics engineering programme to offer projects to students that involve collaboration with industrial sponsors, but they also provide scholarships and vacation placements where students can work towards their final degree. The aim of the undergraduate programme is to deliver courses which meet the needs of industry and to play an important role in creating a generation of engineers that will take a lead in the development of innovative and sustainable technologies.

The first engineering courses in Zalaegerszeg were offered in the year of 2002. Later, in 2010, the mechatronics engineering programme became administered by the University of West Hungary. In 2016, the University Pannonia endorsed the undergraduate programme aiming to explore new areas of science by conserving the traditional values of engineering training.

The dual education scheme of the mechatronics engineering programme was launched to offer a comprehensive range of courses reflecting the changing needs of industry and adapting to the demands of the market. The dual education program is an advanced skills training and career-start program which provides a range of compelling benefits to engineering students. The unique characteristic of the dual engineering degree course is that it is conducted at a higher education institution with practical periods spent at factories/ companies of industrial partners, hence equipping students with a deep understanding of their subjects and exploring the applied side of engineering.

3.4. ELTE SAVARAI CAMPUS/ FACULTY OF INFORMATICS/ SAVARIA INSTITUTE OF TECHNOLOGY

The Savaria Institute of Technology (SIT) was established on the 1st of July, 2014, as a part of the University of West Hungary at the campus of Savaria University Center. In 2017, 1st of February, the Savaria University Center fused with the Eötvös Loránd University (ELTE) and as a part of this process the Savaria Institute of Technology was integrated into the Faculty of Informatics.

The offered programs of the Savaria Institute of Technology in Szombathely:

1. Mechanical Engineering BSc: the education is provided in a traditional and in a dual way where the courses in natural- and differentiated engineering sciences are both taught by the Institute. The courses are offered both in Hungarian and in English.
2. Technical Management BSc: Technical managers are equipped with appropriate knowledge in natural and engineering sciences, economic and management skills. These courses are needed to be able to carry out integrated solutions in production and services with regard to material, financial and IT fields.
3. Teacher program with Technology orientation BSc and MSc: In our so-called technique teacher program we provide the knowledge that is needed for technical basics and education, pedagogical research, design and development tasks for elementary school education.

Laboratories: Materials science lab, Electrical engineering lab, Manufacturing technology lab, Hydraulics and pneumatics lab, Informatics and CAD/CAM lab.

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 Mickiewicz University and the Max Planck Institute for Astronomy.

3.5. ROLE OF INTERMEDIARY INSTITUTIONS

All types of intermediaries are represented with the purpose of enabling regional and sectoral innovation and enhancing innovation capacity abound in West Transdanubia, including regional innovation agency (Pannon Novum RIA), regional industry associations (e.g. West Pannon Centre for Automotive Industry and Mechatronics), clusters; chambers of industry and commerce (in each county of the region), NGOs (e.g. Pannon Development Foundation), enterprise agencies (e.g. Kisalföld Enterprise Promotion Agency; the Enterprise Promotion Agency of Zala County), science and technology centres (e.g. INNONET Centre of Innovation and Technology), business parks (the industrial park of Győr is a prominent example), business incubators (e.g. in Zalaegerszeg at the premises of Technológiai Centrum) and technology transfer offices (e.g. the technology transfer office of the University of West Hungary).

However, the activities of the majority of these intermediary institutions are not directly related to the diffusion of Industry 4.0 technologies, and have therefore little direct impact on the uptake of advanced manufacturing technologies by SMEs in the region.

The main role of these institutions is provision of networking services and business information; organisation of events (brokerage events, trade shows, business forums and seminars), and interest representation. Due to the funding allocated to these intermediaries in the framework of public support programmes, some of these intermediaries (e.g. incubators, science centres) possess up-to-date measurement and testing equipment and other research infrastructure-type equipment items.

The listed intermediaries are not engaged in the funding of regional stakeholders. Funding is completely centralised in Hungary.

3.6. Chambers of commerce and industry in each 3 counties of West-Transdanubia

The primary task is to convey relevant information to businesses and to promote the economic development of the county, partly based on information from businesses and partly on cooperation with partner organizations. Analyzing economic processes, try to assess the impact of planned actions on education and economic policy, and influence decision-making in the interests of the economy. Participating in the implementation of national programs such as industry 4.0.

The Chambers plays an important and decisive role in communicating industry 4.0 and similar programs to businesses, identifying and engaging companies that are pioneers in industry 4.0. The Chambers gather relevant information from companies to see what challenges they are facing and what they need to help them develop properly and intentionally.

3.7. Clusters

The clustering process is developing dynamically in several industries in the region:

1. Professio Metalworking Cluster
2. Pannon Mechatronics Cluster
3. Pannon Wood and Furniture Cluster
4. Pannon Renewable Energy Cluster
5. West-Pannon Ecotourism Cluster
6. Pannon Thermal Cluster
7. Pannon Local Product Cluster
8. Pannon Logistics Cluster
9. Sopron Region Logistics Cluster
10. Pannon Textil Cluster
11. Sopron Region Informatics Cluster

Example of a successful cluster is Professio Metalworking Cluster. Its members include some of the surveyed companies, specialised in metal processing and casting, manufacturing of customised industrial equipment and industrial automation solutions. Cluster members are suppliers of some of the surveyed flagship companies in the region, and obviously of other companies (mainly MNCs in Hungary and abroad). Besides information sharing and networking, the main purpose of cluster members' collaboration is to enhance the quality of dual education in the region, to raise awareness of the importance of up-to-date vocational training and engineering education.

3.8. Technology Centres, business incubators

3.8.1. INNONET INNOVATION AND TECHNOLOGY CENTRE

Example of a successful science and technology centre is INNONET, established in 1997. INNONET is a technological competence centre that provides technology services (e.g. rapid prototyping), and management and business incubation services to the region's SMEs.

INNONET Centre of Innovation and Technology is a business incubator with a 5000 sqm facility located in the Industrial Park of Győr. Main mission is to foster innovation by designing services for tenants and also by participating in collaborative and awareness raising projects in the city and in the surrounding region.

Main clients are SMEs, with special focus on spin-off enterprises founded by former employees of TIER I-II / OEM companies. Among these, especially companies offering services to the enterprises already settled in the industrial area around Győr. Typical clients are engineering companies, suppliers of services, non-production parts and components to state-of-the-art manufacturing lines.

Local companies might be characterized as professional, high quality manufacturers and incremental innovators. Disruptive innovation (presence of start-ups) is less characteristic of our environment. The economy of Győr has significant ties to the automotive industry.

Primary role as an innovation intermediary with respect to digital transformation/Industry 4.0 in the region is that of sensitizing and awareness rising. In this respect the Centre acts in close co-operation with the local Chamber of Commerce and Industry.

3.8.2. TECHNOLOGY CENTRE OF ZALAEGERSZEG

The Technology Centre was founded in 2010 based on the industrial needs. The centre is a service and research facility which has its own human- and technical background and extensive professional cooperating partners. It offers a combination of flexibility, professional performance and scientific values due to its special organizational structure and operational model - besides powerful operating presence - in development projects of industrial branches. The centre plays an active part in strengthening and improving the human base of technical knowledge. Its role in spreading and further developing dual training in the region is determinant. It creates the bases of practice-oriented training by involving students in value-creating processes, with the help of special programmes and projects. Its mission is to contribute to the development of industrial, especially machine industrial, business enterprises in order to strengthen their competitiveness with the help of complex technological research-development services.

3.8.3. Zalaegerszeg test track and Zalazone Research and Technology Center

The ZalaZONE test track, is an excellent example for the successful cooperation of the industry, the government and the academic sphere. The proving ground is an optimal test environment to the future cars and their communication technologies on multi level and contributes to the testing these from the concept condition to the final product status.

3.8.4. RECAR - Research Center for Autonomous Road Vehicles

With the establishment of RECAR the partners created such a comprehensive organization, in which the partners combine their competences and with the utilization of synergies higher level research results can be achieved. Main aim is to connect the academic and industrial competences, also the education and research, so that the training of highly qualified professionals and the strengthening of R+D basis can be enabled.

Founders: Universities, Hungarian Academy of Sciences Institute for Computer Science and Control, Industrial partners: Bosch, Continental, Knorr-Bremse.

3.9. Science and training centers

3.9.1. Technics Playground 4.0 Mechatronics and Robotics Training Centre -

A place to play, to create, to learn, to mentor and to invent

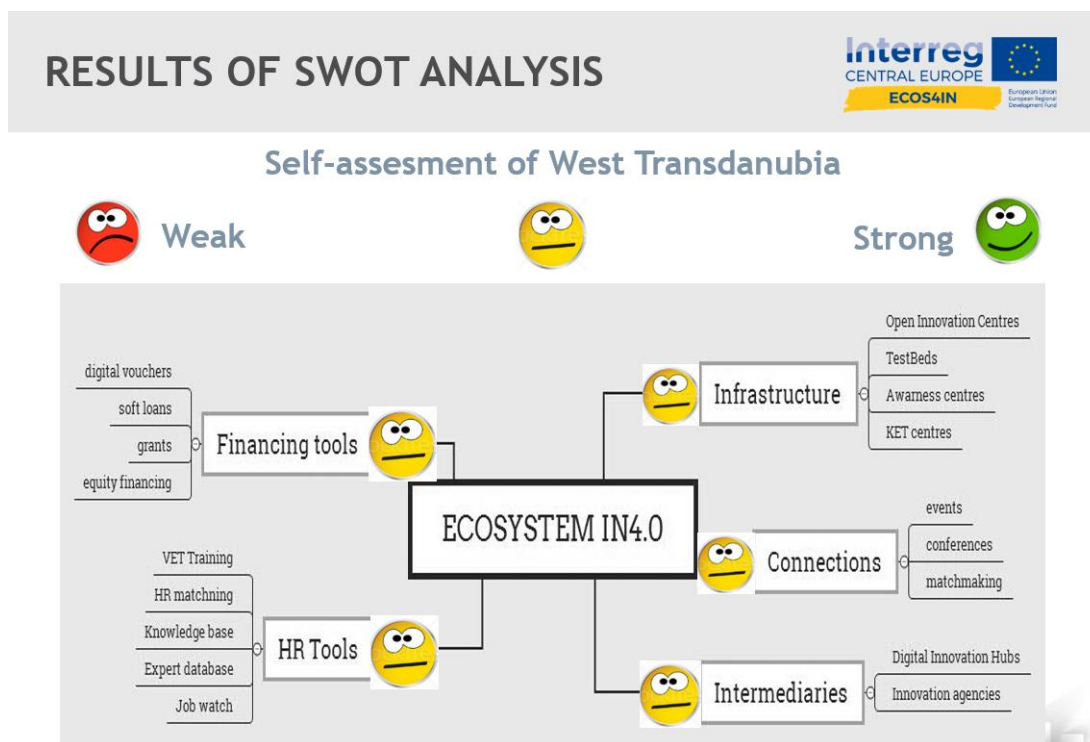
Training Centre is basically open for everyone, targeting both primary and secondary schools and well equipped with machines for digital fabrication. TP 4.0 has thousands visitors each year and operated by Mr. Sandos Juhos individual entrepreneur who holds more then 15 inventions and patents and who is one of the world champion of robot builders.

3.9.2. Mobility - Digital Experience Centre

Mobiliti is located at the campus area of Szechenyi Istvan University.

„Encode, construct, discover!“ - The MobillTy Digital Experience Centre is a creative space where in the weekdays scholar groups, on Saturdays individual visitors and families can create, learn playfully, discover and experiment the latest ICT and digital devices: 3D printing, AR/VR, robotics, smart home tools, animations, humanoid robots.

What components do we have in our ecosystem and how do we evaluate their performance (good, average, poor)



Own edition based on the main findings of D.T2.2.1 SWOT analysis

4. Regional Technology Specializations and expected Impact from Industry 4.0

An updated version of RIS3 (S3, Smart Specialization Strategy) is not yet ready in Hungary. The National Office for Research, Development and Innovation conducted a national data collection in early 2020, on the basis of which new specializations will be developed. The old ones are outdated on the one hand, and have lost their relevance due to the current COVID-19 epidemic. According to the latest survey of the Hungarian Chamber of Commerce and Industry on the situation caused by the epidemic, several of the leading sectors have declined and several previously stagnant sectors have been strengthened by the adaptability of the job.

As a result of COVID19, many former companies in the regional S3 sector have responded to the economic crisis with redundancies, the course of which cannot yet be estimated. Prior to the epidemic, labor shortages were noticeable in almost all industries, but in some S3 sectors there was an oversupply of labor due to the influx of skilled labor from abroad.



There are several areas with past labor shortages where intervention will be needed, these:

- Enhance automation, expand Industry 4.0 and 5G systems, spread them more widely
- Internal reorganizations, trainings, search for solutions based on the existing group of employees
- Increasing efficiency, increasing the productivity of the existing workforce
- Pályaorientáció további erősítése az Ipar 4.0 igényelte szakmák irányában

Due to the economic impact of COVID-19, certain industries were shut down immediately:

- tourism
- trade
- hospitality services
- entertainment and leisure industry.

To varying degrees, but reduced emissions (due to raw material supply problems - due to import dependence):

- automotive, mechanical engineering and manufacturing.

For the time being, due to longer-term projects, the decline is less noticeable:

- construction industry.

Production was forced to increase:

- food industry

These economic effects will be strongly felt by the end of summer 2020, so far no concrete data can support the downturn. Instead of the current labor shortage, an increase in unemployment is clearly expected, just as many micro and small enterprises have started to disappear, so a reorganization of the market can also be assumed.

The introduction of new industries, the introduction of new industries into the region by increasing investment promotion activities, the establishing new industries based on the existing production and processing capacity (eg aerospace, defense and military industry, development of electric vehicles) could be a breaking point. In addition, product and service development, industrial automation supported by design thinking, logistics developments and environmental developments.



There have been dominant specializations in the region so far:

- automotive industry
- mechanical engineering
- manufacturing
- logistics
- agriculture
- food industry
- wood and furniture industry
- tourism

In comparison, the coronavirus epidemic has changed the situation and the following industries have come to the fore:

- health industry
- construction raw material production
- creative industry
- AI (artificial intelligence)
- IT solution providers - robotics

5. 14.0 Development areas in West Transdanubia

Across all industries, the most urgent development opportunities for the region are:

1. Strengthen the infrastructure offer of West Transdanubian research system and facilitate connections to the networks of European and international research infrastructures
2. Finding synergies between funding opportunities and increasing international integration of Hungarian higher education and higher education research
3. Increasing companies' implementation capabilities of innovation projects (among small companies, sensitization of companies for R&D and innovation, support in the elaboration of first innovation strategy, facilitating access to qualified resources, R&D services and infrastructures, access to financial resources)
4. Strengthen the role of innovation agencies - Deep and practical consultation among micro and small companies could be effective
5. Increasing firms and citizens awareness not only of the importance of ICT technologies, but also of the value and importance of data and of finding new ways to deploy them within their businesses in value creating ways - especially as a new competitive avenue for traditional sectors;
6. Support for smaller companies to reorganize management and business processes, desing documented information flow within the organisation in order to be able to meet the digitalization challenges and do not lose of their competitiveness.
7. Improvement of coordination and collaboration of different stakeholders
8. Exploitation of complementarities of knowledge and specializations between different clusters at regional, national and interregional level
9. Adoption of Open Innovation models - sharing problems and solutions
10. Establishment of a science and technology park at the campus area of Széchenyi University of Győr
11. Greater emphasis on the activities of supporting market utilization, the development of the national/regional innovation organization system in this direction
12. The communication of experts and users should be supported on B2B bases (matchmaking, speed dating, "Digithon" similar as Hackathon) incl. networking with experts of different areas of „core technologies“and different sectors
13. Support innovative or knowledge-intensive start-ups and research spin-offs and foster their business opportunities with companies in the region.
14. Development of curricula and new training materials in the vocational training system and higher education, training of techers
15. Enhancing regional firms' attractiveness towards talent and exceptional candidates, foster people empowerment, exploit underused resources
16. Renewal of career guidance system (vocational orientation) with innovative learning technologies (virtual and augmented reality, e-learning platforms with gamification elements). Making technical professions attractive.

6. Main regional sources

- Specialisation Strategy for West Transdanubia, Pannon Novum Nonprofit Kft., 2013
- National Smart Specialisation Strategy for Hungary, 2014
- Irinyi Plan - The Directions of Innovative Industrial Development in Hungary, 2016
- Regional Innovation Report West Transdanubia (Industry 4.0 and smart systems), 2016, Technopolis group in cooperation with Fraunhofer, ERRIN, UNU-MERIT and Andrea Szalavetz
- Digital Transformation Monitor for Hungary: “IPAR 4.0 National Technology Platform”, December 2017
- ZalaZone: <https://zalazone.hu/en/>
- RECAR Program: <http://recar.bme.hu/eng/>