

WP T3: INNOVATION 4.0 COOPERATION HOTSPOT

D.T3.2.1 - Description of the AMiCE
project development support scheme

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Executive Summary

The Alliance for Advanced Manufacturing in Central Europe (AMiCE) aims at enabling the regional Small and Medium Enterprises (SMEs) to tackle challenges concerned additive manufacturing and circular economy. Therefore, AMiCE creates a support scheme that capitalizes on AMiCE partners and their provided services in research, development, and business support. Also, the support scheme leverages the regional connections of AMiCE partners with the local service providers to act as a complementary service in special cases. The support scheme focuses on four main themes that cover the provision of knowledge, project development, matchmaking as well as access to finance. This document compiles the services within the AMiCE alliance that will benefit the regional SMEs in the fields of additive manufacturing and circular economy.



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Abbreviations

ABBREVIATION	DEFINITION
AM	Additive Manufacturing
AMiCE	Additive Manufacturing in Central Europe
CE	Circular Economy
CZ	Czech Republic
DE	Germany
EC	European Commission
EU	European Union
IT	Italy
PL	Poland
R&D	Research and Development
RIS3	Research and Innovation Strategies for Smart Specialisation
RTO(s)	Research and Technology Organisation(s)
SME(s)	Small & Medium sized Enterprise(s)
SK	Slovakia
3DP	3d-printing



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A. Context and motivation

The Alliance for Additive Manufacturing and Circular Economy (AMiCE) tackles some of the main and common challenges for Additive Manufacturing (AM) and Circular Economy (CE) in central Europe. Among these challenges, the lack of customized innovation support schemes that do not follow traditional manufacturing structures. Advanced manufacturing requires addressing many topics simultaneously and in a short time such as: materials, energy efficiency, new value chains, competitors, ...etc. Also, the existing support organisations and clusters are not always linked with the appropriate knowledge partners. That is, their project-based approach prevents them from benchmarking with and learning from top-level players, i.e. from other European regions. Therefore, AMiCE will develop and implement new training tools, which base on a common strategy for the improvement of the innovation services in the field of AM technologies. It will identify and promote promising innovation teams from Central Europe.

AMiCE addresses companies, researchers, and innovation service providers in new advanced manufacturing value chains. All players along these chains- whether research institution, big company, SMEs must consider that global competitive environment. Therefore, all interventions and support strategies can be effective only if they are aligned, co-ordinated or implemented collaboratively in an at least transnational context. This is to ensure that, regional and trans-regional synergies can be exploited, and these interventions will not cause any cannibalisation effects and that economies of scale can be achieved. Finally, the transnational approach will contribute to strengthening the competitive position of all manufacturing actors in Central Europe. Even advanced manufacturing has facilitated global value chains and global competition in nearly all fields of economy.

Therefore, any innovation and innovation support must be measured at the global competition. It is not possible to create valuable and competitive innovation information, to develop World Class clusters or to provide efficient innovation support along global value chains only at national or regional level. Partners will benefit from that approach by enlarging and consolidating their own international networks and experience, by an improved competitiveness, which grounds on mutual learning, combined and shared resources, deeper insights and updated knowledge on strengths and advantages of other regions and improved services for their clients and partners. Regional policies implementation will be synergised through a targeted combination of regional strengths. A particular asset of the transnational partnership is the involvement of players from European top-class manufacturing regions. That will speed up the intended ascent to the first division of manufacturing regions in Europe.

B. Objectives

In parallel with the AMiCE strategy that was documented in “D.T1.1.3 Development of a Cooperative Manufacturing 4.0 support strategy”, AMiCE will support SMEs in the addressed Central European regions in four main areas:

1. **Knowledge:** AMiCE will focus on closing the knowledge gaps that face SMEs in the fields of AM and CE. Aside from the technical knowledge (that has dynamic characteristics and periodically changes), AMiCE will help SMEs to identify business opportunities via its diagnostic system that helps the SME to: realize the benefits of the offered technologies, analyse their organisation, assess the available technologies, benchmark their performance, develop their business, as well as make their decisions.
2. **Project development:** AMiCE will support SMEs to develop their ideas and transfer them into concrete projects based on successful business models.



3. **Matchmaking:** AMiCE will connect SMEs with the innovation actors across the value chain, to benefit both sides and to create the need for further innovations and advances of novel manufacturing technologies.
4. **Access to finance:** AMiCE will update its website regularly with information about financial opportunities. Besides that, AMiCE will help SMEs with identifying the best suitable scheme for their projects (taking into consideration the associated risks). AMiCE will also help SMEs to complete their business plans.

Details for these objectives and the specific steps are highlighted in the actual implementation of this support scheme for individual projects that is provided in “D.T3.2.2 - AMiCE-project development support plans for promising AM-related innovation teams from SMEs and R&D”. This deliverable is mainly dedicated to the listing of the support for SMEs currently available at AMiCE network. This will mainly depend on the business support organizations within AMiCE.

C. Business Support by AMiCE's Czech Tandem

The Czech tandem of AMiCE consists of the Technical University in Liberec (TUL) and the Regional Development Agency of Usti Region, PLC (RDA UR). TUL is the largest and the most comprehensive research organization in the region of Liberec. The Institute for Nanomaterials, Advanced Technologies and Innovation offers cutting-edge technologies in the fields of materials and engineering research. Research and technological base, at the Institute, meets the strictest criteria of the current Standards and serves the local industries in the form of contractual research. TUL has a tradition of long-term cooperation with the industry, which means an experienced staff and professional approach to the industrial partners.

Moreover, the Regional Development Agency of Usti Region, PLC (RDA UR) is an AMiCE Partner and acts as an organisation for the support and coordination of economic and social development of the Usti Region. The main businesses of the RDA UR are economic and social researches, feasibility studies and development plans, assistance in acquiring support for the development from public sources for both public and private sectors. Its activities cover the assistance in development, co-ordination, and implementation of development projects. It provides services to companies as well as to public authorities, such as for the attraction of investments to the region and the grant management, project development and project management, the development of business plans and concepts for internationalisation and new business development, studies e.g. about sector developments and foresight, the organization of training and education measures. RDA UR relates to the Regional Innovation Service (RIS) in the Czech Republic. It is a Public Equivalent Body, a member of the European Association of Regional Agencies (EURADA) and the Czech Association of Regional Development Agencies (CARA). RDA UR performs economic activities on the market. When performing any project supported by public sources in favour of the region, such an activity is not considered as an economic one. The RDA UR is a member of the Czech Enterprise Europe Network consortium and has close working contacts to the current members. Based on extensive experiences, the familiarity with the tools, methodologies and rules RDA UR creates the synergies with the EEN activities for all participating Czech SMEs.

The Czech tandem provides a wide range of continuous support to the AMiCE Alliance and the regional SMEs. Companies can receive support in six broad fields that are summarized in Figure 1 and explained in the following sections.



Figure 1. AMiCE support provided by the Czech tandem

1. Research and Innovation

TUL offers the following specialized laboratories to the AMiCE Alliance and the local SMEs:

■ Laboratory of prototype technologies and processes

- Construction of equipment to expand the potential use of rapid prototyping methods,
- Construction of models and prototypes, product development using various technologies,
- Application of material development in the design of products and new processes.

The laboratory is equipped with various 3D printers (polymers, metal, structure, and mapping tools). Among this equipment, there are:

- **OBJET Connex 500 3D printer with the technology PolyJet Matrix** can combine two-components for quick production of models and very precise printing of prototype functional objects from various materials (similar to rubber, ABS, then hard and pure materials).
- **Generative laser melting device SLM 280HL** for quick production of complex shaped parts using Selective Laser Melting from all machinable powder metals (stainless iron, aluminium, titan, etc.).
- **LAO fibre laser** with an output of 400 W and a laser cutting head for cutting sheet metals and other materials for the construction of prototype parts.
- **3D printer FORTUS 450mc** for repetitious production of precise and tough prototypes from thermoplastic.

■ Laboratory of advanced industrial technologies

- New and innovative technologies for processing of polymers, composites, nanocomposites, micro composites, long-fibrous composites, biopolymers, ceramics, steel, cast iron, aluminium, high-strength metals and metals with treated surfaces, ferrous compounds, hybrid components, etc.
- Optimized and innovative technological and production processes to increase end and utility properties of the products, decrease energy costs and ecological burden (recycling).

2. Centre for Support of Technology Transfer (CPTT)

TUL has a dedicated Centre for Support of Technology Transfer (CPTT). The CPTT aims to expand, deepen and support further cooperation of TUL with companies and enterprises that are interested not only in technology transfer, but also in specific services (testing, measurement, etc.) or consulting in various areas of industrial and business practice, or the use of special instrumentation and laboratory equipment at TUL.



At the same time, CPTT strives to establish and deepen strategic partnerships in the fields of research and development. The CPTT offers:

- Cooperation based on long-term knowledge and experience in various fields of science and research.
The opportunity to use top laboratory equipment with the possibility of testing and verifying the properties of products and other outputs, consultancy in general (e.g. elaboration of professional methodologies, overviews or scientific searches, etc.), joint development of prototypes and samples (with subsequent validation and verification) under laboratory or (semi) operational conditions.
- Initial consultation with subsequent identification of needs and offer of proposed solutions in cooperation with specific faculties and institutes at TUL.
- Finding a workplace for cooperation and possibility to provide other information (e.g. about machinery, testing conditions, etc.).
- Mediation of the contact with a specific employee / workplace at TUL.
- Transmission of information on developed technologies, materials, and other R&D outputs.
- Presentations of application potential (in direct cooperation with colleagues or other professionally and professionally qualified partners).
- Consultancy in the field of technology transfer into industrial practice (especially in connection with the protection of intellectual property).
- Other services (introduction of instruments, information on testing and measurement, mediation of excursions, professional seminars, etc.).
- Management of patents, licenses, and inventions.
- Evidence of the subject of industrial rights.
- Preparation of an annual analysis of the state of TUL in the field of intellectual property.
- Coordination of activities related to the activities of the TUL License Fund administration.
- Providing training and consulting in the field of technology transfer.
- Consultations on the creation of commercialization plans and assistance in finding ways to apply research in practice.
- Promotion of research activities of individual faculties and institutes of TUL.
- Legal advice (focused on the protection of intellectual property).

3. FUNDING

TUL provides funding support and/or supports finding the appropriate funding source via the multiple funding programmes in the Czech Republic that allow funding for Research, Development, and Innovation (RDI) at the “National” as well as the “Regional” levels. For instance, the Ministry of Industry and Trade in the Czech Republic provides different programs such as the “Operational Programme Enterprise and Innovations for Competitiveness” OP EIC (2014 - 2020)¹.

- **The OP EIC** sets out a strategy that will contribute to the Union Strategy for smart, sustainable, and inclusive growth (“Europe 2020 Strategy” or “EU2020”). OP EIC is based on two intersecting pillars: The first pillar consists in common ideas and goals embodied in the Europe 2020 Strategy and the second one is represented by the priorities and needs of the Czech Republic identified in national and European strategic documents. The OP EIC puts special emphasis on supporting the small and medium-sized enterprises (“SMEs”), which constitute a major proportion of businesses in the Czech Republic. The OP EIC supports basic areas of economic specialisation where the Czech Republic shows an above-average

¹ <https://www.mpo.cz/cz/podnikani/dotace-a-podpora-podnikani/oppik-2014-2020/>



growth potential, and it is important for SMEs to identify specific sub-sectors within these industries that represent a major competitive strength of the economy. These areas include:

- Manufacture of transport means and equipment,
 - Mechanical engineering,
 - Electronics and electrical engineering,
 - IT services and software,
 - Electricity production and distribution,
 - Drugs and medical products.
- **The Ministry of Industry and Trade in the Czech Republic** provides also a special support for Research and Development through the TRIO program (2016-2022)² that funds projects focused on the six Key Enabling Technologies (KETs) of: photonics, nano- and microelectronics, industrial biotechnology, nanotechnology, advanced materials, and advanced manufacturing technologies. The program aims at increasing the applicability of the R & D targeting those KETs with emphasis on the economic areas in which the Czech Republic has significant growth potential. In particular: the production of vehicles, machinery, electronics and electrical engineering, IT services and software production and distribution of electric energy and pharmaceuticals and medical devices.
 - **The Technology Agency of the Czech Republic (TA ČR)**³ is an organizational unit of the state to reform and support the research, experimental development, and innovation. The key feature of TA ČR is to simplify the redistribution of financial support from the national budget, which has been fragmented and implemented by many bodies before TA ČR. TA ČR has multiple programs for funding (named as Alfa, Beta, Gama, Delta, Epsilon, Omega, Zeta, Eta, Theta, and the National Competence Centres). Some of these programs have sub-programs with special bylaws that regulate the funding in the different industrial sectors.
 - Similarly, there are different funding programs for RDI in the Czech Republic that support the Advanced Manufacturing and can be found under: the Grant Agency of the Czech Republic (GAČR)⁴, the Ministry of Interior⁵, the Ministry of Agriculture⁶, and the Ministry of Education, Youth and Sports⁷. Further programs for the entrepreneurs can be found through the information portal⁸ of the Operational Program Enterprise and Innovation for Competitiveness (OPPIK).
 - On the **Regional level** at the Czech Republic, there are several funding programs that can be beneficial for SMEs. For example, the Ministry for Regional Development⁹ facilitates the funding in different sectors. Local SMEs can benefit from the Innovation Vouchers¹⁰, which aim at increasing the interactions between businesses and organizations for research and knowledge dissemination to enhance the competitiveness of the SMEs. Furthermore, Regional innovation vouchers can be found for: Central Bohemian Region¹¹,

² <https://www.mpo.cz/cz/podnikani/podpora-vyzkumu-a-vyvoje/>

³ <https://www.tacr.cz>

⁴ <https://gacr.cz>

⁵ <http://www.osf-mvcr.cz/vyzvy/iop>

⁶ <http://eagri.cz/public/web/mze/poradenstvi-a-vyzkum/vyzkum-a-vyvoj/narodni-agentura-pro-zemedelsky-vyzkum/program-zeme-1/>

⁷ <http://www.msmt.cz/vyzkum-a-vyvoj-2/pro-odborniky>

⁸ www.opik.cz

⁹ <http://strukturalni-fondy.cz/cs/Evropske-fondy-v-CR/2014-2020/Operacni-programy/List/OP-INTERREG-EUROPE/Novinky/Program-INTERREG-EUROPE-vyhlasil-4-vyzvu>

¹⁰ <https://www.agentura-api.org/programy-podpory/inovacni-vouchery/inovacni-vouchery-vyzva-iii/>

¹¹ <https://s-ic.cz/cs/projekty/inovacni-vouchery/>



Prague Region¹², Liberec Region¹³, Ústí Region¹⁴, Plzeň Region¹⁵, Karlovy Vary Region¹⁶, Moravian-Silesian Region¹⁷, and Zlín Region¹⁸.

Interfaces in funding programmes between universities and industry

Collaboration between universities, research centres and industry are on several levels that include the cooperation in contractual research between the partners. Another form of cooperation is based on the joint research projects supported by the European and/or the national funding programs and governed by the conditions given by the grant provider. At the same time, there are several platforms to help connect the research sphere and the industry, such as the European Enterprise Network. A significant Czech platform is the KAV (KA), which supports the higher innovation and competitiveness of its members, popularizes their activities in the areas of additive production as well as the ability to solve very complex projects using the latest 3D printing technologies. In the framework of its activities, KAV creates a common identity of legal and natural persons, members and promotes the use of additive production and its popularization.

4. Clusters:

This section presents the specialized Centres, Clusters, and Teaching & Research institutes that are actively participating in the Additive Manufacturing at the Czech Republic, such as:

- **Additive manufacturing cluster**¹⁹ supports the higher innovation and competitiveness of its members, popularizes their activities in the areas of additive production, as well as the ability to solve very complex projects using state-of-the-art 3D printing technologies. In the framework of its activities, the cluster creates a common identity of legal and natural persons, members, thus contributing to the promotion of the use of additive production as well as its popularization as an autonomous component of the manufacturing processes of Industry 4.0.
- **Protolab**²⁰ is originated with the idea of allowing small and medium-sized companies to have access to modern prototyping technologies and enable them to compete on the regional, European, and Global levels. Protolab tries to overcome the challenge that top technologies for industrial 3D printing are very expensive and are not available for many small and medium businesses, and offers them complex prototype services that goes beyond the 3D printing to cover all finishing operations. Protolab allows the use of basic reverse engineering services that include laser 3D scanning services, and subsequent data processing. Protolab offers professional consultancy in the field of additive production with a focus on the technological and economic spheres in the implementation of additive production in the industrial environment. Protolab promotes the collaboration between the private entities in the field of testing and developing powder materials for metallic 3D printing.
- **Research and Innovation Centre on Advanced Industrial Production (RICAIP)**²¹ is a Horizon 2020 funded, with the participation of the Czech Institute of Informatics, Robotics and Cybernetics (CIIRC)

¹² <http://prazskyvoucher.cz/inovace/>

¹³ <https://dotace.kraj-lbc.cz/2-2-Regionalni-inovacni-program-r673148.htm>

¹⁴ <http://www.kr-ustecky.cz/dotacni-program-inovacni-vouchery-usteckeho-kraje-2018/d-1718753>

¹⁵ <http://www.bic.cz/vouchery>

¹⁶ http://www.kr-karlovarsky.cz/dotace/Stranky/dotaceKK/prispevky-region/program_rozvoje_konkurenceschopnosti_kk.aspx

¹⁷ https://www.msk.cz/cz/verejna_sprava/podpora-vedy-a-vyzkumu-v-moravskoslezskem-kraji-2018-116741/

¹⁸ <https://www.kr-zlinsky.cz/rp15-17-inovacni-vouchery-zlinskeho-kraje-aktuality-14284.html>

¹⁹ <http://www.3dklastr.cz/>

²⁰ <https://protolab.cz/>

²¹ <https://www.ncp40.eu/>



Czech Technical University (CTU) in Prague as the coordinator and the Brno University of Technology. The centre will provide the European first distributed, but virtually integrated experimental testbed.

- **National Centre for Industry 4.0²²** was established in September 2017 through the collaboration between research, industry, and professional organizations. Its goals are to raise awareness about Industry 4.0 and to strengthen cooperation between academia and industry. The main founding partners include CIIRC CTU, Brno University of Technology, VŠB - Technical University of Ostrava, Siemens, ŠKODA Auto and others.

5. Research Centers and Institutes

- **Research Centre of Manufacturing Technology (RCMT)²³** at the Czech Technical University is a highly professional research and educational institution. RCMT uses its state-of-the-art equipment to provide services to the industry of cutting and forming machines. RCMT participates in research projects with Kovosvit MAS on: Laser and Non-laser technologies for additive and hybrid metal production. In general, RCMT focuses on the development and application of modern methods, especially in the fields of:
 - Advanced simulation models.
 - Virtual prototyping and virtual testing.
 - Development of advanced feed drive control techniques and vibration suppression methods.
 - Application of unconventional materials and structures.
 - Advanced monitoring and diagnostics of machine tool condition.
 - Compensation of machine tool thermal errors and design of additional measuring systems.
 - Multi-axis machining technology.
 - Minimizing the environmental impact of machine tool operation.
- **The New Technologies for Mechanical Engineering (NETME)²⁴** Centre is a regional research and development centre based on high quality research and development conducted at the Faculty of Mechanical Engineering at Brno University of Technology. NETME Centre aims at delivering technology solutions through applied research collaborations, increase competitiveness of the region and promote regional knowledge economy.
- **Institute of Machine and Industrial Design²⁵**, Faculty of Mechanical Engineering at the Brno University of Technology focuses on the traditional engineering fields and the newly and rapidly evolving technologies as well as the cross-border and the interdisciplinary fields. The institute provides first-class education and research that focuses on additive technologies, with specialization in Selective Laser Melting (SLM). SLM allows the production of unique parts, prototypes, and test specimens with complicated geometry or internal structure that are difficult to manufacture with conventional technologies. The process can handle materials such as titanium (TiAl6V4), aluminium alloys (AlSi12, AlSi10Mg) and stainless steel (1.4404, 1.4410) with sizes up to 280 x 280 x 350 mm. The institute also develops the process parameters for new materials and their testing in terms of mechanical stress and fatigue.
- **The Centre for Additive Production Uprint 3D²⁶** at the Palacký University of Science and Technology in Olomouc is one of the largest workplaces of its kind in Moravia. Uprint 3D offers multiple services that

²² <https://www.ncp40.cz/>

²³ <http://www.rcmt.cvut.cz/home/en>

²⁴ <http://netme.cz/cs/3d-laboratory/>

²⁵ <http://www.ustavkonstruovani.cz/texty/vyzkum-aditivni-technologie/>

²⁶ <http://www.uprint3d.cz/>



include 3D printing, 3D scanning, consulting and project support to companies and university workplaces. UPrint 3D uses state-of-the-art 3D printing technologies from metals, thermoplastics, photopolymers, and paper. The unit has a full range of additive manufacturing methods at a single workplace, which optimizes the choices for materials and tailor-made projects.

- **The Institute for Nanomaterials, Advanced Technology, and Innovation (Cxi)**²⁷, Technical University of Liberec aims at contributing to the development of Liberec region, which is traditionally oriented to technical industries. Research programs at the institute are focused on areas of material research and competitive engineering with an emphasis on the usability of the research and development results in practice. The research projects at Cxi include activities on prototyping and 3D technologies, smart fabrics, and the implementation of advanced fillers in the production of extruded composite profiles with a utilization for progressive additive technologies in 3D printing.
- **Department of Manufacturing Systems and Automation**²⁸, Faculty of Mechanical Engineering, Technical University of Liberec has contactless optical and laser scanners, which are designed to digitize the physical parts quickly and accurately with sizes from millimetres up to tens of meters. The output 3D format is a high quality optimized polygonal network (*. STL), which can be further processed by specialized software to create a surface of solid model (*. STP *. IGES) suitable for CAD / CAM systems.
- **Laboratory of Additive Manufacturing** at the VŠB-Technical University of Ostrava²⁹ focuses on:
 - Scientific research and education,
 - Testing and measuring mechanical properties of printed parts,
 - Technology, development and testing of powdered metals,
 - Component designing methodology (topological optimization and bionic design),
 - Custom production of metal prototypes.

6. Strategies and Initiatives in the Czech Republic

Investment and Business Development Agency (CzechInvest)³⁰ aimed at: ensuring the opening of the economy and its transition to market principles, establishment of links to global market, and an overall modernization of the Czech economy. Therefore, specific strategies to support different industrial sectors in the Czech Republic were developed by CzechInvest. Strategies for supporting the Additive Manufacturing came as parts of bigger strategies for “Advanced Engineering” and “Industry 4.0”. The strategy for “Industry 4.0” is built around the concept of cyber-physical systems demonstrated in Figure 2. This initiative was coordinated by the Ministry of Industry and Trade of the Czech Republic to guarantee a strategic approach to the challenges of Industry 4.0. The strategy extensively analyses the current state of Czech industry, future trends and possible risks, and gives suggestions for specific steps to be taken in the future.

²⁷ <https://cxi.tul.cz/vyzkumne-projekty>

²⁸ <http://www.ksa.tul.cz/>

²⁹ <https://www.3d-tisk-kovu.cz/>

³⁰ <https://www.czechinvest.org>

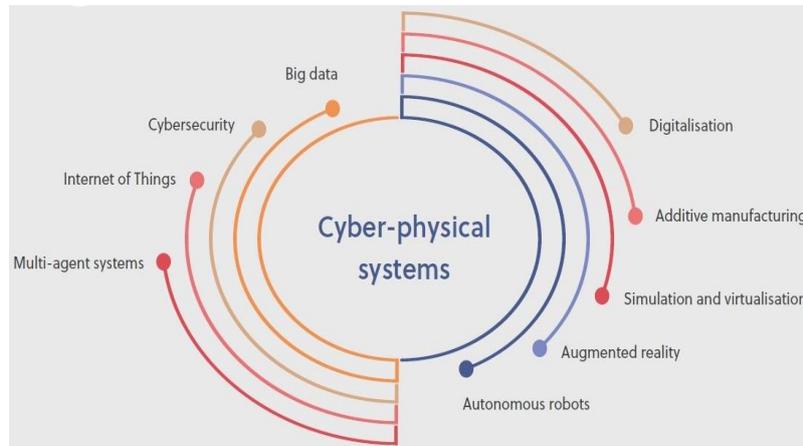


Figure 2. Elements of the Industry 4.0 strategy in the Czech Republic

D. Business Support by AMiCE's German Tandem

As an AMiCE partner, the University of Applied Science Zittau/Görlitz (HSZG) collaborates with the Fraunhofer Institute for Machines Tools and Forming Technology (IWU) that works at the Zittau site within the framework of the development of lightweight construction technologies. The focus is on knowledge transfer and the development of innovative technologies and products within the plastics processing industry. Research focuses on the development of competitive construction concepts with high functional integration as well as the development of economical, resource-efficient lightweight construction technologies based on the generative production and processing of textile-reinforced plastics.

The research and development support are emphasized by the HSZG and the following paragraphs will present the individual research services in more detail [3].

- **Economical Lightweight Structures due to Textile-Reinforced Plastics**

Application-oriented research is carried out in projects involving the automated processing of textile-reinforced thermoplastics in combination with extrusion processes, the manufacture of thermoset FKV structures using HP-RTM, prepreg, wet extrusion and resin infusion processes [6]. Available Lightweight Construction Technologies can be found in Table 1.

- **Material and Component Testing:**

Within the framework of material characterisation and component testing, mechanical determination of characteristic values in tensile, compression, shear and bending tests as well as microscopic analyses are a major focus [2]. For this purpose, modern testing technologies are available, which are listed in Table 1.

- **Product Development:**

The IWU also forms the entire value chain, i.e. from functional prototypes with competencies in the areas of design, FEM calculation, component testing and product design as well as simulation of manufacturing processes [4]. In Table 1, the equipment for additive manufacturing is listed.

- **Toolless Component Production through Generative Manufacturing:**

The research focus here is on increasing the efficiency of additive manufacturing through new technology approaches, the modification of polymers to open new applications in additive manufacturing, and process optimization of additive processes [5]. In Table 2 under the heading Machine Techniques, the available machines at the IWU Zittau within laser sintering and melt coating processes are listed.

Table 1. Equipment Additives Manufacturing of Plastics - Fraunhofer IWU Zittau [7]

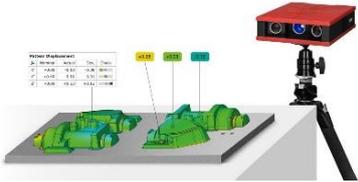
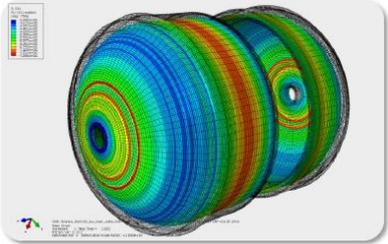
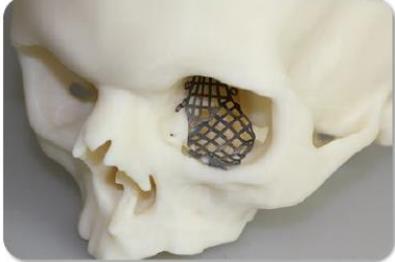
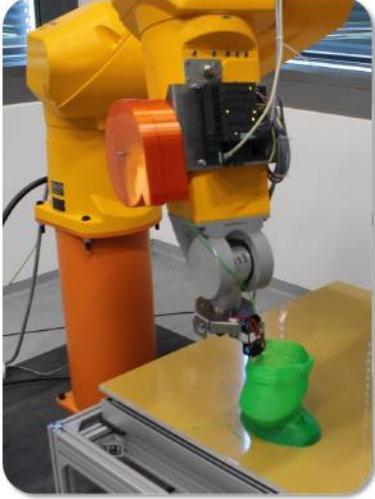
Technology	Machine	Figure
Machine Technique	<ul style="list-style-type: none"> -FDM-System FORTUS 900mc - Stratasys (Enamel Layer Technology) -SLS-System sPro60 HD-HS - 3D Systems (Selective Laser Sintering) -SLS-System S1 - Sintratec -Elastomer Reactive System 	 <p>FORTUS 900mc</p>
Testing Technology	<ul style="list-style-type: none"> -Universal Testing Machine -3D-Scanning Method ATOS Core (GOM) -Digital Microscope KEYENCE -Stäubli Robot for FDM application ("RoboFuse") -Pendulum Machine 	 <p>ATOS Core (GOM)</p>
Lightweight Construction Technologies for Plastic Components	<ul style="list-style-type: none"> -Thermo format plant with preheating station and material transfer system -Plastic Extruder -High-Pressure RTM system -Handling Robot 	 <p>Thermoforming Press KV 287</p>
Software	<ul style="list-style-type: none"> -CAD-Program: Catia V5, Inventor, Solid Works, PTC Creo Parametric -FEM Software: Ansys, Hypermesh, LS-Dyna 	 <p>FEM-Stress Plot</p>
Portfolio	<ul style="list-style-type: none"> -Concepts for economical and resilient components -Construction, (FEM-) Design -Technology and tool development -Demonstrators and prototypes -Material and component analyses -Quality assurance 	

Table 2. Selected R&D Projects - Fraunhofer IWU Zittau [7]

Technology	Description	Figure
Automotive Engineering	Within the framework of the Fraunhofer Institute for Machine Tools and Forming Technology (IWU) Dresden, an installation dummy of an engine mount was designed and manufactured in the IWU Zittau.	 <p>Einbaudummy eines Motorträgers VW-Passat</p> <p>Installation dummy of an engine mount VW-Passat</p>
	This is an industrial order for the manufacture of a lamp cover for rail vehicles. The prototype was printed using the FDM process and the surface coating was finished and varnished.	 <p>Lamp shade for railway vehicles</p>
	The model of an innovative bulk goods wagon serves as an exhibit and was printed using the SLS process as part of an industrial project.	 <p>Model of a bulk goods wagon</p>
Medical Technology	The precise positioning device for skull biopsies was commissioned within the framework of the cooperation with the IWU Dresden. The printed part, printed using the SLS method, is now being tested on dogs and has a higher accuracy than conventional technologies.	 <p>3D-printed positioning devices for skull biopsies</p>
	3D-printed skull for testing orbital implants using SLS techniques. Commissioned by the IWU Dresden.	 <p>3D-printed skull with orbital implant</p>



	<p>3D-printed bone structure for implant preparation using the SLS procedure. Commissioned by the IWU Dresden.</p>	 <p>Bone structure for implant preparation</p>
<p>Tool and Mould Construction</p>	<p>Printed injection mould inserts for small batches using the SLS process. The tool moulds are used for paper casting and deep drawing of plastics as well as the production of complex fixtures and gauges.</p>	 <p>Depp-Drawing Mould</p>
<p>Function-integrated plastic components by means of robotic technology</p>	<p>Flexible production of complex, large-format plastic components using the FDM layer brewing principle and depositing fibres or conductor paths along the 3D component contour.</p>	 <p>Large Format Plastic Component</p>

E. Business Support by AMiCE's Italian Tandem

The AMiCE's Italian Tandem is composed by two different entities: University of Genoa (UNIGE) and the Genova Chamber of Commerce (GCC).

UNIGE has been established in 1481 (37th among universities in continuous operation) and is articulated in:

- Faculty: 1300 members (37% of them are female),
- Four campuses: Genova, La Spezia, Savona, Imperia,
- Five Schools (natural sciences, medical sciences, engineering and architecture, social sciences, humanities),



- 125 Bachelor and Master courses,
- 25 Ph.D. courses and 100+ postgraduate courses,
- More than 30.000 students enrolled in Bachelor and Master courses (56% of them are female),
- Nearly 3.000 of them (10% are international students),
- More than 4.000 students enrolled in Ph.D. and other postgraduate courses,
- More than 1.000 Erasmus exchanges each year (650 outgoing and 400 incoming students).

The internationalisation is one of the key points of UNIGE showing interesting performance:

- 560 Erasmus+ agreements,
- 160 academic cooperation agreements in 60 countries,
- 9 Master Science courses entirely taught in English,
- Nearly 10 double degree courses,
- An increasing number of courses (more than 20) teaches some subjects in English,
- Mobility agreements for students, faculties, and staff on all continents,
- 9% of international students and 1.000+ exchange students per year.

UNIGE supports Innovation, intended as value created out of Research Activities performed in the University, by adopting different tools ranked in the world top 1.6% universities by the main rankings (average position: 320):

- 22 Departments, 2 Excellence Centres and 1 Strategic Centre,
- Nearly 29 M Euro of research income per year, 50% from industry,
- 389 International Cooperation Projects since 2000,
- 122 FESR Interreg, 18 coordinated by UniGe,
- 62 EC-H2020 projects since 2014,
- 15 projects coordinated by UniGe,
- 4 ERC Grants - 2 Starting, 1 Consolidator, 1 Advanced,
- 14 Marie Skłodowska-Curie Actions: 4 RISE, 6 ITN, 3 IF, 1 RN,
- 50 academic spin-off companies,
- 102 patents.

On the Learning basis, UNIGE created several masters many years ago in close collaboration with National and Regional Corporates (Start Up Creation, Innovation Management, Industry 4.0, Corporate Lawyers) and International Summer Schools (SOSMSE³¹) that on parallel with the High Study Specialization School (Issuge) created a permanent developing platform able to provide skilled people to fit with industry need.

UNIGE is one of the 5 Italian Universities officially supported by the bigger Bank Foundation (Fondazione San Paolo) with a direct support for patent exploitation and value creation.

UNIGE Tech Transfer Office provides legal resources and dedicated people to support Spin Off creation and to connect the University with the bigger Innovation Circuit in Italy (Smau, StartupInitiative, BoostAlps) and abroad (Europe, Asia, and American Countries, both North and South).

On the Spin off creation in the last years UNIGE was ranked 3rd in the National Report provided by NETVAL³² just behind the National Research Council - CNR and Milan Polytechnique. UNIGE, in fact, has a portfolio of 50 Spin Off and more than 100 patents, mostly shared in the national platform Knowledge share.

Moreover, UNIGE has several links and working connections with Patent Offices to provide a pre-operative analysis of the research products.

³¹ <https://www.sosmse.eu/>

³² <https://netval.it/>



This let Professors, Technician and PhD students to test their products before facing the real patenting procedures.

On the Spin Off management side UNIGE signed collaborative agreements with all the Ligurian Incubators (Filse, Wylab, Social Hub, Digital Tree, Talent Garden) and external incubators like Bio4dreams while many operative supporting projects operate on a National Basis with other Incubators and Accelerators.

UNIGE is one of the cofounder of National Technological Cluster on Intelligent Factory MIUR³³ (with Prof. Flavio Tonelli), main Advisor of the first Italian Lighthouse plant on Industry 4.0 National Program³⁴ based on Ansaldo Energia Genova main plants, as well as member of Via-Vas Commission of Italian Minister of Environment (Prof. Adriana Del Borghi), President ASME Italian division (Prof. Giovanni Berselli), Member of International Electrotechnical Commission - TC 113 WG 8 "Graphene Related Materials/Carbon Nanotube Materials" - Member, and President Comitato Elettrotecnico Italiano - CT 113 "Nanotecnologie per Sistemi e Prodotti Elettrotecnici" (Prof. Fabrizio Barberis).

On the other hand, Genova Chamber of Commerce (GCC) is one of the oldest Chambers of Commerce in Italy, being founded in 1805. The GCC is a Public Administration, which serves about 80.000 companies located in the Genoa Province and active in all economic sectors. GCC is managed by a Managing Board made of representative of all professional associations (industry, craft, retail, tourism, ports, logistic, financial sector, liberal professions...). GCC supports the interests of local companies and businesses at regional and national level and abroad.

The main activities of the Genova Chambers of Commerce and can be offered to the AMiCE Alliance are focused on:

- Administrative activities: management of official registers concerning the company's life.
- Promotional and statistical activities: support to local companies, promotion of economic development, monitoring and analysis of economic trends and of companies' performances.
- Regulatory activities: management of civic litigations between companies and private citizens.

The core activity of GCC is the support to the economic and territorial development, by means of a varied set of activities, ranging from support to local companies to go international to economic observatories on relevant sectors and economic statistics. In this context, it is worth mentioning that GCC is a managing entity in Liguria of the EU Commission network for support to competitiveness and innovation of local companies Enterprise Europe Network (EEN).

As member of EEN, GCC is actively involved in the following activities:

- technical assistance to SMEs on innovation processes.
- technological audits.
- profiling of companies for technology transfer and for new business opportunities.
- assistance to companies to participate to EU Research and Innovation funding programme Horizon 2020.
- partner search to bid for EU transnational funded projects.

All services offered by GCC are not sold in the market, but they are freely provided to beneficiaries. As an AMiCE Partner, GCC will have a priority for AMiCE alliance to receive these services.

GCC contributes with experiences and insights in sectors and application fields of manufacturing, which are not enough represented in the other participating regions, e.g. ports and logistic, agri-food and tourism/valorisation of cultural heritage. As part of the business ecosystem of the regional economy, the GCC also contributes to AMiCE activities dedicated to the innovation policy. GCC represents regional SMEs

³³ <https://www.fabbricaintelligente.it/>

³⁴ <https://www.fabbricaintelligente.it/light-house-club/>



and takes care of the synergies, which shall be realised with the activities of the EEN. GCC is AMiCE's channel to spread the results and lessons learned from the project to the EEN and other members of the business support community. The GCC brings AMiCE's knowledge and expertise in manufacturing to improve services for more than 11.400 regional SMEs and works on reversing the decline of manufacturing in Liguria.

GCC foresees to offer a specific set of services focusing on increasing SMEs capacity to achieve a better access to finance. As GCC being the coordinator of the EEN thematic group of A2F, they offer the following services to SMEs:

- Bilateral meeting with client
- Client needs' analysis:
 - Strategy
 - Investment
 - Resources
- Supporting activities:
 - Identification of most adequate source of funding.
 - Signposting to the financial providers.
 - Support in the preparation of the needed documents.
 - Participation to Business2Investors (B2I) events.
 - Transnational cooperation opportunities.

This technical assistance is backed by a set of reference materials, validated by DG GROW such as:

- Investment readiness assessment
- Mapping of financial providers
- Reference materials on how to approach financial providers:
 - Preparation to meetings,
 - Guidance for pitching sessions,
 - Overview of the evaluation process (selection criteria, Due Diligence...).
- Selection of B2I events
- Organization of B2I events

Moreover, GCC is always collaborating with the Regional Government for what it concerns the identification of support services to the local economic and social development. This collaboration is also witnessed by a collaboration scheme, which engages both PAs to work together on all fields related to it. To this extent, GCC is a member of the Monitoring committee of the Regional Structural Funds and is a member of Committees related to internationalisation, R&I planning, vocational training, amongst others.

With respect to the areas of business support identified in AMiCE's scheme, CCI Genova is actively engaged in delivering assistance in the following areas:

- FUNDING schemes, covering grants, debt, and equity financing, at EU, national and regional level.
- TECHNOLOGY TRANSFER AND BUSINESS SUPPORT, in its role of EEN partner, thus granting access of the local clients to EIMC services, to partner search facilities and to the participation to international Brokerage events and Business to Investors events.
- CLUSTERS, by being member of the regional clusters for innovation.
- PATENTS, hosting the Patent Office, where local companies can be supported in the process to present patent, designs, and trademarks.



F. Business Support by AMiCE's Polish Tandem

The Technology Park of Legnica (LETIA) organizes and co-organizes specialized workshops and trainings for companies, related to trends in 3D printing technology and design innovation, in marketing, promotion of products and services, optimization of design services, as well as digital prototyping of products. According to the requirements by the SME or the entrepreneur, LETIA offers support and help in the required fields. If the support goes beyond LETIA's possibilities, the Park tries to find and connect the SME with the appropriate source that will help in solving the problem of the given entity. LETIA usually connects the SMEs with an appropriate specialized service-provider (e.g. with a research institution) and supports the process of their cooperation. LETIA keeps in touch with both sides and help in solving any communication problem aiming for achieving an efficient collaboration.

In the laboratories of LETIA, main 3D printing services are offered to the SMEs and they allow some equipment and materials such as the FDM and the Polyjet technologies that utilizes ABS materials (characterized with high strength) and light-curing resins (with excellent accuracy up to 16 microns). LETIA offers:

- Preparation for measurement and measurement of the object in its laboratories or at the customer's site.
- Processing of measurement results in accordance with the customer's instructions to the point cloud or triangle mesh (with or without texture).
- Export of measurement results to one of the popular formats (TXT, VRML, IGES, DXF) or others - according to the customer's request.
- 3D scanning of objects at the rapid prototyping laboratory.

Also, the Institute of Technology Transfer Ltd. (ITT) recently established special purpose vehicle, fully owned by Wroclaw University of Science and Technology. ITT aims at:

- transferring of knowledge and technologies to the regional economy,
- initiating innovation projects in the fields of AM with SMEs.

Main activity of the ITT is the indirect commercialization of intellectual property of Wroclaw University of Science and Technology by acquiring shares in spin-off companies and providing support in commercialization activities:

- access to standardization and intellectual property information,
- supporting innovative ideas for business partner acquisition,
- initiating and coordinate cooperation between Wroclaw University of Technology and business.

ITT is developing and implementing its strategy based on transfer of knowledge to economy, initiating innovation and co-operation with businesses, local administration units as well as research centres.

The Polish tandem within AMiCE also connects SMEs in the Lower Silesia with multiple service providers that can be broadly categorized in the six groups demonstrated in Figure 3.

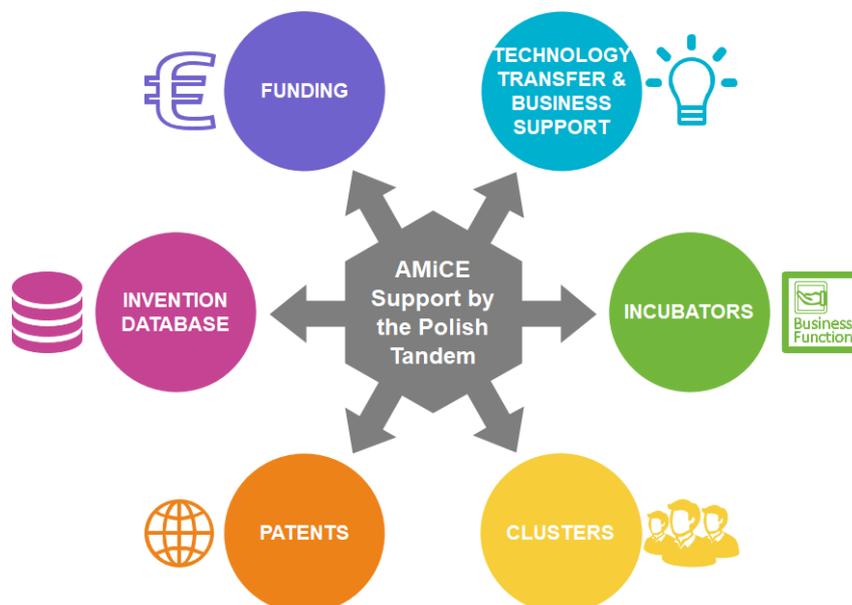


Figure 3. AMiCE support provided by the Polish tandem

1. FUNDING

Institutions providing funding support or supporting with finding appropriate funding source:

- Regional Contact Point at Wrocław Centre for Technology Transfer³⁵

The Regional Contact Point (RPK) at the Wrocław Technology Transfer Center of the Wrocław University of Technology has been operating since 1999, supporting scientists and enterprises in participating in research projects and access to funding from framework programs. RPK services:

- providing information on framework programs,
- looking for partners for international cooperation,
- consultancy in the preparation of applications and implementation of H2020 projects,
- organization of trainings, conferences and workshops,
- helping scientists who come to Poland and go abroad in formal and administrative matters,
- support for scientific institutions planning to employ a foreign scientist.

- *Dolnośląska Instytucja Pośrednicząca DIP*³⁶

The Lower Silesian Intermediate Body (DIP) is a budget unit that aims at efficiently and reliably implementing part of the regional Priority 1: "Increase the competitiveness of Lower Silesian enterprises - Enterprises and innovation" and Priority 5: "Environmentally friendly regional energy infrastructure - Power engineering". The goal of DIP is acquiring and implementing external projects financed from EU funds, regardless of national programs and other international funds.

The main DIP tasks are:

- call for applications for co-financing,
- technical verification, formal and substantive evaluation of applications,
- signing contracts with beneficiaries,
- project settlement,
- payment to beneficiaries,

³⁵ <http://rpk.wroclaw.pl>

³⁶ <http://www.dip.dolnyslask.pl/>



- project implementation control,
- providing information on the selection procedure, evaluation, and selection of applications for funding.

■ **Lower Silesia Marshal's Office UMWD³⁷**

The **Lower Silesia Marshal's Office (UMWD)** is public authority that has the legal right to create and implement regional policies. It is responsible for the management of such region's issues as spatial development, economic development, education, health care, culture, social welfare, rural and transport, tourism, environmental protection, and energy policy. It's scope of competences involves regional development, which is implemented based on the constantly updated strategic documents (i.e. Development Strategy of Lower Silesian Voivodeship 2020). Lower Silesian Voivodeship is responsible for creating, improving and implementing innovation policies. This includes three major priorities for developing competitive and innovative economy: increasing the investment attractiveness of Lower Silesia, creating a knowledge-based economy, and supporting economic activity. Among many others, this includes actions such: supporting business environment institutions, strengthening the innovation potential, supporting SME development, and broadening interregional and international cooperation. It is also responsible for distributing the major regional share of EU structural funds.

The objective of the Regional Operational Programme is to improve the quality of life of Lower Silesia inhabitants and increase the region's competitiveness while respecting principles of sustainable development. The Programme is aimed to help various types of investments specified in the process of extensive consultations and agreements with the entities and bodies involved in the development of the region. Focus of the programme is on the publicity of innovation in the Lower Silesian economy and the development of small and medium-sized enterprises. Priorities of the programme include:

- growth of competitiveness of enterprises,
- development of the information society,
- development of transport infrastructure,
- improvement of the natural environment and improvement of ecological and flood safety,
- environmentally friendly energy infrastructure,
- exploitation and promotion of the tourism and cultural spa potential,
- development and modernisation of education infrastructure,
- modernisation of health infrastructure,
- rehabilitation of degraded urban areas,
- technical assistance.

2. TECHNOLOGY TRANSFER AND BUSINESS SUPPORT

The following institutions and organizations are working to enhance business and technology transfer activities in Lower Silesia:

■ **Łukasiewicz Research Network - PORT Polish Center for Technology Development³⁸**

Łukasiewicz Research Network - PORT Polish Centre for Technology Development is an institute focused on development of new technologies by conducting research for the benefit of and in cooperation with industry. PORT provides high-class specialists using an infrastructure of the most advanced research and development laboratories in the region. The centre's activities

³⁷ <http://www.umwd.dolnyslask.pl/fundusze-europejskie/>

³⁸ <https://www.port.org.pl/en/>



focus on biotechnology (including biobanking) and materials engineering, allowing to carry out both scientific research, as well as pilot studies for the industry in a comprehensive manner.

■ **Wroclaw Industrial Park (Wrocławski Park Przemysłowy WPP)³⁹**

WPP is one of the largest industrial parks in Poland, offering comprehensive services and a wide range of production and office areas for lease. The idea of Wroclaw Industrial Park is to allow the companies operating on its premises to focus on their core business. It is made possible thanks to a structured offer of industrial and non-industrial services provided by the managing entity and available near companies operating in the Park. The service package includes:

- management of industrial facilities - construction, modernization, adaptation,
- lease of manufacturing, storage, and office spaces,
- supply of the necessary process utilities i.e. electricity, heat, water, gas, compressed air as well as providing access to the sewerage system and telecommunication and computer network,
- industrial services including maintenance, overhauls and repairs of cranes and hoisting equipment, construction, and storage services, special rail, and road transport in Poland and abroad (including oversize loads), machine removals, occupational health and safety services,
- non-industrial services, including conferences, restaurants, and catering as well as hotels.

■ **Wroclaw Technology Park⁴⁰**

Wroclaw Technology Park is currently a place of operation for over 200 companies from the new technologies sector. It is also a workplace for over 1,600 employees of these companies. These figures alone indicate that this is a good place for business. It is a place where the business and science meet advanced technologies. Wroclaw Technology Park offers modern laboratory, industrial or office areas, access to world-class laboratory equipment, support of professional advisers within technological and business consultancy and know-how transfer.

■ **Lower Silesian Development Agency⁴¹**

Lower Silesian Regional Development Agency (DARR SA) is the business support organisation established in 1991, with the objective of providing support for the social and economic transformation of the Wałbrzych region, the restructuring of its economy and the development of businesses. The mission of DARR is to provide support for the development of private business enterprises and the adaptation of structures within the business environment towards working in conjunction with the European Union. DARR SA specialises in the following areas:

- obtaining support resources within the framework of European Regional Programmes and managing the use of these resources through the supervision of regional project implementation, including infrastructure and development projects, training programmes, consultancies and so forth,
- business consultations, economic and financial advisory services,
- regional restructuring, construction of regional and local development strategies,
- education in various areas of economic and business activities,
- business restructuring and the creation of new economic initiatives,
- the evaluation of investment projects and the analysis of their feasibility,
- application, implementation, and accounting procedures, in accordance with European Union requirements,
- strategic planning and risk assessment for business and economic enterprises,

³⁹ <http://www.wpp.wroc.pl/>

⁴⁰ <https://www.technologypark.pl/en/>

⁴¹ <http://www.darrwww.hb.pl/en/1/>



- the products of regional business enterprises promotion - both nationally and abroad,
- the collection, storage, and provision of business information.

■ **Wrocław Centre of Technology Transfer (Enterprise Europe Network)⁴²**

Wrocław Centre for Technology Transfer (WCTT) was founded in 1995 as a part of the one of the best universities in Poland (Wrocław University of Science and Technology). The main activity of WCTT is linked to the promotion of the technology and research's results transfer to the economy. The Centre's mission is to improve the efficiency and competitiveness of enterprises through innovation. The Centre is a member of the Enterprise Europe Network - the world's largest business support network set up by the European Commission and is also performing as the Regional Contact Point for Research Programmes of the European Union (Network for Horizon 2020). Additionally, WCTT is an initiator and a member of the Polish Network of Academic Technology Transfer Centres (PACTT).

■ **KGHM Cuprum Ltd Research and Development Centre⁴³**

KGHM Cuprum provides a comprehensive research and design service for the extractive industry. It operates in all service areas linked with mining activity, from project evaluation, through research and development, to project management and supervision of the implementation stage.

Thanks to the knowledge, experience and expertise, KGHM Cuprum offers support in three major areas crucial for the mining industry:

- Preparation of the investment,
- Increased mining effectiveness,
- Supervision over investments and projects.

Offered services and works include all stages of research and development activity: starting from scientific research, through project, evaluation of its impact on the environment, feasibility study, and ending with the supervision over its execution. KGHM Cuprum has its own experts and laboratories that enable us to carry out a wide range of tests. The status of research and development unit of category B enables KGHM Cuprum to combine effectively scientific and business approach.

■ **Lower Silesian Innovation and Science Park (DPIN)⁴⁴**

Lower Silesian Innovation and Science Park is an institution from business environment, that main purpose is the commercialisation of scientific research. DPIN deals with issues of innovative solutions and technologies and their implementation in companies. DPIN was developed on the initiative of the authorities of Lower Silesian Province government in 2008. Substantive support and guidelines in the process of Park organisation were provided by The British Embassy in Poland, and Coventry University Enterprise from West Midlands region (UK). DPIN cooperates with these entities in order to provide the highest-class services for organisations and companies.

■ **Nowa Ruda Industrial and Technology Park⁴⁵**

The investors who decide to set their operations in Nowa Ruda Industrial Park - Technology are granted the following benefits:

- lower business costs due to very convenient rates for rented areas,

⁴² www.wctt.pl

⁴³ <https://kgmncuprum.com/en/>

⁴⁴ <http://www.dpin.pl>

⁴⁵ www.agroreg.com.pl



- access to all media (energy, gas, thermal energy, water supplies and sewerage system with the access to wastewater treatment plant in Ścinawka Dolna, access to landfill with the capacity of 3000 m², phone network with Internet access),
- formal and legal services to obtain all administration permits,
- professional consulting to obtain EU funds (QUALITY SYSTEM CERTIFICATE),
- Business and Innovation Centre (CBI),

The Business and Innovation Centre was established in the premises of Nowa Ruda Industrial Park to organize conferences and business meetings, as well as provide accommodation and catering for the guests.

■ **Nowa Ruda Technology Incubator (NIT)**

Nowa Ruda Technology Incubator aims at providing support for technology transfer, innovation, conferences, seminars as well as innovation and information services.

■ **Regional Development Agency (ARLEG)**

The strategic goal of ARLEG is to create an expansive consulting and business entity with an established position among local governments and business entities with developed foreign contacts. This will enable businesses to actively participate in transforming the Legnica sub-region into a dynamic area of high competitiveness with qualified staff with a diversified income structure. ARLEG's basic goals include:

- cooperation with local governments and the non-governmental organizations sector,
- contributing to the creation of new jobs,
- implementing standards and standards in line with European requirements,
- obtaining sources of financing for development through, among others support for assistance programs,
- supporting the restructuring processes of the region,
- raising the level of teaching and consulting,
- supporting local and regional initiatives,
- inspiring partnerships between domestic and foreign entities in the field of local development,
- creation and management of business incubators, technology incubators, technology parks, industrial parks,
- substitute investment.

3. INCUBATORS

For young entrepreneurs there is several organizations supporting business development - below is a list of academic incubators in Wrocław:

- Academic Enterprise Incubator (AIP) at WrUST,
- Academic Enterprise Incubator (AIP) at Bank Zachodni WBK,
- Academic Enterprise Incubator (AIP) at WSB University in Wrocław,
- Academic Enterprise Incubator (AIP) at Wrocław University of Economics.

Different events are organized in order to support innovativeness and technology transfer in Wrocław, such as:

- Robert Bosch Academy of Inventors,
- Academic Festival of Entrepreneurship,
- Open Days at WrUST.



4. CLUSTERS

Lower Silesia province is one of the most economically developed regions in Poland. Primary industry, automotive industry, the industry of porcelain, crystal, pharmaceutical and electronic production are growing rapidly in the region. Currently, a large part of the province funds (including those coming from EU funds) is devoted to the development of services and modern fields of industrial processing. Five technology parks and 31 clusters as well as cluster-initiatives are located on the territory of Lower Silesia region. The most active and biggest business clusters include:

- **SIDE CLUSTER⁴⁶**- specialized cluster, the aim of which is to rationally manage the wood, promote the wood as a building material and to reduce energy consumption in houses. Lower Silesian manufacturers of wooden houses were the main initiators of creation of the cluster.
- **LOWER SILESIA ECOENERGETIC CLUSTER EEI⁴⁷**- concentrates its activities in the field of renewable energy sources, it is derived from the EKO ENERGIA scientific and economic network.
- **NUTRIBIOMED CLUSTER⁴⁸**- created in similar way to „e-health” cluster based on scientific and economic network; this unusual cluster combines medicine and food industry by developing technologies for manufacturing dietary supplements and healthy food.
- **LOWER SILESIA MINERAL RESOURCES CLUSTER⁴⁹**- created for the purposes of the rational management of the mineral resources in the Lower Silesia.
- **Dolnośląski Klaster Surowcowy KGHM CUPRUM sp. z o.o. Centrum Badawczo - Rozwojowe.**
- **CLUSTER OF INNOVATIVE TECHNOLOGIES IN MANUFACTURING⁵⁰** is to support the development of the region's economy and to strengthen the competitiveness of the enterprises operating in the manufacturing industry.
- **ICT CLUSTER⁵¹** - Knowledge and Innovation Community in the Field of Information and Communication Technologies Cluster - is a joint initiative of the IT and telecommunication companies for the purposes of development and implementation of innovative products and services.
- **MTD GROUP** - a cluster that brings together the traditional industries (woodworking, metal, plastics) formed with the support of European funding within the frameworks of EQUAL initiative.
- **ENERGIA MEGA NANO CLUSTER⁵²**- the second cluster of the energy industry clusters that deals with both issues of renewable energy sources and with rationalization of its use.
- **LOWER SILESIA CLUSTER OF RENEWABLE ENERGY⁵³** - the third cluster in the region operating in the field of renewable energy and environmental protection.
- **THE SILESIA AUTOMOTIVE & ADVANCED MANUFACTURING CLUSTER⁵⁴** -combines automotive companies such as Toyota, Volvo, Volkswagen, Bosch, Faurecia, WABCO and smaller entities; The Cluster's mission in the area of Innovation and Cooperation is to effectively combine engineering with the latest

⁴⁶ www.side-cluster.pl

⁴⁷ www.klaster-eei.pl

⁴⁸ www.nutribiomed.pl

⁴⁹ www.cuprum.wroc.pl

⁵⁰ www.cinnomatech.pl

⁵¹ www.ict-cluster.wroc.pl

⁵² www.klaster-energia.wroc.pl

⁵³ www.dkeo.pl

⁵⁴ <http://silesia-automotive.pl>



technologies to streamline manufacturing processes, increase productivity, optimise resource consumption, minimise waste production and losses, and, consequently, provide businesses with a competitive edge in the international arena. The Cluster is dedicated to:

- encouraging increased research & development activity by tapping strategic competence,
 - promoting the development of advanced manufacturing methods across the supply chain,
 - facilitating cooperation around strategic competence,
 - supporting the use of engineering and research infrastructure.
- **LOWER SILESIA METAL CLUSTER⁵⁵** - a group of metal branch companies working together on different levels, supported by research and business environment institutions.
 - **Agencja Rozwoju Regionalnego „ARLEG” S.A.**
 - **POLISH BIOTECHNOLOGY CLUSTER⁵⁶**- supports cooperation within the group of companies, research centres and industry associations to commercialize the latest scientific advances using the healing properties of natural flax.
 - **CLUSTER OF REGIONAL MANUFACTURERS⁵⁷** - appointed by the Association of Local Activity Forum and Sudecki Incubator of Entrepreneurship to support entrepreneurs and actions for regional development.
 - **LOWER SILESIA EDUCATIONAL CLUSTER⁵⁸** - it serves the development of industry and technical education and cooperates to educate highly specialized and trained staff, which will have a real impact on the development of the economy of our region in the future.
 - **LOWER SILESIA AUTOMOTIVE CLUSTER⁵⁹** -works to increase the potential and ensure common access to modern technologies, the educational base and support the transfer of knowledge and technology.
 - **LOWER SILESIA AIR CLUSTER⁶⁰** - aiming at deepening cooperation and supporting the technological development possibilities of the aviation industry companies operating in Lower Silesia and the South-Western Poland Region, the Association " LOWER SILESIA AIR CLUSTER " was established. The companies associated in the Cluster join forces to jointly create appropriate conditions for the development and location of new aerospace companies, increase the attractiveness of the region, promote the Polish aviation industry abroad and develop the research and development sector. Membership in the Cluster allows for cooperation, support of industrial activities, transfer of knowledge and exchange of production, commercial and organizational experience, as well as mutual assistance in the search for qualified personnel. From 2014, the project is under the patronage of the Ministry of Economy.

5. PATENTS

Regional Patent Information Centre at Wroclaw University of Science and Technology is operating within the European PATLIB network provides services focused on innovations, such as:

- Supporting product development and project work with inspirations from global patent data,
- Searching patent and non-patent specialized databases,
- Investigating and analysing the prior art, relevant trends, intellectual property,
- Defining prospects of intellectual property resources for concepts,
- Checking technology field/solution level of development,

⁵⁵ www.dkm.arleg.eu

⁵⁶ www.pkblinum.pl

⁵⁷ www.inkubatorsudecki.pl/31/Klaster_wytworcow_regionalnych

⁵⁸ <http://lsse.eu/klastry/dolnoslaski-klaster-edukacyjny/o-nas/>

⁵⁹ <http://lsse.eu/klastry/dolnoslaski-klaster-motoryzacyjny/o-nas/>

⁶⁰ <http://lsse.eu/klastry/dolnoslaski-klaster-lotniczy/o-nas/>



- Recommending application or innovation transfer methods,
- Business environment verification (including the competitive environment),
- Providing support in defining the opportunities for company development and methods of innovative solution protection and application,
- Offering information regarding application proceeding for patents,
- Monitoring competitive environment with respect to intellectual property.

6. INVENTION DATABASE

The Wrocław University of Science and Technology provides research services, relying on scientists' knowledge and experience. The objective of this initiative is to develop innovative solutions tailored to individual needs. The dedicated databases were established to present potential and current solutions:

- **Inventions' base**⁶¹, with the solutions offered by Wrocław University of Science and Technology scientists (the base is available in Polish only).
- **Knowledge Repository**⁶², a platform collecting and providing access to scientific achievements of our scientific staff, PhDs and students (the repository is available in Polish only).

G. Business Support by AMiCE's Slovakian Tandem

The Business and Innovation Centre (BIC) Bratislava was founded in the late 1991 as an initiative of the European Commission - DG XVI and a private group coming out of a former R&D institute. The Chamber of Commerce and Industry became a minority shareholder after that, and BIC Bratislava became the first full member of EBN from the Central and Eastern Europe. BIC Bratislava is active in entrepreneurial consulting, business planning and incubator activities, development of national and regional innovation infrastructures, innovation management support in technology-based companies, financial consulting and mediating, support of technology transfer and RTD co-operation, networking, studies and training. BIC Bratislava is a full member of Enterprise Europe Network, European Business and Innovation Centres Network, Pro Inno Europe Cluster Alliance, National Network of Business Innovation and Advisory Centres. BIC Bratislava performed a role of the National Contact Points and Specific Programme Committee Members on behalf of the Ministry of Education of SR in FP5, FP6 and FP7. BIC Bratislava is SME NCP for Horizon 2020 "Innovation in SMEs" and "Access to risk finance". BIC Bratislava is not normally performing economic activities on the market, and -according to statute of the organisation - they do not create profit from economic activities.

BIC Bratislava is a representative of the "business support service part" of the consortium. It has broad and long-term experience with the provision of innovation and technology transfer services to SMES. The sectors, which are in the focus of BIC are important key sectors for the manufacturing industry in Central Europe. BIC is also a valuable partner with its experience as SME-National Contact point and as NCP "Access to finance" in Horizon 2020. That covers important aspects of the financing of new investments for the introduction/transfer of advanced manufacturing technologies.

BIC Bratislava contributes to sharing the results of the AMiCE project with the EEN. BIC Bratislava is closely collaborating with other AMiCE partners to achieve the business support objectives and results for the participating SMEs. BIC Bratislava has a wide information sharing, gaining knowledge, know-how, best practice from institutions and experts on international level, and they offer these services to regional SMEs. Development of common procedures and standards and sharing the best practices will promote SMEs on

⁶¹ <http://biznes.pwr.edu.pl/badania-i-rozwoj/baza-wynalazkow>

⁶² <http://repozytorium.pwr.edu.pl>



higher quality and international level and that will have positive effect on Slovak economy, SMEs, and research organizations.

BIC Bratislava has actively participated in the European research and innovation projects, e.g. Enterprise Europe Network and Innovation Relay Centre - coordinator (technology transfer), PAXIS initiative projects (ESTER - creation of venture capital fund in Slovakia, ISTER - cross-border virtual incubator), Regional Innovation Strategies Projects, Economic and Technological Intelligence actions (ETI in FP5 and FP6).

BIC Bratislava represents the Enterprise Europe Network as the national coordinator (COSME; Pan-European Network supporting entrepreneurship, internationalisation, innovation, technology co-operation and SME participation in Horizon 2020; 2015-2020, also 2008-2014). They also provide the enhancement of innovation management and key account management for innovative SMEs (HORIZON 2020; Establishment of services enhancing the innovation management capacity of Slovak SMEs in the Enterprise Europe Network 2014-2016). Also, BIC Bratislava participates in the KIC InnoEnergy (Education, research, SMEs, industrial actors in sustainable, innovative, and cost-competitive energy technology development). They work on identifying the key technical and business universities in Slovakia, undertaking personal visits and introductions to selected students, co-organising brokerage/piggy-back technology transfer events.

Enhancement of Innovation Management Capacities is a service provided to SMEs and Enterprise Europe Network activities. BIC Bratislava provides the following examples for innovation services that are provided to AMiCE clients.

1. Example 1 - Enhancement of Innovation Management Capacities

Actions that will establish and provide the services related to enhancing the innovation management capacity addressing in general SMEs with significant innovation activities, and the beneficiaries of the SME instrument.

Target Groups: SMEs with significant innovation activities and a real potential for implementation of additive manufacturing processes and potential of international growth via product, process, service, or business model innovation.

■ Description of services provided:

- The experts at BIC and related support organizations carry out a diagnostic audit of selected SMEs that are capable of growth and successful internationalisation in order to develop and implement a tailored action plan to improve the SME's capacity to manage innovation processes.
- The activities tackle the full innovation process from idea generation to market introduction and generation of economic return. The general practices and skills of the company for external cooperation for innovation are an integral part of the analysis.
- Based on an action plan agreed with the SME, the experts address some or all identified bottlenecks and/or accompany and supervise the work of other public or private sector consultants addressing these bottlenecks.

Based on the initial analysis of the client's suitability for the service, the tailored services will be implemented through the standardised seven-day service packages.

Methodology / Design of 7-day service packages for tailored services:

- Day 1: Getting acquainted with services and the SME.
- Day 2: Meeting and mobilising the SME.
- Day 3: Executing the initial assessment.
- Day 4: Developing and presenting the recommendations.
- Day 5: Facilitating the implementation of actions.
- Day 6: Monitoring the implementation of actions.
- Day 7: Measuring the achieved results.



2. Example 2 - Enterprise Europe Network

The main objective of submitted proposals to the EEN is providing an integrated service in support of business and innovation to organisations. The primary focus on SMEs, located in the Slovak Republic (SR). BIC Bratislava provides support services in close collaboration with other Network partners spread-out all-around Europe.

Objectives of actions agreed by the consortium are kept up to date with objectives stipulated in the CIP and the work programme of Entrepreneurship and Innovation Programme. The most important individual objectives of proposed project are to:

- maintain and continually improve the access, proximity, quality, and professionalism of provided services and reduction of administrative burdens,
- raise awareness regarding Community policy issues and the services offered by the network, including the improvement of environmental awareness and eco-efficiency of SMEs and the Cohesion policy and Structural funds,
- consult businesses in the SR and obtain their opinions on Community policy options,
- increase the competitiveness of Slovak and European SMEs through technology and know-how transfer and through increasing their innovation capacity,
- foster the interaction between the European and national R&D base and Slovak and European SMEs to increase productivity, innovation capacity and competitiveness at European and world markets,
- ensure that provided support is complement to other relevant services providers.

To implement above-mentioned objectives, proposals include the following services with specific goals:

■ **Module A - Information, feedback, business co-operation and internationalisation services**

Main objectives of these services are to inform, to gather feedback from businesses and to help SMEs to cooperate with other enterprises or go international. Planned actions are to raise awareness of all relevant Community policy issues and promote the services offered by the network under the new common network brand. To gather feedback, businesses are consulted on aspects of community policy and legislation especially in priority interest of the community. Internationalisation services improve business cooperation competencies of SMEs and increase their chances to do business internationally. These activities will also improve the ability of the Slovak SMEs to access the EU funds (incl. the structural funds).

■ **Module B - Services for innovation and for the transfer of both technology and knowledge**

Provision of support to organisations (mainly technology-based SMEs, universities, R&D institutes, and large companies) and thus enhance their development and growth through exploitation of R&D results and trans-national technology transfer. Focus will be put on increase of companies' innovation capacity, international and cross-border co-operation development, exploitation of progressive manufacturing technologies (own development and technology and know-how transfer) and on support in innovation financing (access to finance), which should help companies to increase their competitiveness on European and world markets and speed up their development and thus contribute to national and European economy growth. Moreover, research and development activities of companies will be supported, including the development of co-operation between industry (SMEs) and R&D base (universities and research institutes), mainly through the active exploitation of RTD results (both European and Slovak ones) achieved within the science and research (RTD) projects supported by the European Commission and national programmes.

■ **Module C - Services encouraging the participation of SMEs in the Community Framework Programme for RTD**

Enhance the participation of Slovak organisations - mainly SMEs - in the Community Framework Programme for RTD and thus increase their competitiveness. It is aimed to provide services complement to the ones offered by the NCP network, in close collaboration with respective NCPs in Slovakia. The



main objective is to help Slovak SMEs in identification of their RTD needs and based on this support them in finding suitable partners for common participation in the Community Framework Programme for RTD.

The activities to be performed to achieve the fulfilment of proposed objectives are quantified in the section 2 of this proposal - Preliminary Work Programme, within the individual service modules description. Deliverables and expected results in first two reporting period are listed in this section as well.

Within the Slovakian AMiCE Tandem, the **Research Centre of the University of Žilina** is a unique research and development facility established in 2013 at the University of Žilina. Its mission is to achieve synergic effect in using and enhancing research potential by integrating crucial research activities as Regional Centre for applied research. Its primary goal is to create the environment encouraging acceleration and integration of innovative research activities of the University of Žilina working places and the swift implementation and commercialization of research outcomes, which will directly contribute to economy competitiveness increase of Žilina region, as well as the Euro-region Beskydy and regional disparities decrease throughout the whole Slovak republic. The Research Centre contributes strongly to the creation of innovative high-tech small and medium sized spin-off companies, which are able to bring new jobs in research and development especially for young researchers and post graduates.

Main research areas are basically focused at the University of Žilina, where the university is considered to excel at the European level and is taken into account worldwide. The areas are transportation including control, operation and new materials, construction, mechanical engineering and smart systems, mainly focused on smart buildings operation and renewable energy sources. The Research centre is focused specifically on three areas. According to these areas, the Research Centre is structured into 3 divisions with following laboratories, machines and equipment:

- Monitoring and evaluation the transport infrastructure conditions.
- Progressive materials for transport infrastructure and vehicles production.
- Design and operation of smart buildings and renewable energy sources.

While primary task is to perform excellent applied research for industrial use, the Research Centre is focused especially on research impact on everyday life and the Centre performs research for people.

The Research Centre is one of the leaders in creating cooperation between the university environment and companies to ensure the development of research and innovations in companies. Through intra-university cooperation with the Department of Design and Machine Elements, it provides support for SME within the AMiCE project, but also outside it. It provides support at two levels, through professional consultations in the development of prototypes or provision of equipment and technology for reverse engineering and rapid prototyping. The Research Centre in connection with the Department of Design and Machine Elements provide services for SME with the following equipment illustrated in Figure 4 to support the Rapid prototyping and Reverse engineering.



Figure 4. Equipment at the Research Centre of the University of Žilina and available to the AMiCE Alliance

H. Conclusion

AMiCE offers a unique package of support for local/regional SMEs with services that cover:

- Business planning, ranging from introductory courses, to individualized assistance in developing business plans.
- Coaching and mentoring assistance, which may include service provider referrals, one-on-one coaching, industry mentor programs, and advisory boards.
- Financial advisory services, including referrals to budgeting assistance and help in identifying or obtaining capital.
- Market development assistance, including market research, advertising and public relations support, and contract procurement.
- Networking opportunities to develop sales leads, foster collaboration among entrepreneurs, and build mentoring relationships.

I. References

1. SME Instrument, "Evaluations EIC SME Instrument | EASME." [Online]. Available: <https://ec.europa.eu/easme/en/section/sme-instrument/evaluations-eic-sme-instrument>. [Accessed: 24-Nov-2018]
2. Scholz, D.-I. S. (2016). *Werkstoff- und Bauteilprüfung am Kunststoffzentrum Oberlausitz*. Chemnitz: Fraunhofer Institut für Werkzeugmaschinen und Umformtechnik IWU.
3. Scholz, P. D.-I. (2016). *Kunststoffzentrum Oberlausitz*. Chemnitz: Fraunhofer Institut für Werkzeugmaschinen und Umformtechnik IWU.
4. Scholz, P. D.-I. (2016). *Produktentwicklung am Kunststoffzentrum Oberlausitz*. Chemnitz: Fraunhofer Institut für Werkzeugmaschinen und Umformtechnik IWU.
5. Scholz, P. D.-I. (2016). *Werkzeuglose Bauteilherstellung durch Gnerative Fertigung*. Chemnitz: Fraunhofer Institut für Werkzeugmaschinen und Umformtechnik IWU.



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6. Scholz, P. D.-I. (2016). *Wirtschaftliche Leichtbaustrukturen durch textilverstärkte Kunststoffe*. Chemnitz: Fraunhofer Institut für Werkzeugmaschinen und Umformtechnik IWU.
 7. Scholz, P. D.-I. (23. 08 2018). Präsentation IWU. Zittau: Kunststoffzentrum Oberlausitz, Fraunhofer IWU.