



  
**INNO  
PROVEMENT**  
Interreg Europe



**INNO PROVEMENT**  
**Translating Industry 4.0 to  
improved SME policy  
instruments targeting  
innovation**

**ACTION PLAN**



MINISTRY OF  
INDUSTRY AND TRADE

June 2021, Prague

## Interreg Europe - Project summary

Industry 4.0 (I4.0) affects innovation activities of companies throughout Europe to a dynamically increasing extent. Failing to turn production or service provision adapted to I4.0 results in losing clients and markets. In our project it will be primarily SMEs that we intend to assist so that they can better address the challenges this new paradigm imposes to increase their competitiveness. Partners' experience suggests that policy instruments (PIs) targeted to SME innovation often struggle to support I4.0 related projects efficiently. With 8 partners from 5 regions INNPROVEMENT aims at improving SME PIs targeting innovation activities and adapting them to requirements set by I4.0. This overall objective will increase the share and number of SMEs successfully implementing I4.0 related innovation projects in the partners' regions and countries. 7 thematic issues will be explored by partners through intense experience exchange:

- Innovation in software development;
- Effectiveness of public money used to support industrial R&D under I4.0;
- Introducing I4.0 to traditional industries;
- Definition of I4.0 public policy initiatives;
- Adjusting calls to I4.0 requirements;
- Market price assessment methodologies;
- Definition of an I4.0 maturity evaluation matrix

Sharing transferable good practices from these 7 thematic issues will be central among project activities. Using the outcomes partners will elaborate action plans to improve their PIs. Improvements of the addressed PIs (mainly calls for proposals) will take place primarily at the level of management of the instruments. The composition of the partnership contributes substantially to durability of project results since the 7 action plans will be elaborated by MAs and IBs directly responsible for the management of the addressed PIs. INNPROVEMENT's approach ensures 4 levels of learning. The project lies on a sound project management and implements a targeted communication strategy.

The duration of the project is from the 1<sup>st</sup> June 2018 to 31<sup>st</sup> May 2023. Phase 1 of the project started on 01/06/2018 and ends officially on 31/05/2021. Phase 2 of the project lasts from 01/06/2021 to 31/05/2023.

### Thematic Issue

The Ministry of the Industry and Trade of the Czech Republic is responsible for the thematic issue "*Effectiveness of Public Money used to Support Industrial R & D under I4.0.*"

The main aim of the project was to carry out a benefit-oriented evaluation of selected R&D&I support instruments within the Priority Axis 1 of the Operational Programme Enterprise and Innovation for Competitiveness. The aim was to analyse the effectiveness of support tools for small and medium-sized enterprises helping them on their way to higher competitiveness and gradual adaptation to the requirements of Industry 4.0. The key question was what method of evaluation of project benefits and their mid-term and longer term expected impacts should be

used to increase the cost-effectiveness of public money supporting innovation activities in enterprises in general and whether I4.0 related projects are so specific to require different type of evaluation methodology.

Implementation of I4.0 is a broad social issue, not just in terms of impacts, it is not a narrowly productive and economic issue, which means it should be best reflected through indicators covering not only economic, but also the social and environmental area (multi-criteria approach to evaluation), which have been increasingly applied in recent years in the evaluation of R & D.

The following steps have been analyzed in the proposed thematic area:

1. Definition of Industry 4.0 and existing solutions in public support programmes;
2. Summarization of general principles to evaluate the effectiveness of R & D projects;
3. Analysis of the existing system of project evaluation in selected public support programmes;
4. Selection of project models and assessment of the cost-effectiveness in relation to project benefits;
5. Proposal of a multicriterial system to evaluate project benefits in short, medium, and long terms;
6. Identification of model projects as good practices;
7. Formulating proposals for better targeting public funds focused on improving the quantification of impacts of the implementation of results into practice.

**Currently**, there is no benchmark for evaluating projects focusing on I4.0 and there are also no specific requirements for projects and proposed **R&D&I solutions related to the implementation of I4.0 in Operational Programme Enterprise and Innovations for Competitiveness (hereinafter OPEIC)**. However, an updated National Research and Innovation Strategy for Smart Specialization of the CR (National RIS3 Strategy) of January 2019 specifies requirements for supporting R&D programmes of modern key technologies related to the digitization of the economy, including, among other things, Artificial Intelligence more distinctly.

When we look at the current practices used by the INNO PROVEMENT partners within their support tools and public policies the I4.0 implementation is overall combined with digitalization transformation of the economy and society. The public support programmes in partner countries are based on national industry, research and innovation strategies, which are focused on economy growth and connected with I4.0 implementation. The approach to I4.0 could be summarized as: targeted innovation support focused on technological process and product innovations as well as on process innovations connected with changes in the management system in companies based on digitization with emphasis on digital readiness of SMEs.

The multi-criteria approach to evaluation of R&D is gradually applied in practice: not only purely cost-related approaches and economic effects (expressed in monetary units) are considered, but various non-economic effects (social, environmental) as well.

Proper definition of selection criteria and their content is an important condition for the quality of the evaluation process. Furthermore, the quality of the evaluation process is influenced by work of evaluators; requirements for their experience, expert knowledge, discussions about expert opinions.

The outputs of the analysis and the final recommendations are based on the analysis of the evaluation criteria, analysis of the feedback and materials provided by INNO PROVEMENT partners and also on the analysis of the evaluation reports. Generally, **the recommendations are focused primarily on how the evaluation system can be improved to ensure approval of highly beneficial projects and hereby to increase the efficiency of public investment to R&D.** Possible solutions for the evaluation of I4.0 projects were also discussed. The recommendations were classified in 4 categories related to the Evaluation criteria adjustment, Additional information required from Project Applicants, **Project Impact Monitoring and inspirational Indicators** and Evaluators. Some of the main recommendations are listed below:

- **The current evaluation system of R&D projects is already very sophisticated.** The individual criteria are specified very clearly and comprehensively. A wide range of aspects are taken into consideration. Cost-effectiveness, cost adequacy and assessment of budget items with a common / market price are addressed in the examined programme. The quality of output in terms of novelty and innovation potential are evaluated as well. The profitability and effectiveness of committed resources is ranked according to the knowledge of the target market, market potential, and by comparison of competitive products and solutions.
- OPEIC R&D calls examine the quality of dissemination plan and application potential – together with the assessment of the quality of research team, research capacity and experience of key researchers. The implementation of project results and identification of benefits after the project termination needs to be given more attention as well as the evaluation of market potential (e.g. through the involvement of users' committees) and knowledge of SMEs' current needs and demands. The assessment of the relation to knowledge domains (identified in the National Research and Innovation Strategy) and key enabling technologies can be considered as a certain relation to I4.0.
- The justification concerning market potential of new or improved products is very often based on the current market position of the applicant. We can agree that the declared business development in the past is a good guideline for estimating future developments. However, the assessment of the potential of new products should not be primary derived from the development of the company applying for support. The applicants / the consortium development strategies should also include the strategy of I4.0 and its related impact on staff knowledge and skills.
- In the evaluation reports evaluators often commented on the missing or insufficiently elaborated analysis of broader competition in the markets. The requirements for this analysis should be clearly stated in the evaluation criteria. The provision of this analysis could help to identify the real need of the project. The competitive potential of the expected R&D results should be described in more details and the comparative analysis to the existing and competitive solutions (particularly the key product characteristics) needs to be provided.
- The market potential should also take into account the level of readiness to the market (Technology Readiness Levels, TRL; adapted in the H2020 programmes); the expected additional costs associated

with bringing the results to the market and how these costs will have to be covered should be taken into account; a comprehensive view can be obtained through a cost-benefit calculation within the life cycle of the new product. The requirements for representations from potential customers should be adequate to the TRL; however, even for outputs with a lower TRL, the applicant should demonstrate knowledge of the needs of potential future customers and indicate the estimated costs associated with transforming the outputs into the final product.

- The evaluators commented on the absence of a clear and detailed business plan and an exploitation plan. The initial business plan, especially the analysis of the real interest in the product and sales, can be based on the Lean Canvas Method that is a simple one-page rating created for new businesses (startups). The applicants should describe clearly what is the value of the result of their R&D activity to the customer (customer). The problem here may be to capture the competitive potential. The whole area of digitization is becoming an attractive market (attracting new startups and also foreign entrepreneurs), it is a very dynamic market.
- The recommendation is to enhance applicants' motivation to maximize benefits of the project outputs and their innovation activities by setting a system of appropriate indicators. The applicant should be asked to submit a set of indicators for measuring impacts on innovation performance of SMEs as well as any further mid-term and long-term impacts including impacts on the increase of skills which do not have to correspond to the mandatory monitoring indicators. The applicants will report fulfilment of these indicators in the project reports and also in the final review procedure.

It is necessary to assess whether I4.0 implementation in the enterprise is consistent with the overall business concept. Therefore, a brief business digitization strategy should be developed and the need for digitalization should be based on this strategy. There is no need for every company to involve a high degree digitization in the context of cutting-edge research results. The OPEIC projects should rather assess the benefits of implementing the I4 concept to increase the competitiveness of the businesses. Each entrepreneur needs a different level of digitalization, also pilot projects and step by step digitalization is recommended. In the OPEIC – sub programme Cooperation Technology Platforms (selected as one of the good practices of the INNOPROVEMENT project) there is a requirement for the elaboration of a road map for the uptake of advanced technologies by SMEs in the given sector. This may be an appropriate tool for mapping the needs for digitization for groups of related SMEs in a sector together with a higher involvement of cluster organizations and SME intermediaries such as Digital Innovation Hubs, testbeds and other types of supporting infrastructure.

## Situation in the Czech Republic

### Overview of the current situation in the Czech industry

Czech Republic is the most industrial country in the EU (with 38 per cent contribution to its GDP<sup>1</sup>). Therefore, good performance of the Czech industry is vital for the Czech economy as the whole. Currently, Czech industrial companies are facing these challenges:

### Economic slow-down in most of the industrial segments in 2020

As a small open economy, development of the Czech industry is highly bound with development of the world economy, mainly EU. Higher competitiveness and therefore stability could be gained only via change from low-cost, labor-based production to smart digital economy.

Past decade was characterized with vast economic and industrial growth, limited only with labor-based manufacturing capacities (firstly huge lack of any labor and secondly its insufficient qualification). As a result, 20 per cent of manufacturing companies were not able to accept more commissions or nominations to the projects and 14 per cent of them were struggling to complete its production and deliver to their customers in acceptable time<sup>2</sup>.

Growing production costs (labor, energy, material...) have not been offset with appropriate increase in the production efficiency, for instance the labor costs have increased twice than its productivity (8 per cent comparing to only 5 per cent in 2018<sup>3</sup>).

Due to lack of the qualified labor force, Czech industrial companies were not able to fully benefit from their investments into new technologies, digitalization/Industry 4.0.

In 2020, the Czech Industry production decreased by 8 per cent due to COVID-19.<sup>4</sup> This had great change effect for the Czech economy. Companies are very aware of the fact that digitalization and Industry 4.0 is a key to their further development. **The practice showed that companies with a higher level of digitization of their processes were able to overcome economic slow-down much more efficiently than the others.**

### The end of low-cost economy

- Change from low-cost labor-based production to value-added and final production is the one of the main business and government issues at the moment. Innovations, research and development and digitalization/Industry 4.0 are currently seen as useful and necessary means for achieving high—technical, high-quality and customer friendly production.
- Achieving higher production efficiency
- Smart digitalization and implementation of Industry 4.0 became crucial for business development in time

<sup>1</sup> <https://www.cia.gov/library/publications/the-world-factbook/fields/2048.html>

<sup>2</sup> [file:///C:/Users/mbure\\_000/Downloads/Studie-ceskeho-strojirenskeho-prumyslu-H2-2018.pdf](file:///C:/Users/mbure_000/Downloads/Studie-ceskeho-strojirenskeho-prumyslu-H2-2018.pdf)

<sup>3</sup> [file:///C:/Users/mbure\\_000/Downloads/Studie-ceskeho-strojirenskeho-prumyslu-H1.2018.pdf](file:///C:/Users/mbure_000/Downloads/Studie-ceskeho-strojirenskeho-prumyslu-H1.2018.pdf)

<sup>4</sup> [www.csu.cz](http://www.csu.cz)

of constantly increasing production costs and raising customer demands.

- Coping with lack of finance for innovations
- Efficient and administration non-demanding programs, tailored-made for companies' production needs, are currently very essential for the Czech manufacturing companies in order to boost their incredible high technical potential.
- Coping with lack of educated and high skilled labor force.

## Research, innovation and digitization

The issue of research, development and innovation, especially from the point of view of corporate R&D and effective use of research and development results in innovation, is a key aspect that will determine the success of the Czech Republic's efforts to penetrate the world's most advanced countries and transform it into a knowledge economy. The share of total R&D expenditure in the Czech Republic in 2017 was 1.79% of GDP<sup>5</sup>, which means that the Czech Republic still lags significantly behind the vast majority of countries in this parameter, which are generally considered to be the most economically strong. At the same time, in terms of the impact on GDP, R&D support brings stable benefits (above 0.3% per year) in the long term<sup>6</sup>. It is all the more important to ensure that OP TAK interventions achieve the maximum possible effect and support the innovation and digitization activities of Czech companies as much as possible.

In addition to the need to intensify domestic innovation, incl. creative innovations (i.e. in the sense of supporting industrial design in order to increase the added value of final products) that could increase productivity across the business environment there is also need to focus on increasing research performance and improving collaboration between the private sector and academia. The relations of cooperation between innovative companies in the years of economic growth are generally gaining in intensity, which is confirmed by the current evaluation<sup>7</sup>, which confirmed the improvement of cooperation between supported companies with research organizations (ROs) and universities. In the past 10 years, there have been partial improvements in the Czech Republic in the area of connecting academic research and the business sector mainly due to the establishment of knowledge and technology centres at universities and ROs and also thanks to public support for collaborative research with corporate partners provided by TA CR and MIT<sup>8</sup>. Partnerships are positively evaluated by the beneficiaries and in most cases have the potential to last even in the period after the end of the project. The long-term nature of the cooperation thus represents the basis for further research activities beyond the scope of grant support. However, public expenditure on R&D expressed as a share of GDP tends to fall below the target value (1% of GDP, the impact of the contribution of GDP growth and limited absorption of EU funds). Another weakness is the low support from investors in venture capital expenditures in the area of R&D applications.<sup>9</sup> In the case of

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<sup>5</sup> [www.csu.cz](http://www.csu.cz)

<sup>6</sup> Impact of ESI Funds on the GDP of the Czech Republic: Simulation of the QUEST III and RHOMOLO Models, Office of the Government of the Czech Republic, 2018 (pp. 13–14).

<sup>7</sup> Result evaluation of specific objective 1.2 OP EIC, MIT, 2019 (pp. 6, 23–25, 49)

<sup>8</sup> National Research and Innovation Strategy for Intelligent Specialization of the Czech Republic (National RIS3 Strategy); Result evaluation of specific objective 1.2 OP EIC, MIT, 2019 (pp. 31–32)

<sup>9</sup> National Research and Innovation Strategy for Intelligent Specialization of the Czech Republic (National RIS3 Strategy)

the share of corporate expenditures on R&D, the domestic economy from the point of view of individual industries is dominated by activities in the field of IT and the automotive industry. The engineering, electrical and electronics industries follow with a large gap. However, the comparison of fields according to knowledge intensity is burdened by large differences between individual fields in terms of the regime of innovation and the need for inputs to the innovation process in the form of research and experimental development results. These differences are reflected in very different levels of corporate R&D expenditures in relation to the generated GVA according to individual fields.<sup>10</sup>

In terms of the readiness of the economy for Industry 4.0, which is characterized mainly by the quality of the Internet and digital environment, the study "Global Information Technology Report 2016" of the World Technology Forum containing the so-called "Networked Readiness Index" of the Czech Republic ranks 36<sup>th</sup> with an index value of 4.7 points, with Singapore ranking first with an index value of 6.00 points.<sup>11</sup> These data show that there is significant room for further improvement, with the introduction of the Czech Republic as a HI-OECD country.

The basic pillars for building I4.0 systems are cybernetics and artificial intelligence. In this context, the integration of digital technologies also needs to be addressed, as the number of households and businesses using data-based technologies remains limited.<sup>12</sup> The actual digitization of the economy then takes place in an extremely wide range of industries, which brings a unique opportunity to ensure the competitiveness of the Czech Republic in a global environment. The development and importance of breakthrough technology transforming production processes and mechanisms is constantly increasing not only in the Czech Republic, but throughout the EU. Key technologies of I4.0<sup>13</sup> include, in addition to the above-mentioned cybernetics and artificial intelligence, also robotics, the Internet of Things, digital platforms, automation and big data.

With increasing automation, SMEs, whose development and shift to high value-added production will be the basis for future prosperity, employment and economic growth, will also face increasing demands for financing and investment. As a result, the advent of AI, automation, and massive robotics can become a source of uncertainty for companies, their business models, and the entire economy. The companies themselves then face an internal rebirth of their structure, organization of production and use of employees, as well as partners and customer-supply chains. In the event of a failure in the global race for technological dominance, there is a risk that Europe and the Czech Republic will lose up to half of their added value.

## **Cooperation between public research and the industrial application sector**

In terms of the market situation, it can be stated that in the case of cooperation between public research and the application sector, knowledge spillovers between companies and other innovative actors and application of R&D results in business practice, this is one of the main areas where market failure manifests itself and where most advanced states apply direct or indirect instruments to promote interaction between the two types of actors. In addition, the situation in the Czech Republic is complicated by the high degree of dependence of Czech corporate R&D on decisions of foreign parent companies, which seldom give their subsidiaries in the Czech Republic

<sup>10</sup> National Research and Innovation Strategy for Intelligent Specialization of the Czech Republic (National RIS3 Strategy)

<sup>11</sup> [http://www3.weforum.org/docs/GITR2016/WEF\\_GITR\\_Full\\_Report.pdf](http://www3.weforum.org/docs/GITR2016/WEF_GITR_Full_Report.pdf);

<sup>12</sup> World Bank – Czech Republic SME Assessment report

<sup>13</sup> <https://publications.europa.eu/en/publication-detail/-/publication/28e1c485-476a-11e8-be1d-01aa75ed71a1>



sufficient autonomy in cooperation with academia in the Czech Republic, or only under conditions unilaterally favoring multinational companies. The reasons for the low relevance of Czech research lie both in the framework conditions, including the structure of innovation demand in the Czech Republic, and in areas requiring intervention at the RO level. An integral part of R&D support are investments in the digital ecosystem and the setting of favorable conditions for investment and cooperation in order to maintain the competitiveness of the Czech Republic, resp. EU.

## **Competitiveness of SMEs in the era of Industry 4.0**

As at 31 December 2018, a total of 1,152,735 legal and natural persons with up to 250 employees reported their business activities in the Czech Republic. However, domestic SMEs are lagging behind in terms of value added. In addition, aggregate factor productivity, which is an indicator of the efficiency of the use of capital and labor in production, is growing relatively slowly. A greater focus on domestic innovation of all types could increase productivity across the entire corporate spectrum, incl. SMEs facing weak productive results compared to their larger counterparts, as well as weak demand for innovation and a disadvantage in global value chains. In addition, smaller companies in the Czech Republic have lower added value per employee.

In 2018, SMEs created value added in the amount of CZK 1,786 billion, while the share of SMEs in the total value added of the business sector in 2018 reached 54.7%. Weaknesses in innovation are related to the lack of innovative SMEs, the export of knowledge-based services and venture capital expenditure. Experience from the period 2014–2020 shows that higher innovation regulations (i.e. 3rd or 4th) were achieved for the majority of supported SMEs in SC 2.1 OP EIC. On the other hand, almost a third of projects are ranked in Innovation Code 1, with some projects just above simple renewal. Last but not least, there are regional differences in terms of innovation performance within a country. The results of the Regional Innovation Survey for 2018 found that while the capital city of Prague is considered a "strong" innovator, other regions, such as Central Bohemia, Southwest and Northwest, face declining innovation performance and are "moderate" innovators.

The use of advanced technologies by Czech companies shows that the adoption rates are heterogeneous depending on the type of technology and the size of the company. I4.0 technologies in the Czech Republic are mostly used by large companies, which are significantly ahead of SMEs in the use of digital technologies. However, the development of 4.0 technologies is absolutely crucial for the Czech Republic in terms of the medium and long-term outlook. Due to demographic changes and emigration of workers (leading to labor shortages) and wage growth, automation of production processes is a possible solution to reduce labor supply. Efficient cooperation with all partners (SMEs, universities, academics and research institutions etc.) is needed in order to upskill current employees and educate the new ones. Business manufacturing sector is fully aware that high-educated employees are the key for future success and its lack is the main struggle in digitalization/Industry 4.0 implementation. Through the whole industrial sector huge willingness is present to cooperate with the technical schools, universities, academics and research institutions - in order to interconnect technical theory with real work experience in efficient and constructive way. The respective industry association and confederations discuss this issue with the Czech government and other authorities on the regular basis.

## Annex 1 – the 2021 Action Plan for the Czech Republic

The **2021 Action Plan for the Czech Republic** is a document providing details on **how** the lessons learnt from the cooperation will be exploited in order to improve the policy instrument tackled within that region. It specifies the nature of the actions to be implemented, their timeframe, the players involved, the costs (if any) and funding sources (if any). If the same policy instrument is addressed by several partners, only one action plan is required.

### Part I – General information

Project:    **INNOPROVEMENT**

Partner organisation: **Ministry of Industry and Trade of the Czech Republic**

Country:            **Czech Republic**

NUTS2 region: CZ0 - ČESKÁ REPUBLIKA

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### Part II – Policy context

**The Action Plan aims to impact:**  Investment for Growth and Jobs programme

- European Territorial Cooperation programme
- Other regional development policy instrument

Name of the policy instrument addressed: *Operational Programme Technology and Applications for Competitiveness (OPTAC)*

### Policy instrument addressed

The good practices identified by the project team of the MIT in the Thematic issue are from the Operational Programme *Enterprise and Innovation for Competitiveness* (OPEIC, 2014-2020), but the actions envisaged will have an impact on the design and implementation of the new calls for proposals within the support instrument OPTAC.

The Operational Programme Enterprise and Innovation for Competitiveness was approved by the European Commission by Decision C (2015) 3039 on 29 April 2015 and thus became a key instrument for supporting Czech

entrepreneurs from European Union funds in the 2014-2020 programming period, in volume of approx. CZK 117 billion funds available.

The main aim of the programme **was to achieve a competitive and sustainable economy based on knowledge and innovation**. The term "competitive" included the ability of local businesses to compete in world markets and create sufficient jobs. The term "sustainable" emphasized the long-term horizon of competitiveness, which includes, among other things, the environmental dimension of economic development.

OP EIC was focused on interventions aimed at (i) supporting Czech companies capable of moving or at least reaching the technological frontier in their field, with emphasis on the development of corporate research, development and innovation capacities and their connection with the environment (**more support to SMEs and start-ups shall be provided in this area in the following Operational Programme, advantage of shared innovation platform shall be taken**) (ii) development entrepreneurship and innovation of small and medium-sized enterprises in lower knowledge-intensive fields, where support focuses mainly on the implementation of new business plans, including the development of services to increase the competitive advantage of SMEs in the international environment (**provision of independent methodology in order to realistically evaluate the current digital level of SMEs shall be provided to them in order to prevent investment wasting**) (iii) in particular in increasing the energy efficiency of the business sector, the use of renewable energy sources, the modernization of energy infrastructure and the introduction of new technologies in energy and secondary raw materials, (iv) facilitating business development, services and access to government services number of information and communication technology services, as the competitiveness of the information society is based on the effective use of modern ICT services.

The OP EIC supported projects in progressive sectors, such as the area of innovative and sustainable business. In accordance with the rules of cohesion policy of the 2014-2020 programming period, **the so-called concept of smart specialization was respected**, which emphasizes cooperation between the scientific research sector and the business sector, in those sectors within which the Czech Republic has suitable conditions for creation and transfer. innovation. **This concept has to be further developed and extended in the upcoming operational programme.**

The specific objectives of the OPEIC related to the INNO PROVEMENT project and the good practices identified are primarily in the first ***Priority Axis Promotion of Research and Development for Innovation***, namely ***Specific Objective 1.1 Increasing Innovation Performance of Enterprises*** and ***Specific Objective 1.2 Improving the Intensity and Efficiency of Cooperation in Research, Development and Innovation***.

#### SO 1 Increasing Innovation Performance of Enterprises

The main objective is to develop entrepreneurship based on an intensive creation and use of unique knowledge in all major fields of specialization of the Czech Republic. Extending the modern production and R&D infrastructure will enhance innovative capacities of enterprises, enable their own R&D activities and increase the demand for outputs of research implemented in research organizations, including technologies with the greatest growth perspective. Implementation of the SO will result in deployment of higher-order innovations in the market and improved technical phases of the innovation process.

Key activities under SO 1.1 include support for projects of industrial research and experimental development,

whose main objective is to create new knowledge base required for developing new products, materials, technologies and services. Outputs of the projects include in particular functional prototypes, pilot plants, verified technologies, software, industrial design etc. Projects may be implemented by individual entities as well as by consortia composed of more partners from the business and research spheres.

#### SO 2 Improving the Intensity and Efficiency of Cooperation in Research, Development and Innovation

Improvements in services provided by the supporting infrastructure will lead to an increase in joint R&D&I activities among enterprises and the public and corporate sector. Implementation of the specific objective will contribute to more knowledge and technology transfers, increased mobility, cross-sectoral cooperation and improved conditions for development of innovative firms and to a competitive advantage, vital element affecting efficiency of the whole innovation system in the Czech Republic.

The SO 1.2 includes activities aimed at improving the external environment for business innovation, i.e. interventions to develop services provided by the supporting innovation infrastructure, which help to solve problems of insufficient capacities of enterprises (in particular SMEs), human and financial resources, lack of expertise in the business sector, caused mostly by the insufficient cooperation in research, development and innovation activities.

#### **Operational Programme Technology and Applications for Competitiveness (2021 – 2027)**

The new Operational Programme Technology and Applications for Competitiveness (2021 – 2027) of the Ministry of Industry and Trade builds on the successful implementation of the previous programme. To support Czech entrepreneurs, approx. CZK 80 billion from the European Regional Development Fund is prepared in this Operational programme.

Mainly the following areas will be supported:

- support for business research and development
- purchase of modern ICT solutions and implementation of digital technologies in companies
- purchase of modern production and non-production technologies
- implementation of business innovations
- reconstruction of business real estate
- development of industry 4.0
- energy savings, purchase of more energy efficient and economical technologies
- obtaining energy from renewable sources
- development of intelligent energy systems and networks for energy system operators (Smart grids)
- building green infrastructure and reducing pollution
- acquisition of technologies and systems for optimizing water consumption, eliminating water waste, etc.
- on waste minimization systems and material intensity of production, on the use of secondary raw materials in production

- to expand and build high-speed internet networks

Inspired by the knowledge transfer activities within the INNOPROVEMENT project, we see especially 3 thematic issues: **Effectiveness of public money used to support industrial R&D under I4.0, Definition of I4.0 public policy initiatives and Definition of an I4.0 maturity evaluation matrix** relevant for the Czech Republic. Therefore, good practices from this area were analysed in detail for further inspiration.

Based on the good practices developed during the project, discussions with key stakeholders and expertise of our partners including the National Centre for I4.0 we identified two main areas as the main tools in the Action Plan for boosting digital and Industry 4.0 level in the Czech Republic:

- Digital transformation of SMEs (incl. start-ups) – provision of independent methodology in order to realistically evaluate the current digital level + provision of related advisory services – technologically independent
- Strengthening research and innovation shared capacities and the introduction of advanced technologies to SMEs and start-ups.

In addition, MIT CR has already started building upon the analyses and discussions done with the project partners on the thematic issue Effectiveness of public money used to support industrial R&D under I4.0. Following on the recommendations mentioned earlier in the presentation of the thematic issue the MIT has contracted experts from the Technology Centre of Academy of Sciences of the CR to collaborate on the design of a whole new set of evaluation criteria for research and innovation activities and for the uptake of advanced technologies including I.4 which will be used for all the new support tools within the Specific Objective 1.1 of the OP TAC.

## Part III – Details of the actions envisaged

### ACTION 1 - DIGITAL TRANSFORMATION OF SMEs (based on maturity assessment methodology)

#### Good practice transfer

The Ministry of Industry and Trade is importing following good practices, related to Interreg thematic **issues Definition of an I4.0 maturity evaluation matrix** and **Definition of I4.0 public policy initiatives**, included in National Industry 4.0 Policies of the partners – two from Portugal and from Poland, one from the lead partner region Hungary, and one from Italy (while taking inspiration from the good practices related to the maturity assessment methodologies of other partners presented within the project).

The MIT CR regards these tools as very useful since knowledge of the real digital maturity of the Czech SMEs can be very beneficial in furthering the efforts in their digital transformation as a complex encompassing different aspects of the business models and processes of SMEs.

Good practice transferred	Elements of the good practice transferred
<p>Industry 4.0 initiatives (Hungary)</p> <p>The Hungarian maturity assessment matrix (SME maturity model)</p>	<p>The Hungarian maturity assessment matrix (SME maturity model) is comprehensive and expert model, if adapted for the Czech industrial reality and its company diversity, it could serve as a good basis to be inspired from, especially the method of processing the results and its universality. The tool gives entrepreneurs an opportunity to take the first step towards digital transformation, i.e. to determine the level at which the company is currently operating and to develop an initial concept of future changes.</p> <p>The following conclusion has been made based on this good practice</p> <p><b>The Czech SMEs shall be more aware of their real weaknesses and digital opportunities. Therefore, only independent digital assessment methodologies should be supported by the Ministry of Industry and Trade.</b></p>
<p>National Industry 4.0 policy (Portugal)</p>	<p>The dedicated implementation initiative contains very nice approach to be inspired from: Companies must learn about their weak and strong sides, have digital</p>

<p>-Distinct implementation initiative (COMPETE 2020)</p> <p>Training oriented to strategies based on digital solutions, promoting efficient and interconnected production processes, creating new business models.</p> <p>Diagnostic / consultancy phase - assessment of SME industrial and technological maturity, identifying critical skills development needs.</p> <p>Training areas (examples) - digital organizational culture; artificial intelligence; robotics; cloud computing, big data.</p>	<p>knowledge in order to succeed, boost their competitiveness and create new business models. Providing companies with a tool to easily assess their digital maturity, resulting in an intelligible report summarizing the company's digital strengths and weaknesses, will make it easier for managers to decide which areas are effective to invest in, is a great tool to boost digitalization.</p> <p>The following conclusion has been made based on this good practice</p> <p><b>The Czech SMEs shall be provided with reasonable funding for independent expert consultations and trainings - business management should have the opportunity to discuss the results of the digital maturity assessment with independent digitization experts to obtain reasonable and independent feedback on their views, and further learn and get proper training in the area needed.</b></p>
<p>National Industry 4.0 policy (Poland)</p> <p>Good Practice of ROP for Lodzkie Region 2014-2020 – “Innovation in SME” sub-measure.</p>	<p>We regard the following projects directly implementing the concept of Industry 4.0 also applicable for the Czech Republic:</p> <ul style="list-style-type: none"> <li>- Sales Force Automation (SFA) systems integrated with Enterprise Resource Planning systems (ERP),</li> <li>- Robotisation of production lines,</li> <li>- Implementation of MES (Manufacturing Execution System) systems,</li> <li>- Automation of production in the medical sector,</li> <li>- Analytical engine for advanced data processing</li> </ul> <p>Moreover, from our experience, the following issues are most important and effective to be solved within the Czech manufacturing SMEs in order to support the growth and competitiveness of SMEs by means</p>

	<p>of digital transformation, thus contributing to the development of regions.</p> <ul style="list-style-type: none"> <li>- Data availability and integration</li> <li>- Production virtualization and flexibility increase</li> <li>- Harmonization and streamlining of all processes in the factory</li> <li>- Improvement of digital communication across the supply chain</li> <li>- Artificial intelligence and reality</li> </ul> <p>The following conclusion has been made based on this good practice</p> <p><b>The findings from the Digital Maturity Assessment shall be worked out into company digital improvement strategies and its results shall lead to real projects. Crucial areas for digital and Industry 4.0 development shall be further supported.</b></p>
<p>the Initiative Portugal 4.0</p>	<p>We regard it as a useful tool for the companies which would like to apply for grants/other means of support for their digital transformation. It provides smart overview of the various possibilities and, as a such, it makes the respective information more available - especially for SMEs, which do not have money to pay grant advisory services to find grants suitable to their need, digital level etc.</p> <p>In the Czech Republic, too, it is necessary to draw up a clear overview of the state support that companies can apply for in their efforts to increase their digital level and introduce elements of Industry 4.0 in their production. Based on the past research made by National Centre for Industry 4.0, only 43% of responding companies regard public funding as an</p>



	<p>attractive source for innovation financing due to lack of information about the suitable programs available to them.</p> <p>Therefore, the Czech Ministry of Industry and Trade shall provide the Czech industry companies with the similar document - the Initiative the Czech Republic 4.0.</p> <p>Combination of the Digital Maturity Level Assessment wherein SMEs would get the knowledge about their digital maturity level with clear overview what kind of support is available for the respective type of SMEs can be a very beneficial tool for boosting up the digital maturity level in the Czech Republic.</p>
<p>A self-assessment tool for measuring the digital maturity of a company (Poland)</p>	<p>The digital maturity tool has been built in relation to key aspects of the company's development in the context of Industry 4.0. The respondent is able to identify the stage of the company's development in several dimensions based on three main pillars: organization, technology and processes. After answering 12 substantive questions and providing 8 short statistical information about the company, the survey participant receives assessments of the level of development of key aspects in the examined company.</p> <p>MIT CR plans to open new Calls for proposals aimed at the support of digitalization of the SMEs. For this purpose, it is necessary to get the knowledge about their digital maturity level to find out the specific needs of SMEs in this area. A dedicated tool should be developed for this purpose.</p>
<p>Manufacturing and Work 4.0 call (Italy)</p>	<p>This Call intended to promote processes of technological and digital innovation with a link to</p>

	<p>Industry 4.0 for SMEs supporting new tangible and intangible investments is capable of creating an impact on their value chain and strengthening the competitiveness of the regional production system.</p> <p>The process of technological and digital innovation in SMEs has been closely linked to the enhancement of the companies' personnel expertise and resources. The intervention provided for the granting of capital grants to companies for the implementation of investment programs aimed at the application of new digital technologies, so they were closely connected to support measures for employment and training policies.</p> <p>For the purposes of the preparation of the new Call, one of the steps that we will take is to discuss, develop and design new evaluation criteria. The evaluation criteria from this Good Practice could be an inspiration for us.</p>
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## Action

The Managing authority of the Ministry of Industry and Trade will start preparations for a new Call for proposals under the new OP focused on the digital transformation of SMEs during the second half of 2021. The purpose of this call will be to support projects targeting the digitalization and automation of the manufacturing and management processes of the applicants and the Call will be published in 2022 as part of the new OP TAC. For this purpose, the Ministry would establish cooperation with external experts for the elaboration of a methodology that will allow SMEs to assess their level of maturity in terms of digitization of processes and the level of established technology. The selected team of experts will have diverse backgrounds in order to ensure complexity and comprehensiveness of the methodology building further on the good practices of the Innoprovement project partners. The MIT will set up a working group including stakeholders and digitalization and technology experts from public universities and innovation centres, as well as experts from professional integration companies with intensive digitization experience.

The working group will explore the current practices and possibilities on how to allow SMEs to assess their level of maturity in terms of digitization of processes and the level of established technology, i.e. a comprehensive analysis of all production processes in the SMEs.

The working group will define the main objectives and conditions of the call as well as the final evaluation model and selection process which should better assess the readiness and maturity of SMEs for the digital transformation.

The final output of the above-mentioned parts will be reflected in the integration of the elements of the I4.0 and digital transformation to the conditions of the Call based on the digital maturity assessment criteria/digital audit.

The critical findings for the maturity assessment are the priorities and motivations of the company on their path to innovation, as well as the readiness of management, human resources and organizational structure and the maturity of processes together with the technologies used. The digital maturity questionnaire introduces assessors to specific areas of companies (a comprehensive range of all processes on a horizontal and vertical level) and prepares the ground for additional questions. It has to be designed so that it is possible to go into professional depth in areas that are important to the company, and vice versa to skip those areas that are not interesting for the company or are not relevant to its nature – therefore it needs to be variable and flexible to be usable for various types of SMEs and their types of production, with the possibility to analyse the activities of a given SME in greater detail.

The aim is to identify those areas wherein the least possible financial and time investment will increase the company's competitiveness as much as possible by increasing its digital level; provide SMEs with clear and comprehensive information about the financial demands of the possible solutions, return of investment and economic benefits for the future operation of SMEs. Based on this context and comparison with the benchmark of the industry the most advantageous solution for the SME can be chosen.

For a suitable design of pilot projects and other steps, there will be a detailed identification and description of the state of the technologies used in the selected areas, readiness for further digitization activities and the need to deploy new technologies.

Based on the outputs of the measurement, specific steps and projects will be proposed for the development of the company's digitization. This can be, for example:

- Optimization and improvement of selected processes
- Development projects in specialized areas
- Technology deployment projects
- Pilot projects for acquaintance with and verification of digital technologies

This Action shall be followed by the newly designed Call for **Digital transformation, which should be launched in 2022** and will provide support to a substantial number of Czech SMEs and start-ups under the conditions specified below.

The aim of this Call is the implementation of digitization actions in SMEs including the necessary analyses of processes and follow-up investment support for the deployment of digital solutions.

Eligible applicants are SMEs or start-ups and the supported activity is the purchase of both technical devices and equipment and advisory, expert and support services in connection with its implementation. The support will be also provided for **digital infrastructure, virtualization of production and data integration**. Applicants should have an already developed strategy for their digital transformation. During the assessment process, the planned digital maturity level after the implementation of the project, i.e. progress in digital transformation, is evaluated.

The following are the most crucial areas to be tackled within the Czech manufacturing SMEs in order to support the growth and competitiveness of SMEs by means of digital transformation, thus contributing to the development of regions.

- Sales Force Automation (SFA) systems integrated with Enterprise Resource Planning systems (ERP),
- Robotisation of production lines,
- Implementation of MES (Manufacturing Execution System) systems,
- Automation of production in the medical sector,
- Analytical engine for advanced data processing
- Data availability and integration
- Production virtualization and flexibility increase
- Harmonization and streamlining of all processes in the factory
- Improvement of digital communication across the supply chain
- Artificial intelligence and reality

**The support** is provided in two ways: technological and advisory.

**Technological** – i.e. through the

- Acquisition of new technological devices and equipment, which must be connected to existing or newly acquired technologies and information systems (IS or ERP, MES, MIS) and other implemented modules integrating all or most areas of business activity, especially production planning and management, inventory, purchasing, sales, finance, human resources, etc.
- Acquisition of new technological equipment and facilities incl. necessary infrastructure, interconnection of acquired or existing technologies with the help of the most modern communication channels and protocols.

**Advisory** – external support services for the SMEs during the implementation phase of the digital

transformation process.

The aid would be granted under aid intensity schemes utilizing the GBER exemptions for small and medium enterprises. The exact aid intensity scheme will be established during the preparation process.

**Eligible expenditure** is expenditure on the purchase of production and non-production technologies, machinery and operating units and also on the purchase of hardware and local networks, including related software. Expenditure and supplies related to technology installation and network building if such expenditure is to be accounted for under the relevant technology or hardware. The same approach will be used with respect to the expenditure for advisory services.

## **Players involved**

**The Ministry of Industry and Trade** of the CR – Managing authority responsible for evaluation and selection projects and the award of support

**The Business and Innovation Agency** – Implementation body

**Advisors** - external experts from public universities, innovation centres; professional consultants who have extensive professional experience from grant programs for the European Commission. The experts and stakeholders with diverse professional experience will be invited to the common working group and ad-hoc roundtables so that the overall result is comprehensive and functional in practice.

**Beneficiary** – not directly involved in Action 1 - Czech SMEs and start-ups

## **Timeframe**

**July 2021 - Ongoing**

- **July – December 2021:** Preparation process of the Call
- **First Half of 2022:** Launching the Call

## **Costs**

The expected costs linked with the preparation of the Call will be about 20.000 € and include the internal staff wages involved into the preparation process (approx. 5 persons) and remuneration for the external experts who will participate on preparation of the evaluation criteria.

## **ACTION 2 – Testbeds and Digital Innovation Hubs**

### **Good practice transfer**

The Ministry of Industry and Trade of the CR is importing Greek Good Practise Digital transformation of the Greek

industry – Industry 4.0 and RIS3 Thessaly management unit, related to Interreg thematic Effectiveness of public money used to support industrial R&D under I4.0. The two other imported Good Practices are from Italy and Poland.

Good practice transferred	Elements of the good practice transferred
<p>National Industry 4.0 policy (Greek)</p> <p>Digital transformation of the Greek industry – Industry 4.0</p> <p>RIS3 Thessaly management unit</p>	<p>Similarly to Greece, there is still significant potential for further support of innovative activities of SMEs, characterized by weaker innovation performance compared to large companies or insufficiently used potential for the introduction of technologies focusing on I4.0 elements in the Czech Republic.</p> <p>Furthermore, SMEs need for their development not only innovation and new technologies, but also expert services in terms of deepening knowledge in technology consulting.</p>
<p>Fostering the promotion and development of Digital Innovation Hubs in the regional territory (Italy)</p>	<p>The regional call "Promoting the creation of Digital Innovation Hubs" aimed at the development of DIHs fundamental for the regional I 4.0 transformation inspired us for the preparation a special Call of targeted support of Testbeds and shared innovative capacities. Like in Marche Region, we are going to promote the acceleration of the digital transformation of the production system through the provision of innovative specialized services in the Czech Republic.</p>
<p>National Industry 4.0 policy (Poland)</p> <p>Startup Spark 2.0 S5</p> <p>5G Technology Accelerator</p>	<p>The competitiveness of the Czech companies in the context of technological changes and the introduction of Industry 4.0 in companies is closely linked to digitization, possibility to obtain data from production and ability to turn them into meaningful information, on the basis of which management can make strategic decisions. Today, the demands for bigger flexibility of manufacturing companies are increasing more and more, in terms of product character, production time management, logistic and overall organization of businesses processes.</p> <p>This trend places increasing demands on the need for virtualization of production. Once manufacturing</p>

	<p>companies have sufficiently virtualized production, the necessary flexibility can be easily achieved and thus remain competitive in an ever-changing global world. The Czech Republic is a small open economy, and Czech industry is extremely dependent on external influences. To maintain its competitiveness, increasing its flexibility through virtualization of production and data integration is the key.</p> <p>In practice, there is on the one hand a lack of sufficient funding for the purchase of the necessary technologies and expertise, especially within SMEs, and on the other hand – more importantly – currently unavailable technological solutions for data processing on the market. These technologically very sophisticated solutions need to be developed.</p>
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## Action

The vision of Industry 4.0 reflects the general trend of moving towards a knowledge society, which is increasingly amplified by the digitalization and automation of most processes in the field of production, services, or internal processes of the companies. The representatives of the business sector in the CR, interested in automated and digital production, will require better access to open infrastructure where they can test new solutions for smart factories according to the principles of Industry 4.0 in production-like environment. Therefore, the Ministry of Industry and Trade will prepare a new special Call under the OP TAC which will follow up on the support of broader innovation infrastructure such as science and technology parks in the OPEIC. The call under the new OP will be specifically modified to provide targeted support of Testbeds and shared innovation capacities (clusters, technology platforms, innovation centres, hubs / co-working centres etc.) for the development of their support activities and services provided to SMEs. The aim of this call will be to attract SMEs to the use of this unique innovation ecosystem. In this way, SMEs would be provided with access to advanced technologies and digital expertise.

Related to the above is the use and transfer of knowledge of cutting-edge research into company practice and closely related issues of skilled and retrained workforce.

Economies of scale achieved through sharing the innovation infrastructure would be significant. Efficient use of Testbeds and the potential of shared innovative capacities is the key solution for weaker innovation performance of Czech SMEs – most important part of the Czech Industry when it comes to total share of company and employee numbers.

The Call will support:

**Joint innovation projects of SMEs and Testbeds and/or Digital Innovation Centres/or Innovative projects and/or consulting services provided by shared innovative capacities** with sufficient technological, digital and Industry 4.0 expertise focused on:

- Production data collection, data islands & integration, data collection automation
- Data evaluation and reporting; real-time data monitoring; visualization, modelling, planning and impact analysis; selection of a suitable platform for data collection / evaluation
- Computationally intensive tasks, processing large data, big data analysis
- Cloud centres and cloud technology use - i.e. edge cloud, public cloud and hybrid cloud
- Connectivity (5G, IoT), mobile and wireless networks
- Data processing from machines
- Cyber security
- Flexible production and response to changing demand, modularity, scalability of production, versatility of machines
- Automated (re) configuration of parameters of universal production machines for the production of specific types of products
- Control tower and management of the entire supply chain
- Optimization of space layout (warehouse, production, production), shopfloor design & management
- Predictive maintenance, augmented reality for service and maintenance
- The use of artificial intelligence, virtual and augmented reality,
- The creation of digital twins
- Development and acquisition of specialized software and digital platforms

1) High value-added **research projects of Testbeds and shared innovative capacities** sharing the results with the industry practice which would bring the following benefits to SMEs:

- Higher innovation performance of SMEs, higher intensity of R&D activities
- Higher involvement in knowledge and technology transfer and cooperation with research organizations
- Higher added value of SMEs products and therefore ability to strengthen their position in supply chains
- Increase the number of innovation leaders within domestic SMEs
- Faster transition of SMEs to digital technologies, including use of artificial intelligence, robotics, etc.
- Sufficient awareness of technological, organizational and business opportunities for the practical use of digital innovations for their rapid economic growth.
- Sufficient access to test and pilot lines and as a such ability to quickly verify the feasibility of potential digital innovations.



- Sufficient investment of SMEs in production with higher added value through innovation or technology development.
- Interest in acquiring new technological devices and equipment, including the necessary infrastructure in accordance with the principles of I4.0 resulting in higher productivity and stronger position in value chains.
- Boost digital skills within SMEs' employees
- Stronger investment environment, which would motivate the establishment of new companies and financing of new SME projects.

Emphasis will be placed especially on market applicability of innovative solutions and useful combination of technological consulting with the possibility of its verification in real practice, resp. possibility to test and verify within the Testbed.

An integral part of the measure is the channelling of support for **pilot projects of larger groups of SMEs and start-ups**, in order to achieve as large as possible economies of scale, such as the initial testing of new technologies and the transfer of innovative solutions to other sectors and new value chains. Sub-projects can serve as demonstration activities for the wider application of new technologies in the sector.

Through the implementation of these specific activities a high number of real research and innovation results should be created. Public support will significantly contribute to the development of innovative activities with SMEs.

## Players involved

**Ministry of Industry and Trade** – Managing authority and programme owner

**The Business and Innovation Agency** – Implementation body

**Czech SMEs and start-ups** – recipient of financial support for technical advisory services and technology.

Supported SMEs will be especially companies with innovation potential and the need to ensure sustainable management and increase competitiveness.

**Testbeds and/or Digital Innovation Hubs** – providers of technological infrastructure and know-how to SMEs and start-ups and recipient of financial support in order to strengthen their capacities to provide expert services and support to SMEs.

The aid would be granted under aid intensity schemes of 50% under GBER Art. 26 or 27. The exact aid intensity scheme will be established during the preparation process. Higher aid intensity can be applied if all of the aid is passed on to the final beneficiaries (SMEs).

**Eligible expenditure** is expenditure on the purchase of production and non-production technologies, machinery and operating units and also on the purchase of hardware and local networks, including related software. Expenditure and supplies related to technology installation and network building if such expenditure is to be accounted for under the relevant technology or hardware. The same approach will be used with respect to the

expenditure for advisory services – eligible expenditure would be net time spent by supervising expert teams.

## Timeframe

### July 2021 - Ongoing

- July – December 2021: Preparation process of the Call
- First Half of 2022: Launching the Call

## Costs (if relevant)

The expected costs linked with the preparation of the Call will be about 20.000 € and include the internal staff wages involved in the preparation process (approx. 5 persons) and remuneration for the external experts who will participate on preparation of the evaluation criteria.

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