

Digitising European Industries - Member States Profile: Poland

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Summary

General Background: Poland is one of the major exporters in the automotive industry, other exports of Polish industry include machinery, electronic equipment, furniture and plastics. With its current policies, the Polish government aims to develop domestic industry technologies to the “industry 4.0” level and produce innovative products. However, Polish companies feel to be confronted with high barriers concerning the digital transformation of the industry. The adoption of digital challenges by businesses and a low broadband coverage are among the main challenges of the digitization of the country, according to DESI. Comparably low wages and further automatization may foster brain drain in skilled personnel, if no new qualified jobs are being created. Poland in 2016 has established a ministry of digital affairs to develop broadband infrastructure, support the creation of web content and e-services and promote digital competences among citizens. Currently, there is a focus on e-government solutions (e.g. the “Paperless Poland” program). The related activities are financed by ERDF funds (2.2 bn. Euro), following the “Digital Poland 2014-2020” work program.

National Strategies towards “Digitizing European Industries”: Poland’s government in 2016 has adopted an economic roadmap (“Responsible Development Plan”). Reindustrialization, the development of innovative companies and capital for development are among the main pillars of this strategy. As part of the “Reindustrialization” pillar, 20 “smart specialisation” scenarios have been defined in relevant application areas such as “Innovative technologies and industrial processes” “Healthy society”, “Agri-food & timber” or “Sustainable energy”.

A key National Work Program focusing on R & D is „Smart Growth 2014-2020 (PO IR)” [1]. It is based on four priority axes: 1) Funding R&D activities in enterprises and sectoral R & D programs. 2) infrastructure (e.g. for research activities) and business potential of R&D&I businesses in Poland. 3) support for innovation in enterprises by increasing the activity of private investors (seed funds, venture capital funds, business angels) in the R&D&I area. 4) research and development activities carried out by scientific and science-industry consortia within the framework of strategic research programs, regional research agendas (smart specialization); and application projects.

Digitising European Industry (DEI) - Pillar 1

Digital industrial Platform actions: One of the major measures for modernizing the local industry is the launch of a Polish Platform for Industry 4.0 that is supposed to be operational in 2018 (initially October 2017). To prepare that launch, the ministry for economic development has appointed an “Industrial Transformation Team” including representatives of ministries, offices and from industry. Minister Morawiecki has furthermore proposed 5 work groups and an organizational structure of the initial platform. On a meeting, May 2017 in Warsaw, the ITT presented their results towards the setup of a Polish Platform “Industry 4.0”, which is supposed to be an educational, promotional and exchange platform for the construction industry in Poland. The ITT in summer 2017 has merged with a bottom-up initiative on Industry 4.0 in Poland (“Przemislu 4.0”). The common initiative has been labelled “Future Industry Platform – Platforma Przemysłu Przyszłości”. An organization structure for this future Industry 4.0 platform has been worked out and a bill to set up the platform was approved by the leadership of the Ministry of Development. It addresses actions taken at both the EU level and the expectations of the private sector in Poland.

Research, Development and Innovation Actions: A key National Work Program focusing on R & D is „Smart Growth 2014-2020 (PO IR).

The National Centre for Research and Development (NCBR), one of the main implementing agencies of the Polish Government, in July 2017 has launched a call for experts to set up a strategic programme “INFOSTRATEG” with technology developments in 5 areas: robotics, cybersecurity, intelligent control systems, image processing (satellite images) and personalized medicine.

Furthermore, NCBR has published (November 2015) a list of 9 projects with a relation to DEI, such as: Development an innovative virtual automation service for industrial automation systems in robotics; or R&D on an ultrathin ultraviolet photovoltaic cell based on electronic inkjet perforated elastic substrate. The Polish Ministries of Digitalization and Development work together on the "Paperless, cashless Poland" program. It aims to create a digital infrastructure that enables individuals to use a broad variety of services in several application areas, i.e. e-Identity, e-Health, e-Courts, eTaxes, e-Invoices and cashless transactions.

Digitising European Industry (DEI) - Pillar 2

Standardization actions: The national standards body (Polski Komitet Normalizacyjny – PKN) has a work group and work program in the area of “Automatization and manipulation of industrial robots”.

Regulatory framework: The Polish Ministry of Economic Development is preparing a new, complex public procurement regulation. Furthermore, the Polish government has worked out a number of bill concerning the reform of tax based stimulation of R&D and innovation in businesses.

Pilot factories and testbeds: The “EO Innovation Platform testbed Poland” initiative, kicked off by the Polish Ministry of Development in January 2016, aims at creating a huge satellite data repository, containing the information coming from several satellite Earth Observation systems. The “National Institute of Telecommunications” works in the scope of state telecommunications networks, normalization and standardization of telecommunication systems and devices.

Digitising European Industry (DEI) - Pillar 3

Digital Innovation Hubs actions: There are three Innovation hubs well documented on the internet (HPC4Poland/Poznan; IoT North Poland/Torun); Cybersec Hub/Krakow; five more DIHs have been named by the ministry for economic development (Gdansk, Wroclaw, Lublin, 2 in Warszawa). Poland in 2016 has presented plans and a roadmap to set up a network of Industry Competence Centers 4.0.

Digitising European Industry (DEI) - Pillar 4

Skills development: Inaugurated in 2013 with governmental participation, the “Broad Alliance on Digital Skills in Poland” is a voluntary association of institutions, organizations and companies (also e.g. Google, Microsoft, Intel, Cisco) that aims at creating a common understanding and acknowledgment of information technology. Funded by EU funds, the project Air 4.0 (01/2017-10/2020; Politechnika Warsaw) aims at reaching a new quality of education in automation and robotics.

Support for Start-ups: The Polish government in June 2016 launched the “Start in Poland” Program; a bundle of government initiatives to foster the creation of innovative businesses within the country. The program fosters activities at all development stages, from incubation and acceleration, to development and international expansion. With the program, Poland during the next 7 years wants to create 1.500 start-up companies that that will develop high quality innovative technologies.

Specific national measures

Innovation promotion: Poland has initially invented tax incentives for R&D in January 2016 and continuously develops tax reduction instruments to raise the innovation level of businesses and their legal security concerning intellectual properties (along with the “Dynamic Poland 2020” strategy). Currently, a bill is being drafted that contains a number of changes concerning the regulatory environment for conducting innovative activities.

Poland is planning ICT investments under ESIF with a total of 4.05 billion Euro.

Facilitate access to finance: In 2016, the Polish government has setup a new investment platform “PFR Ventures”. Money from European funds, (e.g. the “Smart Growth Operational Program 2014 – 2020”) and private funds from selected financial agents are used to create private investment trusts. Investment promotion and the creation of a Polish Development Fund (PDF) is part of the “Responsible Development Strategy” [2]. The Polish Investment and Trade Agency helps investors to enter the Polish market. Poland has 14 special economic zones (SEZ).

I. General Background

Overall economic situation of the country

The economy of Poland is the sixth largest economy in the European Union¹. Since 1990 Poland has pursued a policy of economic liberalization. As of 2017 the Polish economy has been growing steadily for the past 26 years, with GDP per capita at purchasing power parity growing on average by 6% p.a.. In 2014, however, its economy grew by 3.3% and in 2015 by 3.6%².

According to OECD, Poland is ranked 37th worldwide in terms of GDP³. The largest component of its economy is the service sector (62%), followed by industry (34%) and agriculture (3.5%). In 2015, Poland shipped US\$ 198.2 billion worth of goods, whereas the top Polish exports include machinery, electronic equipment, vehicles, furniture, and plastics.

Poland is one of the major exporters in the automotive industry, which is also one of the most technologically advanced in Europe. The automotive industry in Poland comprises more than 2700 companies and accounts for 13% of all national exports (2016).

The gross value added to the economy by the advanced manufacturing sector is, however, only 1 percent, which is less than half the share of the EU-15 [3]. In labor productivity, the gap with the EU-15 narrowed from 69 percent in 2004 to 44 percent in 2012, but still remains high. Poland's advanced manufacturers are, however, successful and internationally recognized producers of specific low-volume and highly customized machinery for transportation, mining, rolling stock, aviation, defense, and navigation. Challenges include a lack of scale and weak ties to international markets.

According to McKinsey [3], the Polish process-manufacturing sector lags behind European peers in innovation-generating R&D investment. McKinsey proposes a number of pathways, such as buying existing technologies and patents, or the formation of strategic alliances or partnerships with global companies to gain access to patents, technology, reputation, and foreign markets. The main challenge of the Poland's government is however to design an appropriate policy that would support the development of the domestic solutions, in particular smart software for the manufacturing sector.

A paper by Pollityka Insight [4] analyzed the situation of SME in Poland and states that

- the SME sector in Poland is smaller (SME per population) and the significance for GDP is lower than in other EU countries
- Industrial and trading firms predominate amongst Polish SMEs. The biggest number of SME firms are to be found in wholesale trade, retail and food industries (butchers, bakers), firms engaged in land transport and buildings (electrics, plumbing).
- The development of SMEs is based mainly on increasing productivity (better use of existing capital and labor), but also a relatively high propensity to invest in research and development. The contribution of Polish SMEs to innovation is higher than their contribution to added value.

¹ https://en.wikipedia.org/wiki/Economy_of_Poland

² <http://www.focus-economics.com/countries/poland>

³ <https://data.oecd.org/gdp/gross-domestic-product-gdp.htm>

- SMEs are investing more into people than machinery. While the share of SME in investments is falling gradually, the proportion of people working in the SME sector is growing steadily.
- entrepreneurs are facing difficulties of finding and hiring new employees. Especially medium-sized industrial and building firms which most complain about the lack of adequately trained personnel. Despite this, Polish companies are the least likely of all EU firms to send their employees for vocational training.
- Access to bank loans is currently much easier in Poland than in the EU. Only 4 per cent of micro-, small- and medium-sized enterprises have been refused a loan.

Furthermore, the paper states that the most significant barriers to growth for Polish SMEs are a high tax burden and bureaucracy. The tax rates in Poland are, however below the OECD average. Realizing the bureaucracy burden, the government has now started a consultation process for legislative package (“Constitution for Business”) aiming at improving the business environment by making the law more clear and transparent. Furthermore, the government is currently launching a new investment policy that offers tax incentives for investments that fulfill certain quantitative and qualitative criteria. The new system replaces the previous Special Economic Zones program.

Concerning Industry 4.0, Polish companies feel to be confronted with higher barriers than companies from other countries. A survey among Polish companies on inhibiting factors for the implementation of Industry 4.0 in the manufacturing sector shows that [5]

- 61% fear that a high up-front capital investment is required (Germany 31%, USA 33%)
- 66% lack qualified employees (Germany 40%, USA 35%) and
- 57% have concerns about data security (Germany 41%, USA 32%)

In January 2013, the Council of Ministers adopted the “Strategy for Innovation and Efficiency of the Economy” (SIEG) [6]. The main objective of SIEG is the creation of a highly competitive economy based on knowledge and cooperation. This strategy anticipates support for the development of the “Internet of Things” with emphasis on the energy sector.

In 2015, Poland’s Deputy Prime Minister Mateusz Morawiecki has unveiled an “economic roadmap” for the country over the next 25 years⁴. This “Morawiecki plan” projects about PLN1 trillion until 2030 in investments “to strengthen Polish capital and the growth of innovativeness of Polish companies to be competitive on foreign markets.” The ministry estimates that almost half of the funds (PLN 480 billion), will be from EU funds. In February 2016, an “Action Plan for the Responsible Development of Poland” [2] was adopted⁵. It is structured in the following 5 pillars:

- Reindustrialization: Partnerships in strategic branches of the economy, Intelligent national specialisation, Clusters and industrial valleys, Foreign investments
- Development of innovative companies: New „Business Constitution”, Friendly legal environment, Review of research institutes
- Capital for development: Growing savings, European funds, Polish Development Fund, Juncker plan

⁴ <http://financialobserver.eu/poland/polish-government-unveils-5-pillar-economic-roadmap-to-2040/>

⁵ https://www.mr.gov.pl/media/14909/ResponsibleDevelopmentPlan_pressrelease.pdf

- Foreign expansion: Export Support, Financial offers, Strong Polish brands, Review of business diplomacy
- Social and regional development: Comprehensive demographic programme, Pact for rural areas, Effective regional policy, Education

According to the “Reindustrialization” part of the plan, 20 large projects in infrastructure and industry will be / are started that are easy to commercialize. Another key element of the plan is to improve Polish competitiveness internationally through the support of innovation around the country.

Overall strategy / situation concerning the digitization of manufacturing / production

An “Industrial Transformation Team”⁶ (ITT), which was appointed by Minister Morawiecki on June 30, 2016, is currently at the centre of the national digitization strategy for the manufacturing sector. The ITT includes representatives of ministries (development, finance), offices (electronic communications, committee for standardization), agencies (Polish Space agency), chambers of commerce and experts from leading IT companies in Poland.⁷ Guidelines for setting up the transformation team and related working groups were presented [7]. The launch of a Polish Platform of Industry 4.0 was initially scheduled for October 2017 (see DESI 2017 report on Poland) and has now been announced to be operational in 2018.

In a presentation⁹, the ministry has analysed the effects of industry 4.0 and the risks if Poland remained passive:

- marginalisation: The lack of action in digitalisation may cause an exclusion of Polish companies from the global supply chains and lead to marginalisation of the economy as a whole. Moreover, inaction may deepen the existing gap in productivity between Polish industrial companies and their foreign competitors.
- Manufacturing reshoring: The consequence of automation and robotization is the decline of comparative advantage based on competitive labour. As a consequence, foreign companies may withdraw from Poland their production lines which would mean job losses and the exodus of know-how.
- Labour market imbalance: Shrinking labour force has been already a serious problem in Poland. Given the demographic situation it is becoming clear that if Polish factories do not introduce automation in the nearest future, they may struggle to find workers.
- Brain drain: The lack of action aiming at bringing the industry to the next level will result in the lack of quality job places and the outflow of the most talented individuals. Also, the unadapted university programs to the requirements of labour market may induce students to look for more valuable programs abroad.

Furthermore, in July 2016 a concept for building up competence centres was presented ([8]; more information, see below).

⁶ <https://www.mr.gov.pl/media/34783/lista.pdf>

⁷ <http://mr.bip.gov.pl/organy-pomocnicze-i-doradcze/zespol-ds-transformacji-przemyslowej.html>

⁸ <https://www.mr.gov.pl/strony/zadania/reindustrializacja-gospodarki/zespol-ds-transformacji-przemyslowej/>

⁹ Personal communication, ministry of Economic development

Facts on the Polish National Strategy '	
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Main Strategy Documents	“Responsible Development Strategy”
Related Strategy documents	Operational Program Digital Poland (OP DP) 2014-2020 “Dynamic Poland”, Chapter 2.6 (2013)

Step	Action	Player
1. SET CONDITIONS FOR THE 4.0 ECOSYSTEM	Promote Industry 4.0 as a European idea	European and state policy makers
2. BOOST INDUSTRY 4.0 OFFERING	Accelerate innovation	Public and private partners, forming collaborative networks and/or innovation clusters
	Develop future champions	Equipment and infrastructure industry players and associations
	Establish a dynamic digital environment	Infrastructure providers and financing
3. PROMOTE FAST ADOPTION AS COMPETITIVE LEVER	Progressively transition to 4.0	Industrial users (pharmaceuticals, automotive, aerospace, manufacturing, etc.)

Activities foreseen to boost the digital transformation of industry in Poland

Digitization level of the country

According to the [Digital Economy and Society Index \(DESI\)](#)¹⁰ [9], Poland falls into the cluster of low performing countries. The country, however, improved its performance within some of the dimensions (Connectivity, Human Capital, Use of Internet). Progress was made in fast internet take-up, in the use of mobile broadband as well as in the assignment of spectrum for mobile broadband.

¹⁰ The Digital Economy and Society Index (DESI) is a composite index that summarises relevant indicators on Europe’s digital performance and tracks the evolution of EU member states in digital competitiveness and Integration of Digital Technology which measures the digitisation of businesses and their exploitation of the online sales channel.

Poland's main challenges are the adoption of digital technologies by businesses and the developments in digital public services.

In DESI 2017, Poland has an overall score of 0.43 (EU medium score 0.52) and ranks 23st out of the 28 EU Member States (0.52). In the Connectivity Dimension, Poland 's performance is still being challenged by its low fixed broadband coverage, fixed broadband take-up and NGA coverage. One reason are large geographic areas with low density of population in which network roll-out costs are relatively high and unattractive to operators. The negative effects of low fixed broadband coverage are, however, not being offset by high mobile broadband take-up. Poland also has no single National Broadband Plan (NBP).

Concerning human capital and digital skills, Poland has made moderate progress. The number of Poles that have at least basic digital skills and the use of internet has slightly increased as compared with 2015. Internet use of individuals aged 16-24 is even above the EU average. Poland's STEM (science, technology, engineering, mathematics) graduate level is relatively high. Poles are considered to be among the best IT developers.

The results for the category "Internet Use" show that many Poles are still hesitant to go online; 70% are regular internet users (EU average: 79%), but 22% of individuals have never used Internet. Few Poles use video on demand services or participate in online social networks. In contrast, Poland scores well in reading news online and a growing number of individuals use Internet for online banking and shopping.

According to the DESI 2017 report, the digitisation of Polish businesses is lagging behind and Poland's performance has worsened as compared to 2016. The use of social media and the use of cloud services (e.g. data hosting, accounting software, CRM software, computing power) remains at a very low level. Only 10% of Polish SMEs are selling online (EU average: 17%) and SME eCommerce turnover is only 6,6%. 67% of Polish enterprises have a website. Thus, e-businesses in Poland represent around 4.1% of GDP while in other member states (e.g. Sweden, Denmark) the share is between 6 and 8%. DESI claims that there are some risks that Polish businesses are missing out on the commercial potential of digital technologies. The report mentions, however, that Poland is currently working on a digital economy strategy devoted to challenges of digital transformation.

On the other hand, a current report on the Polish ICT sector [10] demonstrates a high growth during the past years: According to the report, the number of ICT companies increased by 24.5% in 2011-2014. The number of persons working in the sector increases at the rate of around 6% annually. More than three quarters of persons employed in the sector work in ICT services, of which most are persons employed in IT services. The largest revenues in the sector are generated by services, in particular in telecommunications. IT companies are responsible for two thirds of the revenues in the sector.

National strategies towards digitization (economy, society)

Poland in 2016 has established a ministry of digital affairs. Its mission is “to create a digital boost for the development of Poland”¹¹. The Ministry of Digital Affairs is headed by Minister Anna Streżyńska. The main tasks of the ministry are to develop broadband infrastructure, support the creation of web content and e-services and promote digital competences among citizens. Digitization is seen as a key to modern administration. The spectrum of topics covered by the Ministry of Digital Affairs and the related structure of departments¹² has no - or at least no clear - connection to Industry 4.0. The ministry, however, is focusing on the “Paperless Poland” program (see below).

Effective digitization, in the perspective of the ministry, is based on three pillars: providing internet access, developing web content and services and promoting digital competences.

The Polish ministry of Digital affairs has initiated a Committee of the Council of Ministers for the Digitization as a subsidiary body of the Council of Ministers and the Prime Minister. It works on government documents for the digitalization of public administration and public registers, the development of the information society and the development of broad band networks. The committee also decides on areas such as audio-visual media policy, and applications in the field of education, health and e-signature.

It is correlated with the think tank “Council for Digitization”, whose members support the Ministry of Digital Affairs and the Committee of the Council of Ministers for the Digitization. This council provides feedback on the strategic documents and other topics related to digitization, connectivity and development of the information society (e.g. digital inclusion, privacy protection, removal of barriers, reform of intellectual properties rights).

Dynamic Poland - Strategy for Innovation and Efficiency of the Economy (SIEG) – objective 2.6 [6]

This earlier strategy (2013) is closely linked to various national and EU strategic documents and following the Europe 2020 strategy priority of smart, sustainable and inclusive growth. The main objective of the “Dynamic Poland” strategy [6] consists in a highly competitive (innovative and efficient) economy based on knowledge and cooperation. There’s a focus on four specific objectives:

- adjustment of the regulatory and financial environment to the needs of innovation
- provision of the economy with appropriate knowledge and human resources
- sustainable use of resources
- increase in the internationalization of Polish economy

Objective 2.6 addresses the creation of high-quality ICT infrastructure and the development of e-economy. The measures envisaged in this chapter are closely correlated with the actions of the European Commission.

2.6.1. Creating conditions for investment in high-tech telecommunication infrastructure: The priority is to support competition among service providers in next generation networks by ensuring that the operators have access to infrastructure, in exchange for flexibility in setting of prices and margins and

¹¹ <https://mc.gov.pl/en/the-areas-of-our-activity>

¹² <https://mc.gov.pl/en/our-departments>

market segmentation. Legal regulation of certain technological aspects of telecommunication infrastructure development appears to be important,

2.6.2. Supporting wireless broadband networks to ensure broadband (30 Mbps) internet access for all citizens

2.6.3. Creating conditions for facilitating e-economy development. Measures will include the simplification of procedures of investment in state of the art technologies, the adjustment of legal and technological conditions for the use of electronic signature, the access to the content, easier internet transactions, building trust for digital environment, supporting e-services development; and the implementation of solutions for complex realisation of transactions in key areas of the economy by e-services.

2.6.4. Opening access to public information for enterprises and citizens: The government plans to support the development of services based on open access to content and public information by implementing modern legislative solutions (Open Government Data)

Work Program Digital Poland (OP DP) 2014-2020:

Financed by ERDF funds (2.2 bn. Euro), the aim of the program is to strengthen digital foundations for the national development. According to the Partnership Agreement between the European Commission and the Polish Government, those foundations include:

- common access to high-speed internet,
- effective and user-friendly public e-services and
- a continuously rising level of digital competences of the society.

The program obviously commences the “Dynamic Poland” objectives. The first two pillars indicate the directions of the improvement of the amount and quality of infrastructure, services and content. The third pillar is to help create the demand due to increasing digital competences of the society and to remove mental barriers in using the opportunities digital technologies offer. To address the identified challenges, OP DP will implement the following investment priorities

- extending broadband deployment and the roll-out of high-speed networks
- supporting the adoption of emerging technologies and networks for the digital economy
- strengthening ICT applications for e-government, e-learning, e-social inclusion, e-culture and e-health.

There is, however, no specific relation to the digital transformation of the industry in this program.

In addition, the Polish Government has expressed in a communication that it shares the European Commission’s position on the Internet of Things (fragmentation of activities and initiatives can lead to missed opportunities for European solution providers; focused efforts such as AIOTI are needed). The Polish Government also supports the standardization and development of the 5G communications network and all efforts to modernize both communications networks and end-devices to migrate to IPv6 addresses.

II. National Strategies towards “Digitizing European Industries”

Industrial Transformation team as a nucleus for the Polish Industry 4.0 platform

The purpose of setting up the Industrial Transformation Team was to work out initiatives to digitize the economy in line with the principle of sustainable development and to present proposals for actions aimed at the digital development of industry and services for businesses, in particular concerning system solutions for the industry.

When setting up the ITT, minister Mateusz Morawiecki pointed out the following relevant development areas of digital technologies:

- The internet of Things (Digital management models and new business models)
- Infrastructure (Integrated design processes; Digitization through electronic communication)
- Products and Services (Machine and Equipment Design, Intelligence Implementation)
- Networking Systems (Automation of Processes and Services; Network Automation; Distributed Network Intelligence)
- Data processing (Integration of hardware and network data; Big Data)

Poland should achieve a high level in these areas by [7]

- Building a community around the Industry 4.0 initiative.
- Pay attention on business needs and end users.
- Ensure transparency and participation of all stakeholders
- Promote the ideas of Industry 4.0
- Create a clear structure for cooperation of those who actively want to be involved in digital transformation.

The setup of the following work groups was proposed [7]:

- Standards, norms, infrastructure, smart industry specializations
- Digital industry support
- Regulatory framework for the functioning of industry 4.0
- Education, Competence and Human Resources for Industry 4.0
- Intelligent software and data processing

For each group, the ministry defined general tasks and a chairman (expert in the thematic scope, rotational changes) and supervisors were assigned. The work groups are supposed to plan the topics and schedule their work. They are supposed to develop recommendations for actions and system solutions aimed at the digital development of the industry and services and present these to the chairman of the team. The Ministry of Development provides logistical support to the functioning of working groups.

The Industrial Transformation Team presented results and work group reports on their 3rd meeting (ITT; May 8th, 2017, Warsaw)¹³. Jan Filip Staniłko, deputy director of the Innovation Department, presented the directions of work on the portal "Polish Platform Industry 4.0", which is supposed to be an educational, promotional and exchange platform for the construction industry in Poland. Since then, the work on the concept has continued and is about to be presented.

On this meeting, the ITT representatives adopted the appointment of a working group, which will address the issue of adapting intellectual property rights to data management requirements essential for the creation, development and functioning of industry 4.0. Representatives of the IT Sector Council took part in the work of the 4th Working Group on Education, Competencies and Human Resources for Industry 4.0

Programs of minister Morawiecki's "Responsible Development Strategy"

As part of the "Reindustrialization" pillar of the national development plan, 20 "smart specialisation" scenarios were or will be defined. They address the following branches / application areas:

- Healthy society
- Agri-food, timber and environmental sectors
- Sustainable energy
- Natural resources and waste management
- Innovative technologies and industrial processes

Concerning industry, the specialisation addresses branches in which Poland may be competitive and have a leading role in the global economy: aviation, arms industry, car components, shipbuilding industry, IT, chemical industry, furniture, food processing

As examples, the following programs were specified:

- Drones development program „Żwirko i Wigura”
- Batory - Building a Polish passenger ferry
- „Polish medical products” program (Commercialization of at least a dozen medical products with export potential)
- Cyberpark Enigma - Establishing a facility for Cybersecurity
- „Luxtorpeda 2” program – design of vehicles for urban transport
- „Kazimierz Funk” Biotechnology Development Centre
- „Polish Coal-cutting Machine” program – construction / manufacturing of mining machines
- „Medium-sized cities as Advanced Outsourcing Centres” program – advanced business services

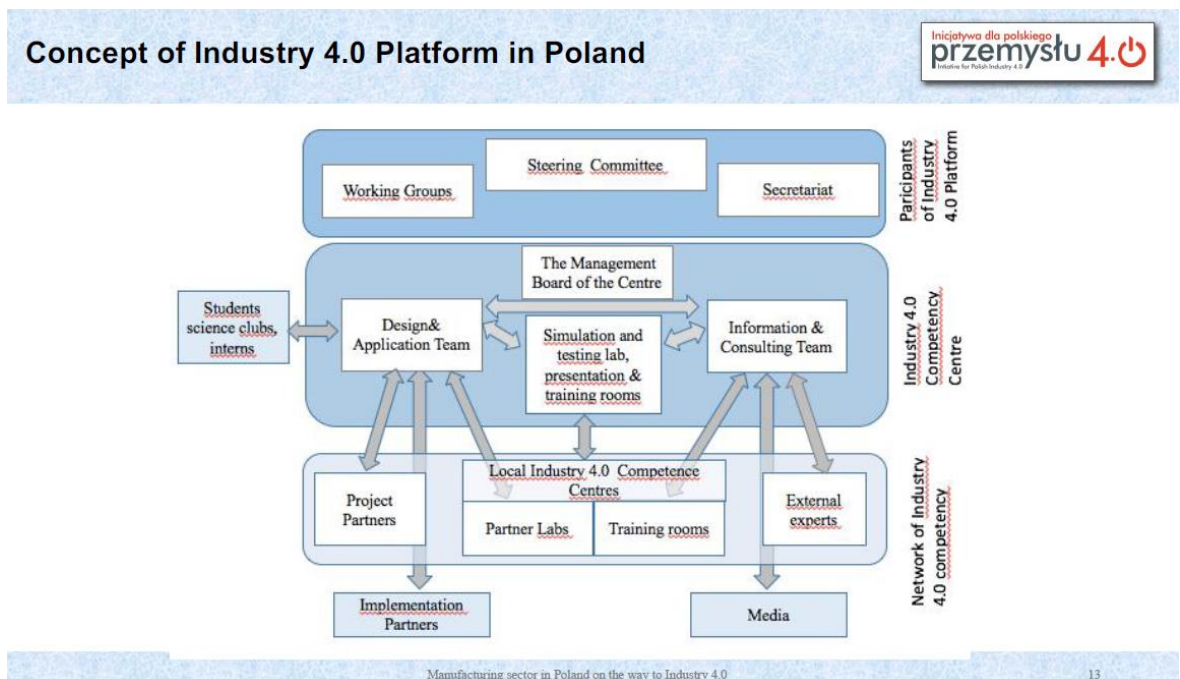
¹³ <http://radasektorowa.pl/index.php/74-przemysl-4-0-zakonczenie-wstepnego-etapu-prac-zespolu-ds-transformacji-przemyslowej>

III. Digitising European Industry (DEI) Pillar 1 - Digital Industrial Platforms actions & Research, Development and Innovation actions

Digital Industrial Platforms actions

In Poland, during the past year, the following platform actions were under development:

1. ZESPÓŁ DS. TRANSFORMACJI PRZEMYSŁOWEJ – The “Industrial Transformation Team” (see above) is a top-down initiative initiated and driven mainly by the government, especially the ministry of Economic development (Minister Mateusz Morawiecki). The ministry has appointed several working groups (Reference Architectures, standards & norms, Legal Framework, Education & Training, Digitalization of Industry, Statistics) and aims to use the Industrial transformation team to build up the national platform Industry 4.0.
2. A bottom-Up initiative "Initiative for Polish Industry 4.0", an open panel for people who want to get involved in the topic of Industry 4.0 in Poland (see presentation of A. Soldaty [5])



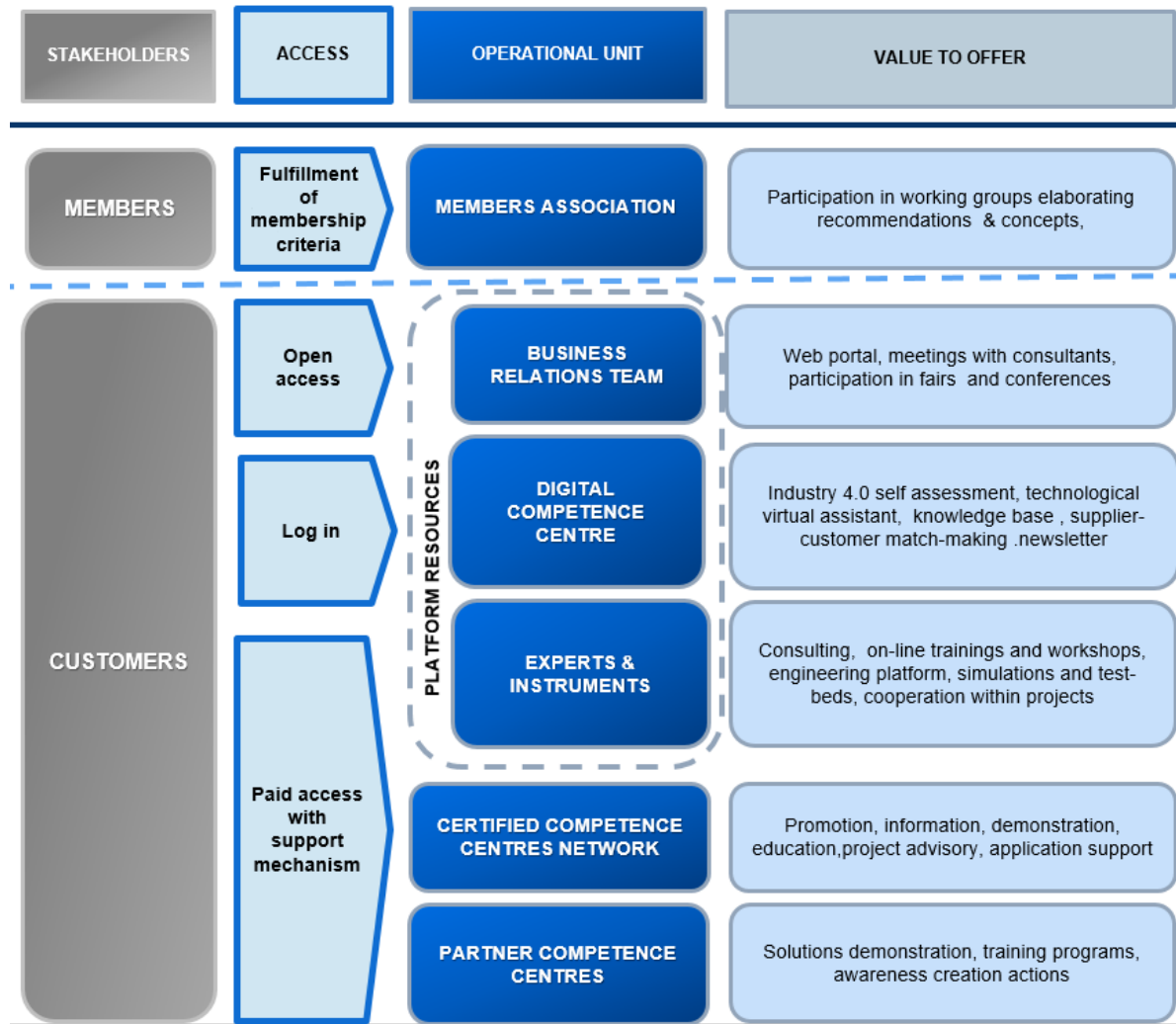
In the meantime (summer 2017) these two initiatives have merged under the common label “Future Industry Platform – Platforma Przemysłu Przyszłości”¹⁴. The primary objectives of The Polish Industry 4.0 Platform will be [11]

- the promotion of the idea of industry’s digitization
- the development of a) new business models for the industry, b) material engineering, c) new products addressing market demand, d) automation processes
- support for the development of machine to machine and machine to human interfaces
- promotion of integrated hardware and software solutions, ensuring data sovereignty and interoperability

¹⁴ Personal communication from the Polish government 09/2017.

- the formation of a professional skills framework for the digitization of the industry
- Building trust and share of knowledge among transformation stakeholders

On June 1st, 2017, minister Morawiecki announced that a new entity will be responsible for supporting the transformation of the home industry to the "industry 4.0 level". A study on "Smart Industry 2017" (Kantar Millward Brown)¹⁵, which the Ministry ordered together with Siemens, had shown that Polish companies are relatively reactive to technological change. That is why an entity is instructed to try to make companies, step by step, start to absorb technology and support them in the process of building new business models.



Conceptual Structure of the Polish "Future Industry Platform"

¹⁵ The study was conducted on a nationwide sample of industrial SMEs operating in Poland, ie, having a plant or production facility in Poland. The survey was carried out on a sample of 251 SME companies, which, due to the need for analyzes in companies of all sizes, have taken care of the appropriate share of micro, small and medium enterprises. Source: https://www.automatyka.siemens.pl/main_ia/16550.htm

It was announced that the Polish Platform Industry 4.0 will be operational from 2018.¹⁶ The platform is supposed to support information and competence development in technology companies and thus increase the global competitiveness of the Polish industry. It will also match technology providers with technology recipients, as well as educational and scientific centres. Its task will be to intensify the dissemination of knowledge, skills and technical and managerial standards that underpin the successful transition to Industry 4.0 - primarily to SME through a network of Competence Centres, as well as advice on the implementation of related solutions and technologies. One of the basic activities of the Platform will be the integration of distributed activities into one, coherent support system.

The platform is seen as a foundation to support the digitization and robotization of Polish industry. It should be funded both by the public and private sectors, however, initially it will be based mainly on public funds. The government assumes that, starting from public funding, the platform will aim at commercialising its services and switch to private funding. By creating an autonomous organisation, the platform shall create its own image, make fast decisions and combine activities at the verge of public and private sector.

A bill to set up the platform has been already approved by the leadership of the Ministry of Development¹⁷. It addresses actions taken at both the EU level and the expectations of the private sector in Poland.

Research, Development and Innovation actions

The National Centre for Research and Development (NCBR) is the implementing agency of the Minister of Science and Higher Education. It was appointed in 2007 as an entity in charge of national science, technology and innovation policies. It was also created as a dialogue platform between the scientific and the business communities. A science reform (2010) gave the Centre more freedom to manage its financial assets, within the scope of strategic research programs. The activity of the Centre is funded by the national treasury and the European Union.

Contact: Prof. Maciej Chorowski DSc, Eng. - Director of the National Centre for Research and Development

According to its website, the center is currently implementing two strategic research and development programs:

- Advanced Technologies for Energy Generation;
- Interdisciplinary System for Interactive Scientific and Scientific Technical Information;

and three strategic research projects:

- Integrated System for Reducing Energy Consumption in the Maintenance of Buildings,
- Work Safety Optimization in Mines;

¹⁶ <https://www.mr.gov.pl/strony/aktualnosci/powstanie-polska-platforma-przemyslu-40/> The launch of a Polish Platform of Industry 4.0 was initially scheduled for October 2017 (see DESI 2017 report on Poland). On May 31st, 2017 the timeframe has been prolonged to 2018.

¹⁷ https://www.facebook.com/permalink.php?id=1815751438744640&story_fbid=1851228151863635

- Safe Nuclear Power Engineering Development Technologies.

The Centre's Board is developing a strategic research and development program focusing on „civilization diseases, new medicines and regenerative medicine”

The strategic research and development programs managed by the center are closely related to the science and innovation policy adopted by the Polish government. According to the website, the basis for their preparation is the National Program of Research, which was adopted by the Council of Ministers on 16 August 2011¹⁸. The Board of the National Centre for Research and Development prepares strategic program projects according to the directions set in the national program of research.

In July 2017, the Center has placed a call for experts to set up a strategic program “INFOSTRATEG”¹⁹- "Strategic Research and Development Program for Advanced Technology in Information, Telecommunications and Mechatronics”. The Strategic Program will support high-budget R & D projects within the following five strategic research areas (lines) identified by the NCBR Council Strategic Programs Commission:

- Area 1: Image processing with a particular focus on satellite imagery.
- Area 2: IT methods in personalized medicine, diagnostics, therapy and chemoinformatics.
- Area 3: Machine learning in robotics, with an emphasis on autonomous device control.
- Area 4: Cyber security for citizens, businesses and administrators.
- Area 5: Intelligent control, management and communications systems.

The task of the experts will be to develop proposals for the program's objectives (3 experts per area).

Furthermore, the website of the national centre for research and development provides a list of in total 9 projects²⁰ (dated November 2015) with a relation to DEI, such as:

- Develop an innovative virtual automation service for industrial automation systems in robotics, control and visualization systems based on mathematical models of real objects (Project value PLN 7.5 m. / EU funding: PLN 5.8 mio.)
- Research and development on the world's first ultra thin ultraviolet photovoltaic cell based on electronic inkjet perforated elastic substrate (Project value PLN 34.6 m. / EU funding: PLN 25.3 mio.) Tablet technology to support early childhood education in children with behavioral and developmental disorders (autism, Down's Syndrome, cerebral palsy) (Project value PLN 2.9 m. / EU funding: PLN 2.3 mio.)

R&D&I related to Digitizing European Industries:

Under the new Financial Perspective for 2014-2020, preference is given to applicants who are part of national smart specializations. They are largely horizontal and technological, but they include specializations that are closely related to the digitization of industry, in particular:

¹⁸ <http://www.ncbr.gov.pl/en/strategic-programmes/>

¹⁹ <http://www.ncbr.gov.pl/programy-strategiczne/aawansowane-technologie-informacyjne-telekomunikacyjne-i-mechatroniczne---infostrateg/>

²⁰ <https://www.poir.gov.pl/en/site/learn-more-about-the-programme/search-through-the-projects/>

- KIS 15 - Intelligent Networks and Geoinformation Technologies
- KIS 17 - Automation and robotics of technological processes
- KIS 18 - Photonics (FOT)

A key National Work Program focusing on R & D is „Smart Growth 2014-2020 (PO IR)”²¹ [1]. It is based on four priority axes:

- 1) Priority axis 1 provides funding for R&D activities in enterprises. Also, sectoral R & D programs are supported, i.e. the development of research agendas by a given industry. This for example could be entities within the technology platform or a cluster. In addition, it is planned to implement funding instruments for research and commercialisation activities in a combination of venture capital funds together with public entities. Competitions are organized by NCBR. As an example, the program “Industrial research and development by enterprises” (sub-measure 1.1.1) aims at supporting R & D projects (including development plus eventually industrial research) by large enterprises and SME that fit to the National Smart Specialisation strategy. A condition for receiving funding is the commercialization of R&D results. Project results have to be established within the entrepreneur's own business or into the business of another entrepreneur.
- 2) Priority axis 2 is supporting the infrastructure and business potential of R&D&I businesses in Poland, e.g. the installation of an R & D infrastructure as a prerequisite for research activities. By creating a platform for innovation and brokerage services, it will be possible to associate technology vendors with SMEs interested in implementing new solutions. In addition, SMEs can receive subsidies for using innovation services from business environments or scientific units. Costs related to the protection of industrial property in enterprises are also financed. Clusters with a great potential for innovation and competitiveness e.g. from the National Key Clusters may apply for co-financing of internationalization and for promoting high-tech products on foreign markets. The competitions are organized by the Ministry of Economic Development.
- 3) Priority axis 3 provides support for innovation in enterprises by increasing the activity of private investors (seed funds, venture capital funds, business angels) in the R&D&I area. Services for the preparation of documentation necessary to enter the Stock Exchange can also be funded. Support for implementing R&D activities is limited to SMEs and is implemented through grants and financial instruments (guarantees). In addition, measures are being taken to support the internationalization strategies of innovative enterprises (advisory services, promotion programs for leading Polish economy). Contests are organized by the Polish Agency for Enterprise Development (PARP) and the state development bank of Poland (BGK). As an example, sub-measure 3.2.1 provides funding for SME for the implementation of research projects according to the motto: "From idea to market." The projects co-financed by this measure are intended to be investment-oriented, which implies that the development activities will result in market launches of new or significantly improved products or services. Experimental development and consulting can also be subject to funding.

²¹ <https://www.poir.gov.pl/en/site/about-the-programme/>

4) The funding in the fourth priority axis is directed to research and development activities carried out by scientific and science-industry consortia within the framework of: strategic research programs, regional research agendas (along with a regional smart specialization strategy); and application projects. Support for the development of modern research infrastructures in the science sector is limited to selected projects included in the Polish Road Map for Research Infrastructure. In addition, International Research Agendas, e.g. new scientific units for high-quality research are supported by teams of outstanding scientists from Poland and abroad. Program resources aimed at increasing human resources will be available to young researchers and research teams led by outstanding scientists. The contests are organized by the National Centre for Research and Development NCBR and the Information Processing Center.

Other related research activities

The Polish Ministries of Digitalization and Development work together on the "Paperless, cashless Poland" program²². This program aims to create a digital infrastructure that enables individuals to use a broad variety of services (e.g. driving license application, university payment) in several application areas, i.e. e-Identity, e-Health, e-Courts, eTaxes, e-Invoices and cashless transactions. The program is part of the "Plan of Responsible Development of Poland" [2] which assumes that an efficient e-Administration is a crucial element of well-functioning state and sustainable development. 68 projects are executed by 6 Ministries in strong cooperation with over 160 experts from business and academia to ensure feasibility and practicality of the designed solutions. Example projects are:

- E-banking as a "quick-win" key to digital services (completed project)
- Development of unified e-ID standard based on federation model and creation of e-ID Hub infrastructure
- Creating a central system providing access to and gathering data from all health services
- Creation of a new payer identification standard and a digital register for all social benefits
- Creation of a FinTech-friendly regulatory environment; launch of a Blockchain project accelerator

It is expected that paper documentation and manual processes in the administration will be limited; also shadow economies could be limited through increasing cashless circulation. Furthermore, it is expected that citizens and businesses will profit from the "Paperless & Cashless Poland" initiatives. It is expected that in 5 years' time 50% of citizens will settle 80% of their administrative cases electronically and the usage of e-services will become more convenient, faster and cheaper for the end users. Project management and other contact information are not available.

The Ministry of Economic Development, in cooperation with Ministry of Finance and several players from the cashless payments sector are actively engaged in actions aimed at digitizing the way Polish companies operate. With the goal of reducing controlling burden it is planned to introduce business data reporting in form of JPK (Polish equivalent of SAF-T, OECD based Standard Audit File for Tax) as well as cash registers reporting on-line to tax authorities. This should reduce the number of controls and entrepreneur undergoes and should seal taxation/decrease tax evasion. Another important field of activity is aimed towards radical increase in saturation of cashless Points of OSales – this will benefit client comfort, increase customer protection/security and stimulate competitiveness of

²² https://mc.gov.pl/files/paperless_cashless_poland-program_overview.pdf

businesses. Introduction of e-receipts should also increase buying comfort in the near future, and contribute to eliminating paper accounting documents almost entirely in few years.

As part of the “Responsible Development Plan”, the project Cyberpark Enigma has the objective to foster Polish companies and research institutes in cyber security and data analysis. It is expected to establish a facility with sufficient potential to compete on European markets in highly specialized IT services. In further projects, this could also lead to a National Cyber Security Centre in cooperation with Ministry of Defence and Ministry of Digitalization. Within the Cyberpark Enigma, a supercomputer and data center, as well as highly qualified scientists and researchers and numerous participating SMEs are available.

IV. Digitising European Industry (DEI) Pillar 2 - Standardization actions, regulation and testbeds

Standardization actions

The Polish Committee for Standardization (Polski Komitet Normalizacyjny – PKN) is a national standards body responsible for the organization of standardization activities. In 2016, 56 administrative organizations and 803 businesses as well as 210 research organizations were member in PKN. According to its yearly report 2016, PKN aims at strengthening its position as an independent, professional organization and to actively participate in the activities of international and regional standardization organizations. Standardisation work is performed in more than 300 standardisation work groups. The work program of the “Automatic and manipulation industrial robots” work group for example shows a great number of standardization activities²³.

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Regulations

Innovation Act

In the past years, the regulatory initiatives in Poland have focused on policies that in general would stimulate the innovation power of the country. Despite more and more research and innovation policies have evolved, Poland’s innovation system has remained weak²⁴ and the policy measures now appear in an overlapping manner. Therefore, the Polish government in 2016 has launched a national council for innovation with the task to coordinate the innovation policies.

The “Innovation Act”, signed in November 2016, introduced incentives for innovative businesses and researchers and encourages the commercialisation of research findings. In the act, the legislation deals with issues that have so far bothered entrepreneurs. It intends to make Poland a more innovation-friendly business environment and to increase the private sector's investment in research and development. Also, the efficiency of managing public funds allocated to R & D will be improved. The new law offers support for businesses, young scientists and research facilities that are involved in technological innovation. The government hopes that the commercialised innovations will be able

²³ <https://pzn.pkn.pl/kt/info/work-program/9000128210>

²⁴ <http://www.ebrd.com/documents/oce/eu-financing-and-innovation-in-poland.pdf>

to work in the Polish economy as well as globally and will, thus, expand Polish entrepreneurship on foreign markets.²⁵

- A major instrument of the Innovation Act is innovation support via tax reductions. According to the law, a business / trade can receive R & D status when at least EUR 1.2 million in annual revenue are made from sales of goods, products and financial operations, 20% of which at least come from research and development services or industrial property rights. Such an entrepreneur is exempt from real estate taxes (including agricultural and forestry) charged to research and development and may set up an innovation fund with a monthly deduction of no more than 20% of revenue.
- A second major instrument are tax credits on personal and corporate income tax on the purchase of new technology. This regulation is already in force since the end of 2015. It is open to all entrepreneurs. The technology needs to be suitable for the statutory activity of the taxpayer and a research unit (university, association, R & D unit) needs to confirm that the technology is new.

The innovation act amended previous acts in support of innovation (Journal of Laws of 2015, item 1767) and introduced numerous legal changes related to the innovative activity of enterprises and the commercialization of research and development. It abolished the previous regulation on "eligible costs" (including R & D staff costs, materials and raw materials directly related to R & D services) and also introduced the possibility of deducting costs for conducting research and development activities for three consecutive fiscal years.

Furthermore, in January 2017 a new law (Journal of Laws 2016, item 1933) became effective that now provides a system of various incentive instruments for innovation - tax reliefs, a stable way to finance the commercialization of research and development and a procedural ease package. For example, the legislation has introduced the following changes in taxation:

- As of January 1, 2017, taxes on intellectual property and industrial property are permanently abolished;
- For SME, the list of costs subject to deduction has been extended to patent costs;
- The maximum deduction of eligible costs incurred for research and development has been increased. For micro-entrepreneurs and SME, these deductions will be up to 50%; and for large companies up to 50% for employee expenses and 30% for other research and development expenditures.
- The period during which a business can deduct R&D costs has been extended;
- Cash reimbursement for R&D based start-ups are possible under certain conditions during the year of their establishment and the following year.

Recent regulations for stimulating innovation

Currently, a bill is being drafted that contains a number of changes concerning the regulatory environment for conducting innovative activities. The most important changes apply to:

- taxation: a) increase of R & D tax credits to 100% (150% for R & D centers); b) revision / extension of the catalogue of eligible costs for R & D; c) allowance of R & D reductions for some

²⁵ <http://impactcee.com/2016/11/30/innovation-act-will-encourage-young-startuppers-work-poland/>

companies outside the Special Economic Zones, d) further exclusion of capital companies and limited joint-stock companies engaged in R&D from double taxation

- non-tax changes to CBR regulations (extending CBR status);
- changes for patent application: reduced costs for obtaining patent protection for academic business incubators and Technology Transfer Centers; changes of entities entitled to appear before the Polish Patent Office; changes in the professional self-regulation of patent attorneys
- changes in higher education: possibilities of universities to act in the form of capital companies were expanded, instruments for monitoring the professional development of postgraduates; deregulation of procedures for determining a roadmap for research Infrastructures; amendments to the National Research and Development Act (scope and forms of activity)

Procurement Measures

The Polish Ministry of Economic Development is preparing a new, complex public procurement regulation²⁶. The legislative path in parliament is planned to commence in 2018, but the timescale for changes is not widely known yet. However, the Moraviecki “Responsible Development” plan unveiled key criteria for the new procurement policy:

- lowest price will no longer be main criterion
- maintenance costs will be taken into account
- Easier procedures for SMEs
- Added value for innovation
- Procurement agreements should foster job stability

In the scope of regulations aimed to increase access to public procurement markets for small and medium-sized enterprises and other underrepresented categories of bidders, the latest version of the public procurement law is fully adjusted to the EU procurement directives. As a result, contracting authorities are obliged to adequately consider the interests of small and medium-sized enterprises.

Pilot Factories and Testbeds

The National Institute of Telecommunications²⁷ is a scientific & research institution operating in the area of telecommunications and information technology. It conducts works in the scope of development of the state telecommunications network, normalization and standardization of telecommunication systems and devices. The Institute employs nearly 250 persons in its three centers: Warsaw, Wrocław and Gdańsk. It has a stable economic position and manages to operate effectively in the new market conditions and in a quickly changing environment. The Institute has run a number of EU funded projects as well as projects funded by the National Science center and by the by the National Centre for Research and Development (NCBR), however, the information on the website is outdated.

²⁶ <https://iclg.com/practice-areas/public-procurement/public-procurement-2017/poland>

²⁷ <http://www.nit.eu/about-institute>

EMC Poland²⁸ provides facilities for the testing of Electrical and electronic products which are regulated for their electromagnetic compatibility (EMC). SGS operates a large network of EMC testing facilities in the world. The Polish facilities located in Warsaw.

The initiative is going to be realized by a consortium led by the Creotech Instruments S.A. company²⁹. It is one of the largest space initiatives that has been ordered from the Polish companies by the European Space Agency (PLN 8 mio.).

²⁸ <http://www.sgs.pl/en/Industrial-Manufacturing/Services-Related-to-Production-and-Products/Product-Certification/New-Machinery-Certification/EMC-Testing.aspx>

²⁹ <http://creotech.pl/en/projects-blog/>

V. Digitising European Industry (DEI) Pillar 3 - Digital Innovation Hubs actions

DIHs already listed on I4MS Website

HPC4Poland (Poznan) aims at raising the availability of HPC simulations in order to trigger growth of innovation in manufacturing SMEs. The related competence Centres are Poznan Supercomputing and Networking Center and HPC FundingBox (funding IWP, dissemination). Activities/Services encompass technical support; Infrastructure; Testing; Access to finance; Support of new product and start-up development; Ecosystem building and networking. FundingBox is a Startup accelerator that is also active in implementing Smart Growth funded programs, e.g. FIWARE technology programs
Contact: Adam Olszewski, adol@man.poznan.pl, +48510117254

IoT North Poland (Torun) is a regional Digital Innovation Hub related to Internet of Things services in the northern regions of Poland. By cooperation between manufacturing SMEs, IT companies and regional stakeholders we built a platform for needs identification and access to finance for common initiatives. Activities/Services include access to finance; training and education; innovation coaching; network development; support of new product and start-up development; ecosystem building and networking; dissemination and awareness and market analyses. The DIH is driven by Torun Technology Park, an Torun based organization that since 2013 provides a modern data center and other facilities for innovative business projects.

Contact: Tomasz Urbanowicz, tomasz.urbanowicz@technopark.org.pl, +48607200274

CYBERSEC HUB (Krakow) builds on the synergy between stakeholders from the Małopolska Region in Poland, with the city of Krakow as its strategic center. Krakow is one of the largest start-up hubs in Europe with over two hundred ICT businesses, unparalleled investment opportunities, and access to talent, funding and the entire EU market. This environment attracts global IT companies to the area, many of whom have already moved their Research, Development and Security Operations Centres to Małopolska. Krakow also hosts the European Cybersecurity Forum - CYBERSEC, one of the main public policy conferences on cybersecurity.

Contact: The Kosciuszko Institute; ul. Feldmana 4/9-10; 31-130 Kraków, POLAND; +48.12.632.97.24; cybersechub@ik.org.pl

The following other Digital Innovation Hubs have been initialized³⁰.

- Gdańsk: Pomeranian Digital Innovation Hub (PDIH)
- Wrocław: NSN Centre for Innovation
- Lublin: IoT Poland Foundation Hub
- Warszawa: 5G environment for innovation purposes
- Warszawa (Wronki): PIAP

e-Commerce Poland (= "Polish Chamber of Digital Economy")

Founded 2013, the mission of e-Commerce Poland³¹ is the development of a Polish market for the provision of digital services, in particular e-commerce sector through cooperation, exchange of know-how and strong and effective representation of the interests of the industry. E-Commerce

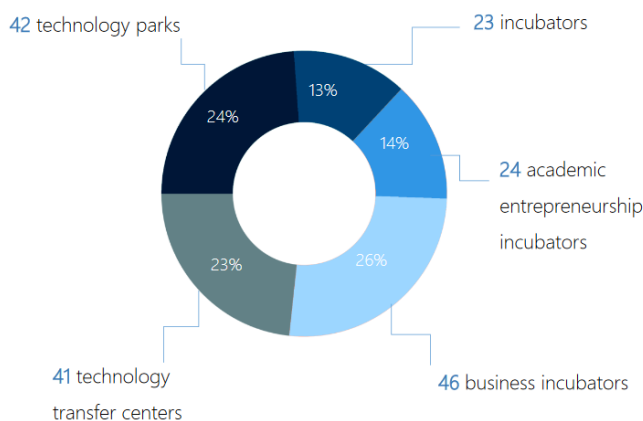
³⁰ Personal communication by the Polish Ministry of Economic Development.

³¹ <http://www.ecommercepolska.pl/en/>

Poland is in dialogue with the Polish Government, the European Union and non-governmental organizations in Poland and abroad. There are focus groups in the following areas: e-Logistics and distribution; e-Services; Research; e-Payments; e-commerce promotion and education; e-Commerce Polska School.

According to Jacek Czech³², Director of the Polish Chamber of Digital Economy, Poland has 176 active innovation centers [12]. Their main function is to support the development of companies that offer innovative solutions. They provide office and manufacturing space with appropriate infrastructure and offer services to support business activities

STRUCTURE OF INNOVATION CENTERS IN POLAND



Source: [12]

Czech claims that there is range of initial solutions to help manufacturing companies manage the transition to Industry 4.0:

- Vertical networking solutions: IT Integration, Analytics and data management, Cloud-based applications, Operational efficiency
- Horizontal integration solutions: Business model optimization, Smart supply chains, Smart Logistics, IT security management, New taxation models, new IP management
- Engineering solutions: Cross-disciplinary engineering, Efficient management of innovation, Efficient life cycle management
- Exponential technologies solutions: corporate venturing, learning organization.

Concept for a Polish network of competence centers Industry 4.0

In 2016, Andrzej Soldaty³³ has presented a concept for the national Competence Centers Industry 4.0 on behalf of the Polish Industry. The idea is to set up a network of Industry Competence Centers 4.0 in order to support transformation of the domestic manufacturing sector. The competence centers should provide knowledge, skills, technical resources and engineering tools for implementing a

³² Jacek Czech, President of the Polish Chamber of Digital Economy, Director of Business Development in National Chamber of Commerce; jacek.czech@ekig.pl

³³ At present, Mr. Soldaty is working as project Leader at the Polish Ministry of Economic Development; Contact: Andrzej Soldaty, 694 398 241, andrzej.soldaty@mr.gov.pl

national industry transformation program to the Industry 4.0 level. The centers should work on the basis of own local experience and cooperate with specialized international organizations. They should have an engineering profile with a market focus on Industry 4.0 solutions (consulting, concepts, simulations, tests). They should focus on industry-standard solutions according to the specificity of the national industry.

The competence centers should create a solution library and a knowledge transfer program. Activities of the centers should be linked to national R&D programs on Industry 4.0, vocational training programs and international cooperation programs. Also, they should support the creation of new business models according to Industry 4.0 (horizontal integration in value creation chains).

Access to the Center's competence (access to tools, developments, implementations, products) shall take place on a commercial basis, including support mechanisms for the transformation of national industry. The centers collaborate with each other and with the market, based on internet platforms, dedicated to joint engineering projects. Students should be included in practical and forward-looking activities that create visions of development pathways in the national industry.

As a service, the centers should provide comprehensive pilot configurations for complex solutions, e.g. for the process of configuring and simulating end-to-end solution. They should disseminate the latest technical solutions and support joint development and optimization of the solution concept according to the specific requirements of industry. The centers should adapt the solution to future needs by using concepts for simple reconfiguration. The centers should also provide products, such as a library of ready-to-use modules that perform the functions.

The centers should be equipped with engineering stations and software for configuring and simulating mechatronic solutions, such as a testing laboratory for prototype solutions and installations for testing functional requirements on a given solution. The centers should also be equipped with base modules and components for the design and configuration of solution models. Also, the centers will need facilities for the knowledge transfer to customers (demonstration rooms, audiovisual equipment, direct communication with customers).

Mr. Soldaty proposed the following roadmap:

- Analysis of the initial state of the manufacturing sector
- Defining the needs for transformational support
- Detailing the concept, defining the profiles of the Centers
- Identification of business models and funding principles
- Identification of organizational solutions and locations

VI. Digitising European Industry (DEI) Pillar 4 - Skills development

The “Broad Alliance on Digital Skills in Poland” („Szerokie Porozumienie na rzecz Umiejętności Cyfrowych w Polsce”), inaugurated in 2013 with government participation, is an informal, voluntary association of institutions, organizations and companies fostering digital literacy in Poland³⁴. It aims at creating a common understanding and acknowledgment of information technology in Poland. The alliance accents the need to prepare graduates for a radically different marketplace, where digital technologies are becoming more and more present. It brings together both public institutions and private sector to jointly act towards common goal of digital literacy. The alliance has been already supported by 61 institutions and businesses, including some of the major industry players in the field of digitization (among others Google, Microsoft, Intel, Orange and Cisco)³⁵. Among the recent initiatives supported by the Broad Alliance on Digital Skills is the SuperCoders programme that covers 35 schools where coding and robotics classes were provided to 800 pupils by Orange Foundation.

The project Air 4.0 (01/2017-10/2020) is funded by EU funds and performed by Politechnika Warsaw (Project cost: 2.409.779 zł, Subsidy EU: 2.030.961 zł.). It aims at reaching a new quality of education in the areas of automation and robotics. The Technical University has published a study plan³⁶. The education program in automation includes industrial process control, computerized automation systems, diagnostics and artificial intelligence, as well as basic knowledge on robotics; It also provides IT preparation. The education program in robotics encompasses design, programming and operation of automation systems, industrial robots and mobile robots. The specialty combines the issues of integration of modern power systems (electric, pneumatic, hydraulic), control systems, sensory systems, programming techniques and systems and methods of organization and production control

³⁴ http://umiejtnoscicyfrowe.pl/wp-content/uploads/2013/10/Zasady_Dzia%C5%82ania_SPRUC_przyjete200913.pdf

³⁵ <https://ec.europa.eu/digital-single-market/en/polish-broad-alliance-digital-skills-0>

³⁶ http://www.mchtr.pw.edu.pl/files/studyprograms/Automatyka_i_Robotyka/Ist_stacjonarne/plan_studiow_kier_air Ist_A.pdf

VII Specific National Measures

Innovation promotion

Tax incentives

Poland has initially invented tax incentives for R&D in January 2016. R&D is defined as a creative activity including scientific studies and development works. This includes combining existing expertise to improve manufacturing processes, increase efficiency or improve the quality of products or services. R&D tax relief is potentially available to all businesses that carry out improvement. The R&D tax relief is available if the R&D incurred qualified costs that are not refundable and the entrepreneur does not carry out business activity within a special economic zone in the given tax year. R&D costs must be recorded separately in tax accounting books and the entrepreneur needs to have concluded an agreement with a scientific unit. In the meantime, new and easier applications for R&D tax reductions are available.³⁷ (see chapter IV on DEI Pillar 2)

Structural Funds

According to the ICT Monitoring Tool [[Website](#)], Poland is planning the following ICT Investments under ESIF with relevance to smart manufacturing research and dissemination³⁸:

- EAFRD - ICT in rural funds: N/A
- 05 - ESF 2nd theme - Enhancing the accessibility, use and quality of information: 293 M.
- 015 - Intelligent Energy Distribution Systems at medium and low voltage levels (including smart grids and ICT systems): € 103 M.
- 044 - Intelligent transport systems (including the introduction of demand management, tolling systems, IT monitoring, control and information systems): € 322 M.
- 046 - ICT: High-Speed broadband network (access/local loop; >= 30 Mbps): € 1.020 M.
- 048 - ICT: Other types of ICT infrastructure/large-scale computer resources/equipment (including e-infrastructure, data centres and sensors; also where embedded in other infrastructure such as research facilities, environmental and social infrastructure): € 5 M
- 078 - e-Government services and applications (including e-Procurement, ICT measures supporting the reform of public administration, cyber-security, trust and privacy measures, e-Justice and e-Democracy): € 1054 M.
- 079 - Access to public sector information (including open data e-Culture, digital libraries, e-Content and e-Tourism): € 403 M.
- 080 - e-Inclusion, e-Accessibility, e-Learning, e-Education services and applications, digital literacy: € 179 M.
- 082 - ICT Services and applications for SMEs, living labs, web entrepreneurs and ICT start-ups): € 191 M.
- 081 - ICT solutions addressing the healthy active ageing challenge and e-Health services and applications (including e-Care and ambient assisted living): € 351 M.
- 101 - Cross-financing under the ERDF (support to ESF-type actions necessary for the implementation of the ERDF part of the operation and directly linked to it): € 123 M.

³⁷ <http://www.internationaltaxreview.com/Article/3712926/Poland-R-D-tax-deduction-in-Poland.html>

³⁸ Data were generated by a search tool from the ESIF Operational Programmes (OP) on planned ICT related investments (retrieved on 20/01/2017 from the SFC2014/Infoview database)

Which is summing up to a total of 4.047 mio. Euro.

Innovation vouchers for SME consulting

In the framework of the „Smart Growth 2014-2020 (PO IR)” program (Sub-measure 2.3.2) innovation vouchers are handed out to SME to stimulate cooperation between science and economy. Funding is provided for the implementation of projects that purchase services from a scientific unit for developing a new or significantly improved product, service, production technology or a new design.

Support for Startups – “Start in Poland” program

To support young innovative enterprises, the Polish government in June 2016 launched the “Start in Poland” Program³⁹. It consists of a number of initiatives of the Polish government to foster the location of innovative businesses within the country. The program creates favorable conditions for their activities at every stage of their development, from incubation and acceleration, to development and international expansion. The program is closely linked to other activities, mainly legislative ones, which aim at improving the conditions for innovative companies and their foreign expansion.

According to the Polish government, “Start in Poland” is the largest start-up program in Central and Eastern Europe. The budget of the program amounts to nearly PLN 3 billion⁴⁰. Thus, Poland has a chance to create 1.5 thousand start-up companies that that will develop high quality innovative technologies during the next 7 years. It is expected that the program will accelerate the complex development of the ecosystem, it will foster the exchange of expertise and intellectual property, it will attract talents from abroad and lead to long-term co-operations between companies of all sizes

The financial instruments for start-up support have been consolidated in the Polish Development Fund PFR. PFR Ventures⁴¹ is responsible for establishing funds dedicated to SME and start-ups (see below). On 15 May 2017, the first competition for capital funds was launched (“Starter” component). Capital investments in start-ups are targeted at this stage in the pre-seed phase. They will identify ideas based on innovative solutions and will verify the market potential of the ideas presented.

The various components of the “Start in Poland” program are in different phases of implementation. Currently, a scale-up Accelerator component run by PARP, is under development. As a result of a recruitment for the accelerator program, 61 applications of grantees were received, totaling PLN 344.6 million. The average value of the requested subsidy is PLN 5.65 million. 10 accelerators were selected, with contracts totaling PLN 57.8 mio. These accelerators will work with 32 large companies from different industries (energy, fintech, food, health, automotive, machine, transport). The young companies undergo a pre- program that has been developed in partnership with selected corporate partners. The start-ups receive access to high-end mentors, infrastructure, but also to clients and large corporate markets. As a result of the program, commercialization of innovative solutions proposed by start-ups, including products and services, will address the identified needs of large enterprises. Scale UP is implemented under Sub-measure 2.4.1. POIR Center analyzes and pilot new instruments inno_LAB

³⁹ <https://www.mr.gov.pl/strony/aktualnosci/pierwsza-inicjatywa-w-ramach-programu-start-in-poland/>

⁴⁰ Personal communication of the ministry of economic development.

⁴¹ <https://pfrventures.pl/en/>

A Business Angels consultation process has also been launched through the Biznest program⁴² as part of “Startup Europe”. In September 2017 the ministry for economic development announced a call for Financial Intermediaries (“Biz Biz FIZ”). It is the first “fund of funds” in Poland, aimed at supporting the investment activity of business angels in innovative companies at an early stage of development.

To develop innovative ideas for individual inventors (who can no longer benefit from financial support), a pilot program for Idea creation (“Good idea program”) has been developed in 2016 under the “Smart Growth” 2014-2020 strategy (sub-measure 2.4.1) The program takes care of inventors outside any contract of employment or other legal relationships to establish their intellectual property rights. Initiators will have access to the services needed to verify the commercial suitability of the idea and the ability to prepare a comprehensive commercial offer for investors to implement innovative solutions. Further investment components are in preparation or have been started (Polish Prize; encouragement of foreign startups to open a business in Poland; Industry acceleration; cooperation of start-ups with medium sized and large enterprises, legal assistance for startups, etc.).

Next to these measures, IMPACT_POLAND is an acceleration program for startups, micro and small companies in the fields of e-healthcare and e-agriculture. It is funded by the EU Smart Growth fund and ERDF. The project offers 6 months mentoring program, collaboration with the accelerator, support of big companies and 180k PLN equity free for companies with the most interesting solutions.

Facilitate access to finance

Venture Capital

In 2016, the Polish government has setup a new investment platform “PFR Ventures”⁴³⁴⁴ with over 630 million EUR (2,8 billion PLN) to be invested into the startup industry in the next years. PFR Ventures provides equity investments in innovative companies at an early stage of development. This measure intends to support the development of the Polish VC and tech market.

Investments may be direct together with a co-investor or indirect – in venture capital funds as the leading investor. Mainly, PFR Ventures is offering financing for innovative SMEs via selected financial intermediaries, e.g. venture capital or business angels.

The money dedicated to innovative projects come from European funds, i.e. the “Smart Growth Operational Program 2014 – 2020” and private funds from selected financial agents. Using these funds, PFR Ventures creates private investment trusts. The choice of investment projects is based on clearly defined and publicly available criteria in the framework of a competitive and professional investment process. Within the platform, PFR Ventures is able to finance projects at various stages of development and different sizes: from about 50 000 EUR to 15 M EUR for a single project. Seed funds and venture capital funds may count on governmental investments with a value of approximately 5M EUR to 200M EUR. PFR Ventures will finance half of the value of the investment, and another 50%

⁴² <http://www.mr.gov.pl/strony/aktualnosci/pfr-biznest-fiz-wystartowal/>

⁴³ <https://www.pfrventures.pl/en/>

⁴⁴ <http://150sec.com/polish-government-plans-to-invest-over-e630-m-in-startups/>

will come from private investors, both institutional and individual. Investments of PFR Ventures have started in autumn 2016.

As a new initiative, the program “Start in Poland”, which is part of the Moraviecki Responsible Development plan, aims at breaking barriers in commercialisation in Poland for innovative solutions created by start-ups. Its objectives are to

- build a network of innovation liaisons in large companies
- apply new rules for EU fund financing – 1 bln zlotys from Innovative Growth OP
- let start-ups find solutions for public administration and local authorities (eg. Smart City)

Investment promotion

There is no information on specific measures concerning DEI available. However, investment promotion and the creation of a Polish Development Fund (PDF) is part of the “Responsible Development Plan” [2].

The Polish Investment and Trade Agency (formerly Polish Information and Foreign Investment Agency), helps investors to enter the Polish market. Investors are guided through the essential administrative and legal procedures that involve a project; firms that are already active in Poland are supported as well. Agency’s mission is also to create a positive image of Poland across the world, promoting Polish goods and services. The offers are, however, generic.

Poland has 14 special economic zones (SEZ)⁴⁵. They are a key tool for boosting Poland’s appeal and ensuring the further growth of the Polish economy. The automotive industry takes the largest share in the total investment volumes in SEZs. Towards the end of 2013 the total value of capital invested in the SEZs reached PLN 93.1 billion. The number of jobs within special economic zones in 2013 has exceeded 287 thousand. The leading investors within special economic zones by investment expenditure include: General Motors (USA), Volkswagen (Germany & Netherlands), Toyota (Japan), Michelin (Switzerland), Electrolux (Sweden), Gillette (Luxembourg), LG (South Korea). On 23 July 2013 the Council of Ministers extended the term of SEZ operation until 31 December 2026.

⁴⁵ <http://www.outsourcingportal.eu/en/special-economic-zones-in-poland-the-investment-potential>

VIII Investments for Digitising European Industry

Activity (Poland)	Timeframe	Reliability	Amount (€)
Total investment in national strategy (Smart Industry)			
“Smart Growth”	2014-2020		
Work program “Digital Poland”; ERDF Funds	2014-2020		2.2 bn. Euro
Responsible Development Strategy (“Moraviecki Plan”)			???
Polish platform (PPP)			
Paperless Poland, Cashless Poland			
Pilot Factories			
Digital innovation hubs, network of competence centers			
eCommerce Poland			
AIR 4.0 (EU financed)			
Startup-Program “Start in Poland” (Polish Development Fund)			PLN 3bn.
Startup Measures PFR Ventrues (identical with above?)			630 mio. Euro
IMPACT_Poland			
Investment Promotion in Special Economic Zones			
ICT research through Structural funds (= identical with responsible development strategy?)			4.04 bn. EUR
Investment in tax reductions for innovation stimulation (including “Dynamic Poland”)			

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