

OUTPUT 1

Research on innovative skills and best practices to enhance HE students' employability, flexibility and transversal capabilities and develop effective digital work-based approaches

Case of Poland



Digital Transformation, Industry 4.0 and Human Resources Management:
Innovative skills to enhance HE students' employability, flexibility and transversal capabilities

Project no.: 2021-1-PL01-KA220-HED-000032182



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Introduction

This report provides an overview of the present state of Industry 4.0 awareness and development in Poland. It encompasses analysis of statistical and economic indicators reflecting the level of digitalization, examination of national strategic planning documents, policies and laws, and a review of relevant educational events and projects within the context of Industry 4.0. Additionally, the report offers insights into companies and their best practices regarding digital transformation and the implementation of the Industry 4.0 concept.

Furthermore, it outlines key knowledge and skills that should be deliberately cultivated to facilitate the successful integration of Industry 4.0 into Poland's economic landscape and industrial competitiveness.

1. Geography and population of Poland

The latest population balance sheet reports that Poland has a population of slightly more than 38 million, with almost 23 million living in cities and more than 15 million in villages. The gender statistics are nearly equal: women represent more than 51% of the population¹.

According to calculations made in 1775 by cartographer and royal astrologer Szymon Antoni Sobiekranski, the center of Europe is located in Suchowola, Poland. This is the place where the lines connecting the farthest points of Europe intersect. Although more recent research indicates that the center of Europe runs a bit further east, in Lithuania, Poland's unusual central location is highlighted by an expanding infrastructure of roads and international business².

Poland's convenient location makes the country an ideal place to locate investments with an audience in both Western and Eastern European markets. The main transportation routes leading from north to south and from east to west in Europe intersect in Poland. Four of the 10 continuously expanding trans-European

¹ <https://demografia.stat.gov.pl/BazaDemografia/Tables.aspx>

² https://pl.wikipedia.org/wiki/Środek_Europy

corridors run through Poland: from Helsinki via Warsaw, with a branch to Gdansk; from Berlin via Warsaw, Minsk, and Moscow to Nizhny Novgorod; from Brussels via Krakow to Kyiv; and from Gdansk to Brno³.

2. Digitalization and digital literacy in Poland

In the case of Poland, it is worth noting that the level of digitization has increased significantly by the COVID-19 pandemic; however, it is still low. The COVID-19 crisis has accelerated the digital transformation trends around the globe, as evidenced in the development and expansion of digital infrastructure; the shift to digital delivery of services by companies and within organizations, for instance, in education, healthcare, and retail; and increased implementation of digital technologies in manufacturing. Although the pandemic has had a negative impact on many businesses, it has also uncovered new opportunities for entrepreneurship. It has boosted digital entrepreneurship, for instance, reflecting changing consumer behavior during and in the aftermath of the pandemic.

Digital literacy in Poland is considered to be among the lowest levels in the whole EU. According to DESI (Digital Economy and Society Index), Poland ranks 24th of 27 EU Member States as of 2021. Poland makes constant progress in all fields rated and tracked by DESI. Still, given the equally positive developments in other countries, this has not translated into a change in its overall position in the past years. Poland ranks 24th of 27 EU countries in the Human capital category, being below average on basic and above basic digital skills. Only 44% of people between 16 and 74 years have at least basic digital skills (EU average is 56%), and only one in five have above-basic digital skills (EU average 36%). The COVID-19 pandemic had a powerful impact on digital skills development due to the modernization and training needed in remote work-related areas, especially education.

³ https://www.paih.gov.pl/dlaczego_polska/strategiczne_polozenie

Regarding connectivity, Poland ranks 21st, with 32% of Polish citizens not having broadband Internet access. Despite that, Poland ranks higher than average in the percentage of households accessing more than 100 mb/s internet bandwidth.

Poland ranks 24th among EU countries in integrating digital technology into business activities. 52% of Polish SMEs have at least a basic level of digital intensity, below the EU average of 60%.

Poland ranks 22nd in Digital public services. 49% of Internet users relied on e-government services, compared to 64% in the EU. Despite below-average usage, the Polish digital solution – the m-Obywatel digital wallet for documents and services – is currently one of the most advanced case studies among European digital identity wallet solutions⁴.

The ICT industry is one of the fastest growing in the country. In 2020, the number of ICT companies increased by 3.1% over the previous year (from 2393 to 2468). ICT service providers represented 90.8% of ICT sector businesses, and most of them (77.4%) specialized in IT services. The number of employees in the ICT sector increased by 3.2% year-on-year (from 260 654 to 269 030). Those working in ICT services accounted for 86.1% of the sector's workforce, including 64.7% in IT services. Compared to 2019, the largest increase in the number of employees among service companies was observed among wholesale entities (6.3%). Telecommunications service providers, as well as device makers, saw a decrease of 3.1% and 0.5%, respectively⁵.

3. Most demanded digital skills in Poland

Based on the national research conducted for the DigiWork project, we believe that the most in-demand skills in the area of digital transformation are:

⁴ <https://digital-strategy.ec.europa.eu/en/policies/desi-poland>

⁵ <https://stat.gov.pl/obszary-tematyczne/nauka-i-technika-spoleczenstwo-informacyjne/spoleczenstwo-informacyjne/spoleczenstwo-informacyjne-w-polsce-w-2021-roku,1,15.html>

a) core skills:

- analytical thinking
- critical thinking
- creative problem solving
- lean management

b) hard skills:

- product and service design:
 - 1) web design
 - 2) e-learning design
 - 3) designing digital ecosystems for companies (using AI, OCR, etc.)
 - 4) designing digital payment management systems
 - 5) creation of digital attendant-free customer service points
- human-centered design:
 - 1) user experience (UX) design
 - 2) user interface (UI) design
 - 3) WCAG implementation
- managing a modern company and/or production:
 - 1) ERP implementation & management
 - 2) implementation and management of automation and robotics
 - 3) data management
 - 4) QA tests

4. Digital literacy in the country

Digital literacy in Poland is considered to be among the lowest levels in the whole EU. According to DESI (Digital Economy and Society Index), Poland ranks 24th of 27 EU Member States as of 2021. Poland makes constant progress in all fields rated and tracked by DESI. Still, given the equally positive developments in other countries, this has not translated into a change in its overall position in the past years. Poland ranks 24th of 27 EU countries in the Human capital category, being below average on basic and above basic digital skills. Only 44% of people between 16 and 74 years have at least basic digital skills (EU average is 56%), and only one in five have above-

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Poland ranks 22th in Digital public services. 49% of internet users relied on e-government services, compared to 64% in the EU. Despite below-average usage, the Polish digital solution – the m-Obywatel digital wallet for documents and services – is currently one of the most advanced case studies among European digital identity wallet solutions.

5. How the Covid-19 crisis has affected?

The COVID-19 crisis has accelerated the digital transformation trends around the globe, as evidenced in the development and expansion of digital infrastructure; the shift to digital delivery of services by firms and within organizations, for instance, in education, healthcare and retail; and increased implementation of digital technologies in manufacturing. Although the pandemic has had a negative impact on many businesses, it has also uncovered new opportunities for entrepreneurship. It has boosted digital entrepreneurship, for instance, reflecting changing consumer behaviour during and in the aftermath of the pandemic.

The pandemic has reinforced the value of industry 4.0, but it has also exposed the limitations of today's implementations and set a higher bar for success.

Moreover, the transition to a post-COVID-19 next normal has changed the context for many digital projects. Months of unexpected costs and dampened sales have left many businesses short of cash for technology investments

6. DIGIWORK. Best practices of digital transformation

1	Best practice name:	Digitizing a pallet company
2	Sector:	production of special-purpose pallets
3	Organization implementing/ disseminating the practice:	PalettenWerk Kozik Spółka Jawna ul. Przemysłowa 219 34-240 Jordanów Poland https://palettenwerk.pl/en/
4	The goal:	PalettenWerk is a manufacturer of wooden pallets. In this company the aim of implementation of modern solutions is first of all to optimize the pallet production process and company management.
5	Description / Focus:	<p>Although the production of wooden pallets seems not connected with new technologies, PalettenWerk shows what manufacturer 4.0 should look like. First of all, the company has been managed thanks to the modern, fully integrated ERP system. ERP (<i>Enterprise Resources Planning</i>) is a comprehensive business management software. It provides centralized, dynamic planning of reserves, supply chain, production, and sales. It allows for identifying all materials and products, optimizes the process of production, and creates reports and summaries.</p> <p>PalettenWerk also invests in machines. In their second venue, they launched an automated</p>

		<p>pallet painting line. The output capacity of the line is 4,000 pallets per 8 hours of operation! Although the company hasn't informed the public about its previous capacity, it admitted that thanks to the new production line, it has significantly increased its production capacity for pallets that require painting. Moreover, using a new line reduces the environmental impact because of an efficient filtration system.</p> <p>In 2020, PalettenWerk has completed the installation of Europe's most modern production line of pallets. The production line has a capacity of 1000 pallets over 8 hours of operation. The machine guarantees the remarkable quality of the manufactured products and optimized process of work at the same time. The investment was completed with the support of EU funds from the Regional Operational Programme for Świętokrzyskie, 2014–2020, Priority Axis 2. Konkurencyjna gospodarka, Działanie 2.5 Support for the investment in the SME sector.</p>
6	Target groups:	<ul style="list-style-type: none"> - students of engineering schools - engineering school teachers
7	Dissemination / implementation method:	N/A
8	Results / impact with a focus on:	N/A

	1. sector 2. individuals, like students or employees	
9	Sustainability:	N/A
10	What were the obstacles?	Automated production lines are very expensive. PalettenWerk wrote in the announcements on its website that the purchase of the modern line was possible thanks to EU funds. So we can assume that the obstacle was the high price of the machine and the solution was EU funds.
11	What innovative skills (if any) the described above best practice might have developed to enhance students employability?	<ul style="list-style-type: none"> - ERP implementation in a manufacturing company - lean management with ERP system - managing automated production - data management - analytical skills - looking for alternative sources of financing for the purchase of new technologies
12	References (pls insert a link to more data on the practice)	<ul style="list-style-type: none"> - https://palettenwerk.pl/en/erp-system-for-palettenwerk-group-completed/ - https://palettenwerk.pl/en/automated-pallet-painting-line/ - https://palettenwerk.pl/en/europes-most-modern-dhp-pallet-production-line/

1	Best practice name:	Self-service hotel
2	Sector:	hotels & accommodation
3	Organization implementing/	Hotel Panorama Bohaterów Warszawy 28,

	disseminating the practice:	78-400 Szczecinek Poland
4	The goal:	<p>The purpose of this best practice is to show how a modern hotel that:</p> <ul style="list-style-type: none"> - is friendly for both tourists and business customers - has no time limits for check-in and check-out - there are no restrictions due to the lack of staff at the reception desk - respects guests' privacy and time using new technologies.
5	Description / Focus:	<p>The Panorama Hotel is located in the center of the small town, Szczecinek, on the top floor of the Galeria Nova Shopping Mall. Szczecinek is neither an engaging tourist place nor an enormous business center. Nevertheless, the hotel owners decided to create a very modern and contactless place for guests to stay.</p> <p>Guests can make room reservations on many popular portals such as booking.com. Immediately after booking, guests are instructed how to enter the hotel. The instruction is necessary because the hotel does not have a traditional reception desk. Upon arrival, they do not have to stand in any queue, check-in, or ask for a key card. This is probably the last thing a tired tourist or businessman dreams of after a day of negotiations.</p> <p>So how do guests get to the room? That is possible through a digital access system</p>

		<p>to the facility and the room without the need for personal attendants. This system also allows guests to move around the facility on their own and check out efficiently. In case of any technical problems, the hotel staff is available at the virtual reception, which guests may access at the phone number provided.</p> <p>The advantage of this hotel is its availability at any time (a guest with an access code can check in and check out at any time of day or night), comfort, and privacy. Due to the prevailing COVID-19 pandemic, it is also important to note the increased security through reduced contact with staff and other guests.</p>
6	Target groups:	<ul style="list-style-type: none"> - hotels & accommodation schools — both teachers and students - business schools — both teachers and students - MSME
7	Dissemination / implementation method:	N/A
8	Results / impact with a focus on: <ol style="list-style-type: none"> 1. sector 2. individuals, like students or employees 	N/A
9	Sustainability:	N/A
10	What were the obstacles?	N/A

11	What innovative skills (if any) the described above best practice might have developed to enhance students employability?	<ul style="list-style-type: none"> - designing digital hotel ecosystems - digital hotel key system monitoring - digital payment system management - OCR in accounting - virtual reception and customer service - user experience design
12	References (pls insert a link to more data on the practice)	https://hp-hotel.pl/hotel

1	Best practice name:	Increasing academic accessibility
2	Sector:	university
3	Organization implementing/disseminating the practice:	Tischner European University/ Wyższa Szkoła Europejska im. ks. Józefa Tischnera al. Jana Pawła II 39a 21-864 Kraków Poland
4	The goal:	The main goal of the project is to make the university more accessible (both structurally and in terms of education and communication) to people with disabilities. This good practice shows how to do this using new technologies.
5	Description / Focus:	Tischner European University (WSE) in Kraków has launched 1 the accessibility-related program in recent years: <ul style="list-style-type: none"> - The program "Including Effectively in Access = EEU" aims at ensuring that the European University increases the accessibility of the university for people with disabilities by, among others: improving communication

		<p>accessibility, improving IT tools (including the website), adapting teaching materials, procedures and organizational structure, and increasing the competence of the university staff in the field of the inclusive education in accordance with the 7 principles of educational support.</p> <p>These 7 principles are the result of the Conference of Rectors of Academic Schools ("KRASP") and established therein the Resolution of the Presidium of KRASP dated June 2, 2016, on providing equal educational conditions for students with disabilities in access to education in higher education institutions. The following principles are:</p> <ol style="list-style-type: none"> 1. "Individualization - adapting the study process of a person with a disability to his/her individual educational needs, resulting from the specifics of his/her condition and the specifics of the classes, including the conditions in which they are held. (...) 2. Subjectivity - taking into account the autonomy of a person with disabilities and their right to self-determination. (...) 3. Development of potential of a person with disabilities in relation to the educational process - selecting reasonable adaptations that would allow the student to acquire knowledge and develop practical skills (...)
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		<ol style="list-style-type: none">4. Rationality of adaptations - proposing adaptations that are economically rational, provide a satisfactory level of equal opportunities for the disabled person and guarantee that academic standards are maintained. (...)5. Maintenance of the academic standard - preparing adaptations while maintaining academic standards applicable to all students. (...)6. Adaptations that are closest to the standard course of classes — i.e. those that do not have the character of a privilege for a disabled person, but that would reasonably equal their chances in terms of the possibility of realization of the educational process considered optimal in given classes (...)7. Equal rights and obligations - taking care not only to realize equal rights for persons with disabilities but also to enforce (by ensuring these rights) the fulfillment of student obligations at the same level as for students without disabilities." <p>Source: https://kssn.pl/kssn_czasopismo_archiwum/017_KSSN/pdf/KSSN_17_DODATEK_PDF.pdf</p> <p>The University' s main objectives under this program are:</p>
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		<ul style="list-style-type: none"> - activities in the area of the organizational and procedural structure of the university to increase its accessibility, including, among others, adjusting the WSE website to WCAG standards, providing loan equipment to facilitate education for people with various disabilities, ensuring greater accessibility of library collections, organizing on-call specialists in individual support for people with disabilities. - activities in the area of architectural and equipment accessibility - reduction of architectural and equipment barriers in order to increase the accessibility of the university - activities in the area of adaptation of didactic materials, equipment, and software to the needs of persons with disabilities in order to increase the accessibility of the educational process - adjustment of e-learning courses, purchase of equipment enabling the realization of classes in 3D technology - activities in the area of staff training - improving the competencies of the university staff in terms of educational support for persons with disabilities and improving the accessibility of the university for them
6	Target groups:	universities

<p>7</p>	<p>Dissemination / implementation method:</p>	<p>WCAG (Web Content Accessibility Guidelines) is a set of documents published by the WAI (Web Accessibility Initiative) containing recommendations for creating accessible websites.</p> <p>The WCAG standard consists of 4 main principles:</p> <ul style="list-style-type: none"> - Perceivable - information presented on a site must be provided in such a way that it can be perceived by users with various limitations (e.g., adding alternative text to images for blind users). - Operable - buttons and other interface components must be accessible to users with various limitations (e.g., users with mobility impairments should be able to use the keyboard instead of the mouse). - Understandable - information on the site and its architecture should be understandable to users (e.g., a screen reader should be able to read the content of the site correctly for blind or visually impaired users). - Robust - the structure and operation of the website should meet standards appropriate for the technology used, which is supposed to enable long-term functioning of the website.
<p>8</p>	<p>Results / impact with a focus on:</p> <ol style="list-style-type: none"> 1. sector 2. individuals, like students or employees 	<p>N/A</p>

9	Sustainability:	N/A
10	What were the obstacles?	N/A
11	What innovative skills (if any) the described above best practice might have developed to enhance students employability?	<ul style="list-style-type: none"> - user experience design - user interface design - e-learning design - web design - WCAG implementation - QA tests
12	References (pls insert a link to more data on the practice)	<ul style="list-style-type: none"> - https://wse.krakow.pl/projekty/wlaczamy-skutecznie-w-dostepie-wse/ - https://kssn.pl/kssn_czasopismo_archiwum/017_KSSN/pdf/KSSN_17_DODATEK_PDF.pdf - https://www.w3.org/Translations/WCAG21-pl/ - https://www.w3.org/TR/WCAG20/

1	Best practice name:	Creating databases in the cloud
2	Sector:	database, cloud, apps
3	Organization implementing/disseminating the practice:	<p>Digitalseum Sp. z o.o. Jasionka 954E, 36-002 Jasionka Poland</p> <p>https://digitalseum.com</p>
4	The goal:	The purpose of creating such a unique platform was to enable museums and libraries to digitize their resources and make them more accessible.

<p>5</p>	<p>Description / Focus:</p>	<p>The pandemic exposed the problem of many Museums, which is the lack of an intuitive tool for the digitization of museum collections and their public presentation. That is why designers of the new app (now called Digitalseum) ask for funds for their new project.</p> <p>Digitalseum is an innovative platform that allows maintaining order in digital collections of museums, libraries, archives, etc. This is a virtual place where cultural institutions may keep their records of items.</p> <p>Digitalseum offers various stages of digitization. Creators promise an intuitive tool that eases the cataloging of the items stored and designing a database for your museum or library.</p> <p>Depending on the need and possibilities of your institution, collections may be presented in the form of traditional pictures (2D), 3D scans, animations, films, or rotating images. It is like an enormous virtual archive.</p> <p>Ok, so you know how to store the data — what next?</p> <p>Each item that you add to your collection may get 1 of 3 indexes: barcodes, mini GPS carriers, or RFID (<i>Radio-frequency identification</i>) tags. Thanks to that you will always keep your collection in the right order.</p>
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		<p>The platform is designed to support the process of digitization and data inventory of museum exhibits, documentation in the form of records, and collections management, among others.</p> <p>The creators offer not only the application itself (web and mobile) but also the hardware infrastructure.</p> <p>By ensuring integration between the platform, applications, cloud computing, and the aforementioned, the process of digitization and data inventory is faster, more efficient, and organized.</p>
6	Target groups:	<ul style="list-style-type: none"> - universities - university libraries - museums
7	Dissemination / implementation method:	N/A
8	Results / impact with a focus on: <ol style="list-style-type: none"> 1. sector 2. individuals, like students or employees 	N/A
9	Sustainability:	N/A
10	What were the obstacles?	
11	What innovative skills (if any) the described above best practice might have developed	<ul style="list-style-type: none"> - 2D and 3D scanning - photographing - 360 degree photography - cloud computing

	to enhance students employability?	<ul style="list-style-type: none"> - database creating/ managing - cybersecurity in cloud - copyrights
12	References (pls insert a link to more data on the practice)	<ul style="list-style-type: none"> - https://digitalseum.com/#scrollToServices - https://www.parp.gov.pl/component/grants/practice/cyfryzacja-zasobow-muzealnych-w-zakresie-udostepniania-elektronicznych-zasobow-muzealnych-bibliotecznych-zabytkowych-oraz-archiwalnych

APPENDICES

Appendix 1: Digitalisation level in Poland

1. Country:	Poland
2. State aid programs in the field of digital transformation:	
<i>Program no. 1</i>	
Program name:	Fundusze Europejskie na Rozwój Cyfrowy 2021-2027 more: https://www.polskacyfrowa.gov.pl/strony/o-programie/fundusze-europejskie-na-rozwoj-cyfrowy-2021-2027/zalozenia-do-nowego-programu/
Designed for the sector:	entrepreneurs, public administration, non-governmental organizations, entities of higher education and science system, medical entities, cultural institutions
Period:	2021-2027
Aid amount:	2 bln euro
Other indicators:	
<i>Program No. 2</i>	
Program name	Akademia Transformacji Cyfrowej MMŚP more: https://hrp.com.pl/projekty/akademia-transformacji-cyfrowej-mmsp/
Designed for the sector:	MSME
Period:	from March 2022
Amount:	N/A
Other indicators:	
<i>Program No.3</i>	
Program name	Konwersja cyfrowa domów kultury

	more: https://www.nck.pl/dotacje-i-stypendia/dotacje/granty/konwersja-cyfrowa-domow-kultury
Designed for the sector:	cultural institutions
Period:	from May 2021
Amount:	N/A
Other indicators:	
3. State aid programs for the implementation of Industry 4	
<i>Program no. 1</i>	
Program name:	Przemysł 4.0 - dotacja dla firm produkcyjnych na cyfryzację, automatyzację i robotyzację more: https://bldg.pl/przemysl-4-0/
Designed for the sector:	SME
Period:	15-30 June 2021
Aid amount:	800 000 PLN
Other indicators:	
<i>Program No.2</i>	
Program name:	Przemysł 4.0 more: https://pfr.pl/oferta/przemysl-40-pilotaz.html
Designed for the sector:	SME
Period:	till 30 June 2021
Amount:	800 000 PLN
Other indicators:	
<i>Program No.3</i>	
Program name:	N/A
Designed for the sector:	N/A
Period:	N/A
Amount:	N/A

Other indicators:	N/A
4. State of aid programs aimed at increasing the digital skills of the population:	
<i>Program no. 1</i>	
Program name:	Digital skills 50+ more: http://naviculam.pl/project/rozwoj-kompetencji-cyfrowych-osob-bezrobotnych-po-50-roku-zycia-di-ski-50/
Designed for the sector:	Unemployed citizens 50+
Period:	01/10/2016 do 31/05/2018
Aid amount:	N/A
Other indicators:	N/A
<i>Program No.2</i>	
Program name:	Skills+ more: https://www.marr.pl/skills/
Designed for the sector:	SME
Period:	2016-2021
Amount:	N/A
5. Programs aimed at supporting the digital transformation of education, supporting the employability of university graduates, other	
<i>Program no. 1</i>	
Program name:	Digital Skills Accelerator more: https://www.digitalskillsaccelerator.eu/
Designed for the sector:	Students
Period:	2017-2019
Aid amount:	199 214,00 EURO
Other indicators and Impact of the Program	N/A

Program No.2	
Program name:	AI Tech more: https://www.gov.pl/web/govtech/akademia-innowacyjnych-zastosowan-technologie-cyfrowych-ai-tech
Designed for the sector:	Students
Period:	2020-2023
Amount:	51,5 mln PLN
Other indicators and Impact	N/A
6. Digital literacy in the country:	
Percentage	44%
<p>More: https://digital-strategy.ec.europa.eu/en/policies/desi-poland</p> <p>Digital literacy in Poland is considered to be among the lowest levels in the whole EU. According to DESI (Digital Economy and Society Index), Poland ranks 24th of 27 EU Member States as of 2021. Poland makes constant progress in all fields rated and tracked by DESI. Still, given the equally positive developments in other countries, this has not translated into a change in its overall position in the past years. Poland ranks 24th of 27 EU countries in the Human capital category, being below average on basic and above basic digital skills. Only 44% of people between 16 and 74 years have at least basic digital skills (EU average is 56%), and only one in five have above-basic digital skills (EU average 36%). The COVID-19 pandemic had a powerful impact on digital skills development due to the modernization and training needed in remote work-related areas, especially education.</p> <p>Regarding connectivity, Poland ranks 21st, with 32% of Polish citizens not having broadband Internet access. Despite that, Poland ranks higher than average in the percentage of households accessing more than 100mbs internet bandwidth.</p>	

Poland ranks 24th among EU countries in integrating digital technology into business activities. 52% of Polish SMEs have at least a basic level of digital intensity, below the EU average of 60%.

Poland ranks 22th in Digital public services. 49% of internet users relied on e-government services, compared to 64% in the EU. Despite below-average usage, the Polish digital solution – the m-Obywatel digital wallet for documents and services – is currently one of the most advanced case studies among European digital identity wallet solutions.

7. What proportion of university graduates were employed within 12 months of graduation?

% of employed graduates within 12 months:	We do not have current data. Most of the data is from 2014 and indicates a longer-term outlook than 12 months.
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8. What is the awareness and preparedness of individual sectors for the digital transformation:

Sectors:	State and public administration:	2
	Services and trade:	4
	Industry:	3

9. Which jobs are most in demand:

Sectors:	State and public administration:	no
	Services and trade:	yes
	Industry:	yes more here: https://interviewme.pl/blog/zawody-przyszlosci-najbardziej-poszukiwane

10. Which sectors are the leaders in:	
1. Digital transformation:	<ul style="list-style-type: none"> - Finances & insurance - ICT <p>See here: https://www.mckinsey.com/pl/~/_/media/McKinsey/Locations/Europe%20and%20Middle%20East/Polska/Raporty/Polska%20jako%20cyfrowy%20challenger/Raport-McKinsey_Polska-jako-Cyfrowy-Challenger.pdf</p>
2. Industry 4:	<ul style="list-style-type: none"> - Automotive - Food & Beverages - Machinery - Chemistry & Pharmacy <p>See here: https://przemyslprzyszlosci.gov.pl/raport-cyfryzacja-w-polskich-firmach-wymaga-przyspieszenia/</p>
11. To what extent do universities have implemented knowledge for Industry 4 in their curricula:	
<p>Some schools, especially universities of technology, have introduced this knowledge. Business schools, especially private ones, are introducing it faster than public ones. Universities are the slowest.</p>	

Add:

1. Statistics and economic indicators related to the level of digitization and the development of digital skills/literacy in your country
2. State policies, plans, laws, initiatives, guidelines, programs related to Industry 4.0
3. Educational Activities intended to raise awareness of society and industry about Industry 4.0

4. Projects (local and international) related to Industry 4.0 in which your country participates
5. University study programs and courses directed towards Industry 4.0 technologies
6. Companies whose websites include information about Industry 4.0

Appendix 2: Digitalization and Industry 4 from the perspective of work-based environment. Desk research

0. Please indicate three companies/organizations which profile you examine in this research questionnaire:	
<p>1. PalettenWerk Kozik Spółka Jawna</p> <p>2. Hotel Panorama</p> <p>3. Tischner European University/ Wyższa Szkoła Europejska im. ks. Józefa Tischnera</p>	
1. From the point of view of your company/organization, to what extent do university graduates generally meet their requirements in the field of:	
1. Innovative digital skills:	they are unprepared or moderately prepared
2. Industry 4:	are moderately prepared
2.1. What innovative skills do your company/organizations expect from university graduates in the area of:	
1. Digitization technologies	ERP (<i>Enterprise Resources Planning</i>) management OCR in practice user experience & user interface design e-learning design web design WCAG implementation QA (automation) tests
2. Industry 4:	OCR in practice lean management managing automated production data management IoT AI Big Data

2.2 What knowledge do companies/organizations expect from university graduates in the area of:	
1. Digitization technologies	WCAG 2.1 standards RODO
2. Industry 4:	RODO cloud computing working rules
3. What job positions did the companies/organizations create or plan to create in relation to digitization and Industry 4.	
1. New positions:	UX designer QA engineer Cybersecurity manager/ specialist Big data specialist App designer
2. Estimated number of new jobs for the next five years:	N/A
4. For which processes do you plan digital transformation in the near future:	
1. Customer service 2. Packaging of products, storage of products, counting them 3. Internal trainings	
5. Prepares the university with enough experts for the new production conditions:	
Small	?
Just	
Redundant	
6. How is training generally encouraged in companies:	
1. Each employee is educated in their free time	yes

2. Every employee is looking for training courses and the company supports him in this	no
3. Further education is provided by companies externally	yes
4. Further education is provided by companies internally	yes
5. Trained staff is already hired	yes
6. Other form:	
7. Which competencies (on individual level) for Industry 4 are considered as a key:	
<ul style="list-style-type: none"> 1. Creativity 2. Entrepreneurial thinking 3. Problem solving 4. Conflict solving 5. Decision making 6. Analytical skills 	
8. Do you have a shortage or in the future you will need experts for the following areas of digital transformation and Industry 4:	
1. Digital transformation system solutions	Digital Transformation Consultant
2. Analytics, data evaluation, and optimization	Data Analyst
3. Internet of Things	IoT Consultant
4. Software applications	.Net developer, c# developer

5. Administration	Data Administrator
6. E-shop	?
7. Communication systems	System communication Administrator
8. CAD / CAM / CAE	3D printer operator
9. 3D printing	3D printer operator
10. Robotics	Scientist
11. Artificial intelligence	Data Scientist
12. Virtualization and Visualization	Visualisation/Virtualisation analyst
13. Use of databases	Data Engineer
14. Use of cloud computing	Cloud Engineer
15. Remote monitoring and diagnostics	Monitoring & diagnostics consultant
16. Other:	N/A
9. Which soft skills university graduates lack the most:	
<i>Note: 1 – least requested, 5 – most requested</i>	
1. Communication	3
2. Ability to work in a team	3
3. Analytical thinking	3
4. Critical thinking	5
5. Flexibility	5
6. Leadership	3
7. Other:	
10. In what proportion should university graduates have soft and hard skills:	

1. 0% soft skills vs 100% hard skills	
2. 100% soft skills vs 0% hard skills	
3. 50% soft skills vs 50% hard skills	It's good to have both at the same level because thanks to that university graduates are more flexible
4. 30% soft skills vs 70% hard skills	
5. 70% soft skills vs 30% hard skills	
6. Other:	
11. How the Covid-19 crisis has affected:	
1. Digital transformation, such as:	The COVID-19 crisis has accelerated the digital transformation trends around the globe, as evidenced in the development and expansion of digital infrastructure; the shift to digital delivery of services by firms and within organizations, for instance, in education, healthcare and retail; and increased implementation of digital technologies in manufacturing. Although the pandemic has had a negative impact on many businesses, it has also uncovered new opportunities for entrepreneurship. It has boosted digital entrepreneurship, for instance, reflecting changing consumer behaviour during and in the aftermath of the pandemic.

<p>2. Implementation of Industry 4, such as:</p>	<p>The pandemic has reinforced the value of industry 4.0, but it has also exposed the limitations of today's implementations and set a higher bar for success.</p> <p>Moreover, the transition to a post-COVID-19 next normal has changed the context for many digital projects. Months of unexpected costs and dampened sales have left many businesses short of cash for technology investments</p>
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