COCO4CCI

Annex

Fact Sheet Advanced Manufacturing

Version 1

03/2020

Facts about advanced manufacturers (AVM)

EU

1. In the European Union, the manufacturing sector plays a major role in the economy and hence the overall societal balance across many European regions. The manufacturing sector includes a vast range of activities and production techniques, from small-scale enterprises using traditional production techniques, such as the manufacture of musical instruments, to very large enterprises sitting atop a high and broad pyramid of parts and components suppliers collectively manufacturing complex products, such as aircraft. Around 1 in 10 (8.8 %) of all enterprises in the EU-27 ’s non-financial business economy are manufacturers a total of almost 2.0 million enterprises. The manufacturing sector employed 28.5 million persons in 2017 and generated EUR 1 820 billion of value added. By these two measures, manufacturing was the second largest of the economic activities within the EU-27’s non-financial business economy in terms of its contribution to employment (22.8 %) and the largest contributor to non-financial business economy value added, accounting for more than one quarter of the total (29.3 %).

Key indicator, Manufacturing (NACE Section C), EU-27, 2017

	Value
Main indicators	
Number of enterprises (number)	1 964 946
Number of persons employed (number)	28 531 905
Turnover (EUR million)	7 230 000
Purchases of goods and services (EUR million)	5 440 000
Personnel costs (EUR million)	1 110 000
Value added (EUR million)	1 820 000
Gross operating surplus (EUR million)	708 000
Share in non-financial business economy total (%)	
Number of enterprises	8.8
Number of persons employed	22.8
Value added	29.3
Derived indicators	
Apparent labour productivity (EUR thousand per head)	64.0
Average personnel costs (EUR thousand per head)	41.0
Wage-adjusted labour productivity (%)	154.0
Gross operating rate (%)	9.8

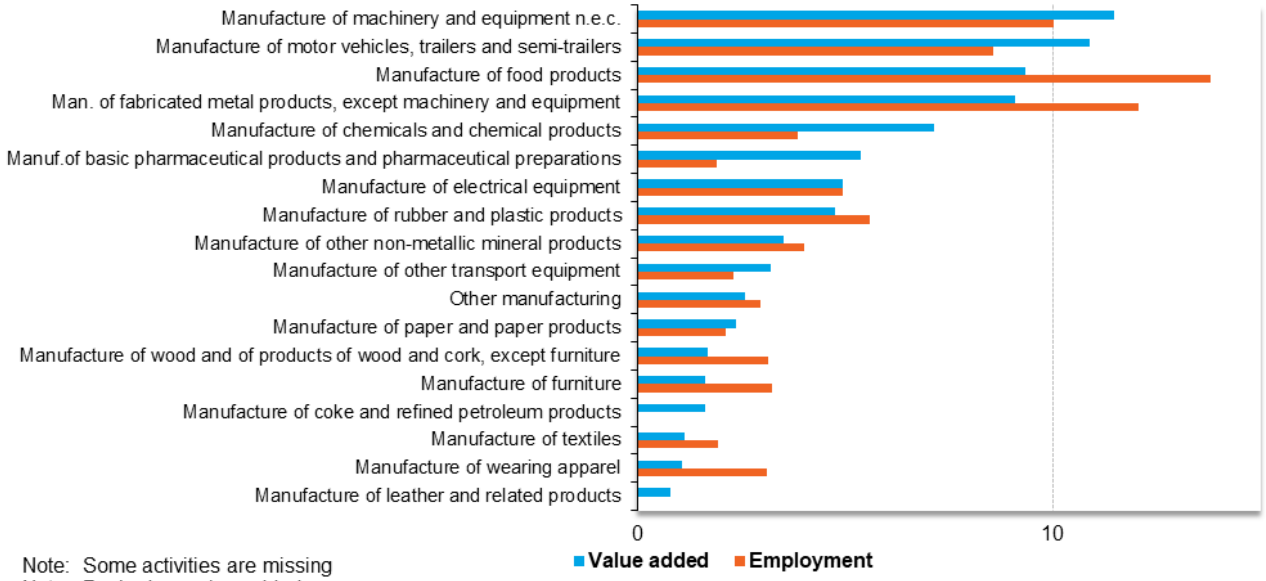
Source: Eurostat (online data code: [sbs_na_ind_r2)

eurostat

2. The manufacturing sector is responsible for over 80% of exports and 80% of private research and innovation (EPRS, 2015). In 2017, the turnover or gross premiums written of the manufacturing sector was approximately €7,900 billion EUR.
3. Manufacturing is the backbone of the European economy. In 2017 it generated EUR 2,020 billion of value added and €69,000 in value added per employee. Manufacturing subsectors are very diverse, combining activities with relatively low apparent labour productivity and average personnel costs, such as the manufacture of wearing apparel, wood and of products of wood and cork, furniture, and textiles, with other activities that have considerably higher values for the same indicators, such as manufacture of basic pharmaceutical products and pharmaceutical preparations, manufacture of other transport equipment and the manufacture of motor vehicles, trailers and semi-trailers.

Sectoral analysis of Manufacturing (NACE Section C), EU-27, 2017

(% share of sectoral total)



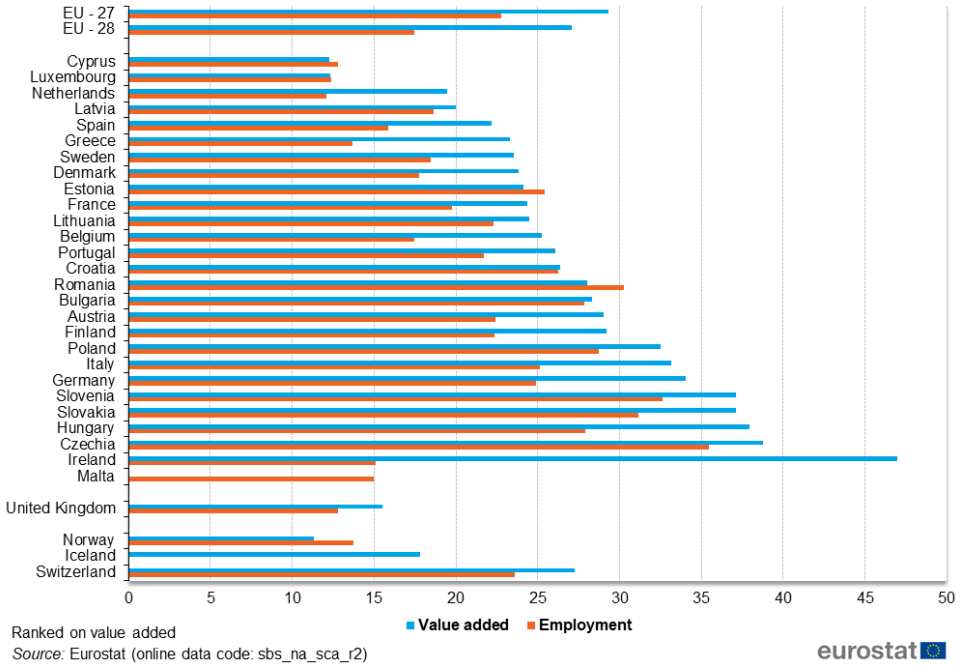
Note: Some activities are missing
Note: Ranked on value added.
Source: Eurostat (online data code: [sbs_na_ind_r2)

eurostat

4. The importance of manufacturing (measured by added value and share in employment in the economy) is with 37.0 % of the total in high in Slovenia and Slovakia. The range in employment terms was similar. Among the five largest EU Member States, Germany stood out as its manufacturing sector contributed almost one third (32.5 %) of the EU-27's value added in 2017, above its 28.0 % share of value added in the EU-27's non-financial business economy as a whole. Italy also recorded a larger share (13.3 %) of the value added generated in the EU-27's manufacturing sector than it did for the non-financial business economy as a whole (11.7 %). In value added terms, Germany was the largest EU Member State in 19 of the 24 manufacturing subsectors in 2017; Italy was largest in three (the textiles, wearing apparel, and leather and related products manufacturing subsectors). In Slovakia, the specialisation rate for the manufacture of motor vehicles, trailers and semi-trailers was very high and amounted to 8.2 % of non-financial business economy value added. Other high specialisation ratios were recorded in Slovenia for the manufacture of fabricated metal products.

Relative importance of Manufacturing (NACE Section C), EU-27, 2017

(% share of value added and employment in the non-financial business economy total)



Ranked on value added

Source: Eurostat (online data code: sbs_na_sca_r2)

eurostat

Key indicators, Manufacturing (NACE Section C), EU-27, 2017

	Number of enterprises	Number of persons employed	Turnover	Value added	Personnel costs	Investment in tangible goods
	(thousands)		(EUR million)			
EU - 27	1 964.9	28 531.9	7 230 000.0	1 820 000.0	1 110 000.0	251 000.0
EU - 28	2 101.7	31 088.4	7 930 000.0	2 020 000.0	1 220 000.0	276 000.0
Belgium	36.8	500.8	267 652.4	56 092.4	30 037.7	9 713.1
Bulgaria	31.3	556.1	33 370.8	7 767.2	3 699.1	2 160.3
Czechia	175.9	1 319.4	178 105.9	39 930.5	21 638.1	8 729.1
Denmark	15.3	310.4	115 938.8	35 623.4	20 110.0	3 761.4
Germany	190.5	7 409.6	2 193 357.5	592 027.2	413 971.2	66 088.7
Estonia	7.5	110.1	12 474.7	3 018.2	1 978.4	597.4
Ireland	16.7	219.8	226 192.9	97 262.2	11 424.7	1 099.8
Greece	57.4	320.5	54 119.8	11 521.2	6 034.0	1 558.2
Spain	168.7	1 917.7	505 350.9	110 841.4	67 211.7	18 475.9
France	197.7	3 103.6	1 021 247.9	240 268.1	175 396.6	35 296.9
Croatia	19.5	268.7	21 497.5	6 126.4	3 535.1	1 068.0
Italy	383.6	3 744.3	965 031.0	241 413.9	143 779.5	30 681.5
Cyprus	5.0	31.9	3 411.4	1 077.6	628.0	153.3
Latvia	10.9	119.5	8 409.0	2 333.9	1 297.2	520.9
Lithuania	20.3	216.5	20 257.7	4 552.7	2 582.4	997.8
Luxembourg	0.8	34.1	13 703.0	3 125.2	1 995.9	415.9
Hungary	50.8	757.8	109 581.7	24 176.0	11 358.7	6 537.0
Malta	2.1	22.2	:	:	:	:
Netherlands	66.7	698.5	345 979.9	70 850.4	38 651.6	8 762.1
Austria	25.5	638.6	191 203.9	56 265.9	35 641.8	7 283.9
Poland	198.8	2 654.8	321 925.9	70 361.0	34 119.7	15 681.5
Portugal	67.6	711.7	90 310.8	21 842.4	12 402.2	5 474.7
Romania	49.8	1 215.9	83 852.6	18 742.1	11 707.5	7 072.0
Slovenia	19.4	204.9	29 353.0	8 365.7	4 940.2	1 654.3
Slovakia	72.6	501.3	76 382.2	14 075.1	7 900.2	4 172.8
Finland	20.2	332.9	123 675.7	29 753.2	16 890.3	4 757.3
Sweden	53.7	610.2	213 355.3	55 108.7	35 480.7	8 174.7
United Kingdom	136.7	2 556.4	700 030.8	194 012.5	102 841.0	24 630.2
Iceland	2.1	22.8	6 566.6	1 981.6	1 552.4	:
Norway	17.0	221.9	85 695.0	21 429.9	14 658.6	2 755.7
Switzerland	20.1	656.7	298 061.2	98 363.7	57 276.1	10 003.7

(:) not available

Source: Eurostat (online data code: sbs_na_ind_r2)

eurostat

5. EU lags behind China, Japan, South Korea, and the United States (USA) in the acquisition of industrial robots. In 2018, 18% of EU manufacturing enterprises (at least 10 employed) used

industrial or service robots (16% use industrial robots and 4% use service robots). In Slovenia 19% of EU manufacturing enterprises used industrial or service robots (18% use industrial robots and 3 % use service robots).

6. Europe's competitiveness is highly dependent on the ability of this sector to deliver high-quality innovative products using the latest advances in ICT.
7. Manufacturing in EU-28 accounts for 17.4% of GDP. In Europe this sector is responsible for 64% of the private sector's research & development expenditure and for 49% of innovation expenditure in Europe.
8. ICT-based solutions applied across the manufacturing value chain help to make processes more efficient. They enable the creation of more personalised, diversified and mass-produced products as well as a more flexible reaction to market changes.
9. The importance of SMEs lies in the fact that they account for 58% of the total employment and 42% of the total value added by the manufacturing sector. SMEs are a key source of innovation. They naturally include start-ups seeking growth and venture capital.
10. In the EU high-tech and medium high-tech manufacturing represented 632,000 companies and 13 million jobs in 2017. The turnover was approximately €3,900 billion EUR.
11. EU countries in high-tech and medium high-tech manufacturing account for 3.7% of gross sales in tangible goods. In 2017, €144.5 billion was earmarked for investment in tangible goods. Investment in development, development and digitalisation are very important as they will help to achieve higher value added per employee. In 2017 high-tech and medium high-tech manufacturing recorded €80,000of value added per employee.

Manufacturing includes the physical or chemical transformation of materials, substances, or components into new products. The raw materials are products of agriculture, forestry, fishing, mining or quarrying as well as products of other manufacturing activities. Substantial alteration, renovation or reconstruction of goods is generally considered to be manufacturing.

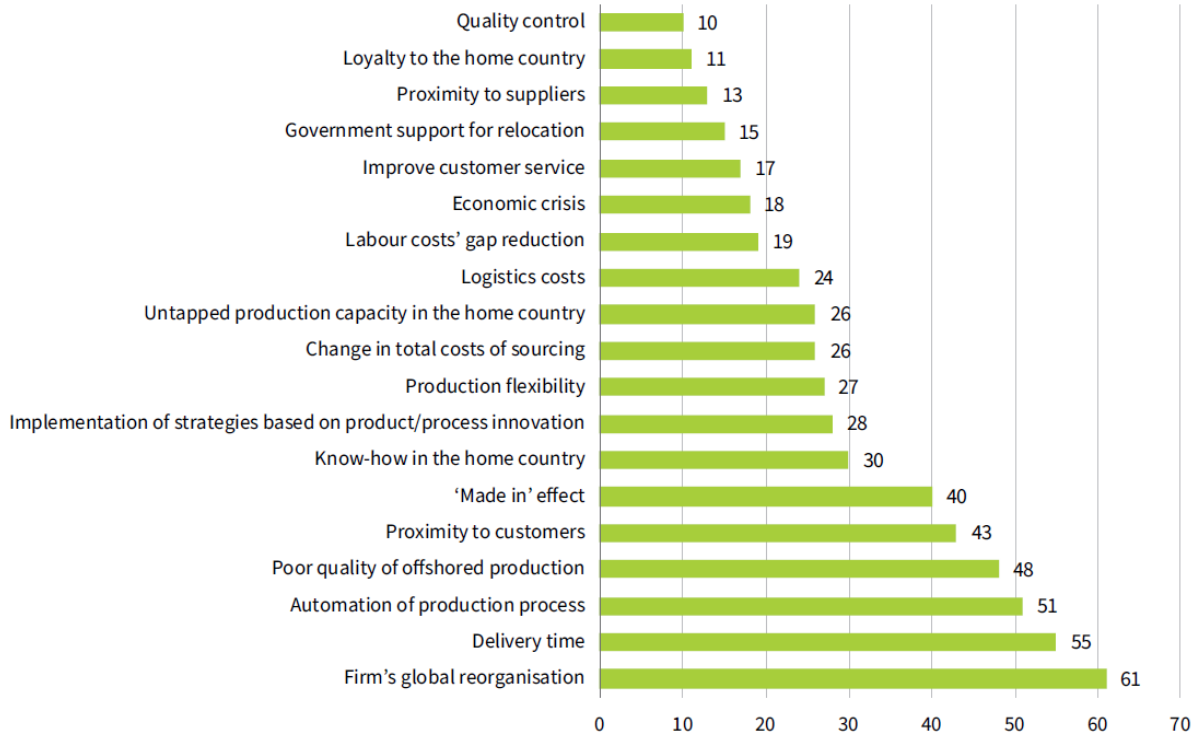
SOURCE:
Manufacturing statistics - NACE Rev. 2 Statistics Explained
Data extracted in March 2020

Advanced manufacturing encompasses all production activities applying cutting edge knowledge and/or non-technological innovation leading to improvements of existing products, processes and business models and to the production and diffusion of new ones. Advanced Manufacturing includes production activities able to improve production speed, productivity, energy and materials consumption, operating precision, waste, pollution management and enabling resource-efficient and low emission production.
Source: European Comssion

The future of Manufacturing

Manufacturing was one of the sectors that was most effected by offshoring (transfer of economic activities and employment to off-shore countries with lower labour costs, lower environmental requirements etc). What are the most cited reasons of companies for reshoring (returning their activities to Europe)?

Figure 15: Reshoring motivations (only those declared at least 10 times)



Note: *Multiple motivations can be indicated for a single reshoring case.*
Source: *Eurofound: The Future of Manufacturing in Europe – European Reshoring Monitor*

Source: Eurofound: The future of Manufacturing in Europe, April 2019

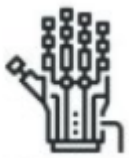
Some fun facts on manufacturing: https://www.thefactsite.com/top-100-technology-facts/

Most of today's successful companies started in garages.

That's right, aside from just Apple, other huge name companies started with humble beginnings HP, Google, and Microsoft all were started in a garage.

Slovenia

1. In 2018, Slovenian industry represented 23.7% of value added (GDP). If we compare Slovenia with EU-28 countries, the industry generates a greater share of value added only in Ireland and the Czech Republic.



2. Production in high-tech manufacturing has increased by an average of 7% in the EU in the last 5 years (2014-2018) and by 6.5% in Slovenia. Production in medium high-tech manufacturing has increased by an average of 2.4% in the EU over the last 5 years (2014-2018) and by 7.7% in Slovenia.
3. In 2018, Slovenia recorded a 5.8% share of exports of high-tech products in the country's total exports (based on the standard SITC international classi fication of goods), in the EU-28 this share was 17.9%. Thus, Slovenia lags behind the EU average in terms of exports of high-tech products by more than three times.

4. In all technologically demanding industries, Slovenia recorded a higher share of employees than the EU countries on average, as the industry is more represented in the Slovenian territory. In Slovenia in 2018 there were 24.9% of all employees in manufacturing, while in the EU-28 significantly less, 15.4%. The highest share of employees in terms of technological complexity was 14.7% in Slovenia in medium and low technology sectors; 10.2% of employees were in the high and medium technology sector in Slovenia (in EU 5.8 %).
5. In Slovenia in the 5-year period from 2013 to 2017 Manufacturing business enterprise earmarked EUR 456.7 million R&D expenditure in high-tech sectors. In high-technology manufacturing spent 46 % of R&D expenditure, in medium high-technology manufacturing 37% and in medium low-technology manufacturing only 12 % expenditure R&D.

6. In Slovenia, the most important industries (by share of manufacturing revenues generated) are the automotive industry, metal, chemical, pharmaceutical and electrical industries and also food industry.
7. Slovenia‘s productivity is about 20% below the EU’s, but Slovenia is catching up with EA-19, largely due to higher importance of a ever more advanced manufacturing. The Slovenian sector of automobiles and automobile components is equipped with robots in a way as it is in Germany.

8. In absolute terms, investment in Slovenia in the manufacturing sector has increased compared to the pre-crisis period (driven by metal products, electrical equipment and motor vehicles). High-tech and medium high-tech manufacturing spend 7% of their turnover on investment.
9. Supported by a relatively fast growth in foreign demand from the financial crisis on, the strongest productivity growth has been recorded in technologically intensive and export-oriented manufacturing activities in Slovenia. Value added - productivity in high-tech manufacturing in Slovenia in 2018 amounted to €80,000, in medium high-tech manufacturing €45,000 and in medium low-tech manufacturing €42,000.

10. In Slovenia, productivity growth in manufacturing as a whole has remained broadly in line with the euro area average, leaving the gap almost unchanged.
11. More than half of the patent applications filed by Slovenian businesses with the European Patent Office in the period 2010-2018 were filed by large enterprises. In 2018 Slovenia reported 50 patent applications per million inhabitants to the European Patent Office (EPO), most of them from industry.

Austria / Oberösterreich

1. Die heimische Industrie in Österreich erwirtschaftet einen jährlichen Produktionswert von rund ...
A: 170 Mrd. Euro <-- richtig
B: 230 Mrd. Euro
C. 95 Mrd. Euro

2. Die Industrieunternehmen Österreichs beschäftigen mehr als ...
A: 330.000 Mitarbeiter
B: 530.000 Mitarbeiter
C: 430.000 Mitarbeiter <-- richtig

3. Die österreichischen Industrieunternehmen sind mit einer Exportquote von …. % sehr stark international vernetzt.
A: 65 % <-- richtig
B: 71 %
C: 59 %

4. Welches Bundesland hat österreichweit im Sektor "Industrie" den höchsten Absatz?
A: Wien (20,7%)
B: Oberösterreich <-- richtig (38,2%)
C: Niederösterreich (27,2%)

5. Wie viele Technologie-Patentanmeldungen gab es 2018 in Österreich?
A: 1971 <-- richtige Antwort
B: 1628
C: 1447

6. Der österreichische Innovationsgeist wurde im 15 Jhdt. beim Bau des Stephansdoms unter Beweis gestellt. Welche "Geheimzutat" wurde von den Bauherrn mit dem Mörtel vermischt?
A: Wein <-- richtige Antwort (sehr saurer Jahrgang, jedoch verbot der Kaiser per Erlass den Wein einfach wegzuschütten)
B: Ausscheidungen
C: Knochenmehl

Germany

1. Germany, the UK, Italy and Poland together account for around 53 % of the high-tech sector in the EU-28.
2. Germany's high-tech manufacturing turnover stood at €121 billion in 2004.
3. Manufacturing accounts for nearly 21% of the German economy (and 7.7 million jobs)[1]
4. According to Eurostat[2], Germany had the highest spending in the high-tech manufacturing sector in 2013, at almost EUR 11.5 billion or 20 % of its total R&D expenditure
5. Germany and Italy are among the leaders regarding the dimensions of production, trade and technology.
6. AVM was identified as one of the highest-priority manufacturing technology areas in need of federal German investment.
7. Through 2025, 84% of German manufacturers plan to invest €100 billion or more per year into smart manufacturing technologies, but only 20% are already spending money on investments.
8. With about 20,000 industrial robots utilized in various industries each year, Germany is the 5th largest robot market in the world.
9. The main industries are automotive, metal working, chemical rubber and plastics, electrical and electronics and the food industry.
10. A major challenge when entering the German market is to comply with German electrical engineering standards and conformity assessment procedures.
11. The reason Germany has remained competitive against cheaper manufacturers in Asia and elsewhere is that it has made good use of new technology. The Fraunhofer network of technical institutes is an example of how researchers and manufacturers work closely together in industry.[3]

[1] according to the Manufacturers Alliance for Productivity and Innovation

[2] https://ec.europa.eu/eurostat/statistics-explained/pdfscache/46748.pdf

[3] https://www.scientificamerican.com/article/us-could-learn-germany-high-tech-manufacturing/

Poland / Westpomeranian Region

1. Poland is the sixth largest manufacturing country within the EU, with manufacturing contributing 27 percent of the country's GDP. Leading manufacturing sectors include: food and beverages; automotive; metal products; rubber and plastic; coke and refined petroleum products; chemicals and chemical products; electrical equipment; non-metallic mineral products; basic metal products; miscellaneous machinery and equipment, and furniture.

2. Gross value added in industry in 2019 increased by 4.2% compared to 2018, compared to an increase of 4.6% in 2018. In Q1-Q3 2019, most of the financial results of industrial enterprises (keeping accounting books, employing 50 people or more) were weaker than those achieved a year ago. Basic economic and financial indicators have deteriorated. Lower gross and net financial results in industry than in the previous year

3. In 2018, high-technology exports as a share of exports for Poland was 10.6 %. High-technology exports as a share of exports of Poland increased from 2.6 % in 1999 to 10.6 % in 2018 growing at an average annual rate of 8.43%.
4. In 2008-2018 in Poland was observed an increase of employment in high-tech manufacturing production of 0.2%
5. Poland reported that 50 % or more of those employed in high-tech manufacturing were women.
6. In 2017, it was reported in Poland that approx. 29.5% people were employed in knowledge-intensive activities (KIA). The EU average is 36.1%.
7. In Poland in 2016 there were 3,512 enterprises operating in the high-tech manufacturing sector.
8. In enterprises with 10 or more persons employed, sold production of industry in I-III quarter 2019 was by 4.5% higher than in the previous year (which saw 5.9% increase). An increase of production was observed in most of the industry sections, in manufacturing – by 4.9% (an increase of 5.9% in the previous year).
9. Average paid employment in industry (in enterprises with 10 or more persons employed) in IIII quarter 2019 equalled 2 771.0 thousand persons and was by 2.0% higher than in the previous year.
10. Number of persons employed by enterprise size class (2017): small enterprises 28,4%, medium enterprises 26,6%, large enterprises 45,0%.
11. To help Polish industry move to the next level, the Polish Government launched its Industry 4.0 Platform in 2019. The aim of this project is to increase the innovativeness of Polish companies, popularizing knowledge about 4.0 processes and developing competences in areas such as robotics and automation.
12. Poland currently ranks as a moderately innovative country (21st place in the Bloomberg Innovation Index) as measured by R&D spending, manufacturing capability and high-tech companies' presence.
13. One of the most innovative investments of last years was a 3M SuperHub in Wroclaw, a modern production plant which became a model for the region. The plant, called the "manufacturing plant of the future", has highly automated production and supply chain, as well as modern safety and security measures controlled by drones.
14. The potential of a given country in terms of the development of Industry 4.0, and the main barriers can be measured using the following indicators:
    - according to NRI (2016) - 42 place (out of 139)
    - according to DESI (2018) - 24th place (out of 31)
    - according to EDPR (2017) - 23 place (out of 28)

    Position in the DESI and EDPR rankings puts Poland in a group of low-performing countries, which also includes Romania, Greece, Bulgaria, Italy, Hungary, Croatia, Cyprus and Slovakia. Despite the improvement observed from year to year, Poland still does not exceed the average for the European Union countries in any category.
15. The Polish Government provides a number of incentives to support advanced manufacturing and industrial transformation through tax incentives and a robust grant system to support research and

innovation surrounding manufacturing. Grants are provided to support industry research, and experimental means of production that are likely to be implemented in manufacturing. These projects, with a budget of USD 200 million, are supervised by the National Center for Research and Development (NCBiR) and the Agency for Industry Development (ARP).

16. Recent analyses of the competitive global industry markets indicate Poland is in a strong position for and has good prospects of future investments in industrial automation and manufacturing technology. Good opportunities for U.S. exporters include for example:
additive manufacturing equipment, sensors and instruments, electric motors and actuators, electrical relays and industrial control equipment, handling equipment, industrial robots, including those used in spot welding, sorting, palletizing, and painting or machine tools for cutting metal and forming metal pieces.
17. Examples of companies from Zachodniopomorskie Voivodship:

- GARO - Garo Polska, based in Szczecin, manufactures electrical equipment and charging stations for electric cars and distributes selected products on the Polish market.
- DGS Poland, based in Mierzyn near Szczecin, is involved in implementing new products and manufacturing hearing aids and diagnostic equipment. The company also operates a distribution centre for hearing aids and diagnostic equipment with a state-of-the-art high-bay warehouse. The company employs a high-class engineers and specialists.
- 3 SHAPE - Danish company 3shape Poland, which produces in Szczecin the only teeth scanning devices in the world. It employs the world's largest team developing scanners and software for the dental segment.
- Bridgestone is the world's leading manufacturer of tyres for passenger cars and commercial vehicles, trucks, motorcycles, agricultural machinery, aircraft and earthmoving machinery. Founded in 1931, the Japanese company has more than 70 tire factories around the world and has over 144,000 employees. The Stargard factory is one from Bridgestone's state-of-the-art production facilities. Over 900 people work there.
- Plastics Technology (TTS) based in Goleniów is a company that builds luxury ocean yachts. They sets new quality standards not only for Poland but also for the whole world. Their products are known all over the world and are the pride of the most renowned marinas and ports. Despite the huge of success in the yacht industry, we're still short.

Methodology:

https://stat.gov.pl/

https://ec.europa.eu/eurostat/home?

https://www.trade.gov/

Italy

1. The most competitive manufacturing sectors in Italy are the beverage (which in 2008 was ranked in the tenth position), chemicals, pharmaceuticals, machinery and transport.
2. With about 5,400 manufacturing companies high-tech, Italy is one of the top four countries in the world Countries in Europe (together with Germany, UK and Poland), where there are overall about 46,000 high-tech companies. Then widening the perspective to sectors high technology (i.e. including, beyond to manufacturing, also services), Italy still ranks at the top in Europe, with over 105,000 companies.
3. In Italy, companies invest a lot of resources in scientific and technological research. According to European Commission data, research and development of top Italian R&D spender (approximately € 185.4 million) is higher than the EU average (€ 165.8 million)
4. Industrial robotics is a sector highly concentrated and dominated at the global level from four leading countries: China, South Korea, Japan and the United States. However, Italy ranks 7th in the world with an annual production of 6,500 units (Figure 7), which is estimated to rise to about 8,500 by 2020.
5. In 2017, the IoT market in Italy has reached a value of more than 3 billion and a half of the euro, with a growth rate of 32% compared to the previous year. For the past three years, in fact, the value of the sector is more than doubled (+139%). At particular, the Smart Metering and Smart Car are those with the highest value absolute (980 and 810 million), followed by the Smart Building (520 million) and Internet solutions of Things for industrial logistics (360 million).
6. The most critical issues in the high-tech manufacturing sector emerge when considering the backwardness of the Italian education system in terms of skills and training on most advanced technologies. According to estimates of the Ministry of Economy and Finance, Italy has much lower values to the European average as regards the dissemination of digital skills in the workforce (29% vs. 37%).
7. In Italy, the Artificial Intelligence market is still in its infancy - 85 million euros were spent on algorithm development. Only 12% of the companies have a project underway, while almost half have not yet moved but are about to do so.
8. The value of Industria 4.0 projects carried out in 2018 amounted to 3.2 billion euros, up 35% compared to the previous year.
9. The technologies most used by industries 4.0 are Industrial IoT, which represents 60% of the cake (1.9 billion) and recorded the strongest growth (40%). This is followed by Industrial Analytics (530 million euros, up 30%) and Cloud Manufacturing (270 million, +35%). Among the production technologies (OT) the most important values are Advanced Automation (160 million, +10%), Additive Manufacturing (70 million) and Advanced HMI (45 million, +50%).
10. Flexibility (47%) and increased efficiency (38%) are the two main benefits that companies have recorded. Other benefits include reduced design time and the possibility to develop innovative products. The main obstacle identified is the difficulty in using technology and adopting standards, followed by organisational issues and finding professionals with digital skills.

Slovakia

Photo by Lenny Kuhne on Unsplash

1) **Industry 4.0 is based on the vision of smart factories - with a fully integrated, automated and constantly optimized via interconnected cyber systems.**

   In order to transform their factories, manufacturers need to have a possibility to develop, evaluate and test compatible solutions in a production-like environment with interaction with the latest technologies.

   How is a research and experimental environment, in which companies interested in automated and digitized production according to Industry 4.0 principles, can test innovative solutions for smart factories themselves, verify their compatibility, functionality and efficiency, simulate and optimize manufacturing and related in-house processes?

a) TestBed 4.0
a) TestLab 4.0
b) Industry 4.0 Lab

Odpoveď a) je správna. 20.02.2020 bolo na pôde Technickej univerzity v Košiciach otvorené prvé slovenské testovacie laboratórium - TestBed 4.0. Pracovisko je orientované na riešenie praktických potrieb priemyselných podnikov spojených s digitálnou transformáciou. Okrem technologického vybavenia poskytuje tiež špecialistov pre potreby rôznych skupín používateľov (napr. podnikom, študentom, výskumníckym pracovníkom). Viac sa dozviete tu https://www.testbed.sk/

Photo by Greg Wilson on Unsplash

2) **Although the aerospace industry is more of a new industry in the Slovak economy, its strong potential, which arose in the strength of related industries, is evident.**

At the same time, the industry builds on the old tradition of Slovak inventions such as parachute and helicopter.

What is the name of the Slovak inventor who invented the helicopter?

a) Štefan Banič
b) Maximilián Hell
c) Ján Bahýľ

Odpoveď c) je správna. Dôstojník rakúsko-uhorskej armády Ján Bahýľ, mal mimoriadne technické nadanie. Zaoberal sa množstvom rôznych technických problémov z odboru vojenskej vedy, vojenskej stavebnej techniky a strojárstva. Od roku 1892 do roku 1895 pôsobil v Trebeníku, kde skonštruoval a úspešne vyskúšal balóny so vzdušnou turbínou. Svoj najväčší sen, vrtuľník s motorovým pohonom, začal realizovať po presťahovaní do Bratislavy. Pri realizovaní jeho nápadov mu významne pomohla spolupráca s Antonom Marschalom, ktorý vlastnil továreň na koče a vozy (sídlila na rohu dnešných

bratislavských ulíc Grösslingová a Tobrucká). Cisár František Jozef I. mu 13. augusta 1895 udelil na vrtuľník patent č. 3392. Vylepšený vrtuľník skonštruoval v roku 1901 a vzniesol sa do výšky asi pol metra; v roku 1903 to už bolo 1,5 metra. Dňa 5. mája 1905 sa Ján Bahýľ vzniesol do výšky asi štyroch metrov a preletel približne 1 500 metrov. Tento jeho najvýznamnejší let zaprotokolovala aj Medzinárodná vzduchoplavebná spoločnosť.

https://vedanadosah.cvtisr.sk/jan-bahyl-vynalezca-vrtulnika

Photo by Greg Wilson on Unsplash

3) **The automotive industry is the driving force of the SK economy. Slovakia also belongs to the key players of the global automotive industry. In which indicator is Slovakia the world leader?**

a) Slovakia is the global leader in the car production per capita
b) The highest annual production of cars
c) The best developed e-mobility sector

Odpoveď a) je správna. Automobilový priemysel má na Slovensku silnú tradíciu. Za posledných 20 rokov bol dôležitým zdrojom priamych zahraničných investícií. O dôležitosti tohto priemyslu v slovenskej ekonomike svedčí aj prítomnosť svetových automobilových značiek ako Volkswagen, PSA Peugeot Citroën, Kia Motors či Jaguar Land Rover. https://www.sario.sk/sk/investujte-na-slovensku/sektorove-analyzy/automobilovy-priemysel

Photo by 五玄土 ORIENTO on Unsplash

SAV vyvinula tzv. penový hliník. Uhádnete, jeho využitie v praxi?

4) **Slovak Academy of Science developed so-called aluminium foam. Can you guess its use in practice?**
   a) Samonosné ľahké panely pre dopravné a stavebné konštrukcie / self supporting light panels for transport and architecture
   b) Náhrada polystyrénu v obalovom priemysle / Replacement of polystyrene in the packaging industry
   c) Deformačné časti automobilov na ochranu pasažierov pred nárazom / impact energy absorption components for cars as protection for passengers

A aj C je správna odpoveď. Penový hliník je špeciálnym spôsobom pripravený vysokoporézny materiál na báze hliníka alebo jeho zliatin. Póry tvoria viac ako dve tretiny celkového objem. Jeho vlastnosti ho robia zaujímavým pre použitie, najmä v konštrukciách dopravných zariadení a v stavebníctve.

Zdroj: https://www.sav.sk/index.php?lang=sk&doc=activity-offers-results-home&work_total_no=98

Slovenská spoločnosť RONA vyváža svoje sklárske výrobky do celého sveta. Tipnite si, na ktorých miestach ich NEnájdete.

Photo by Andrew Seaman on Unsplash

5) **Slovak company RONA exports its glass products all over the world. Guess, where you can't find them.**
   a) Buckinghamský palác / Buckingham palace
   b) Biely dom / White House
   c) Mrakodrap Burj Khalifa v Dubaji / Skyscraper Burj Khalifa in Dubai

C je nesprávne. Skláreň RONA má viac ako 125 ročnú históriu a patrí medzi významných svetových výrobcov vysoko kvalitného nápojového skla, stolovacích doplnkov a dekoračných predmetov zo skla. 96% produkcie sa vyváža do viac ako 80 krajín celého sveta. V súčasnosti je RONA spoločnosťou so silnou exportnou pozíciou, kvalifikovaným personálom a špičkovou technológiou. Vnímame ju ako dobrý príklad prepojenia špičkových dizajnérov a technológiami. Viac nájdete v našej brožúre [prelink na brožúru dobrých príkladov].

Photo by mnm.all on Unsplash

Slovensko býva kvôli chýbajúcej výskumno-vývojovej a inovačnej základni označované ako montážna dielňa. Ako dôkaz toho, že by to mohlo by inak, môžu slúžiť úspechy slovenských dizajnérov v spolupráci s automobilovým dizajnom.

Spolupráca s ktorou automobilkou bola kľúčová pre Ateliér transport dizajnu VŠVU, z ktorého vyšlo mnoho úspešných slovenských dizajnérov v oblasti transport dizajnu?

6) **Due to the lack of research and development and innovation base, Slovakia is referred to as a car assembly hall. However, the successful cooperation of Slovak designers and the automotive industry shows it can be otherwise.**

The cooperation with which the car manufacturer was the key for the Transport Design Studio at VŠVU, from which many successful Slovak designers in the field of transport design came out?

a) **Škoda**
b) **Volswagen**
c) **KIA**

Odpoveď b) je správna. Ateliér transport dizajnu, ktorý vznikol na VŠVU v roku 1993, nadviazal spoluprácu s dizajnérskymi centrami VW vo Wolfsburgu a Ingolstadte, výsledkom bolo zásadné zefektívnenie štúdia na tejto vysokej škole. Spolupráca zahŕňala pomoc pri materiálnom vybavení, či výmenou skúseností renomovaných automobilových dizajnérov zo zahraničia.

https://www.library.sk/arl-scd/sk/csg/?repo=scdrepo&key=1648570790