



DATA AS THE ENGINE OF EUROPE'S DIGITAL FUTURE

The European Data Market Monitoring Tool Report

12 June 2019

D2.5 SECOND REPORT ON POLICY CONCLUSIONS

UPDATE OF THE EUROPEAN DATA MARKET STUDY
SMART 2016/0063

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1. Introduction

The European data market has increased by over 50% from 2014, when we started tracking its value, to 2018 (from €47B to €72B in the EU28), a remarkable increase by any estimate. But even more remarkable has been the change in awareness about the value of data and the potential of data-driven innovation to increase growth and welfare. While data was once the domain of accountants and math geeks, today it is recognized as a precious resource (often likened to oil) by everyone, from entrepreneurs to the general public. But only in the last couple of years the role of data as the key ingredient to capture value from digital innovation has become clearly recognized. Collecting, analysing and exploiting data is understood as the enabling condition of digital transformation, the continuous transformation of business processes by which enterprises exploit the opportunities of digital innovation. “Data monetization” was a virtually unknown concept 3 years ago and today is quoted by every self-respecting manager. “Innovation accelerator” technologies such as the Internet of Things, Virtual/Augmented Reality, Cybersecurity, Robotics, Additive manufacturing (3d printing) rely on the collection and manipulation of data to be implemented.

But the real game changer is the connection between Big Data and Artificial Intelligence. Big Data is the fuel powering the emerging AI innovation wave, driven by breakthroughs in machine learning and deep learning technologies. Without massive datasets to train neural networks, the current generation of AI systems and applications would not exist. And of course, without Big Data and AI we would not have the next generation of digital assistants, robots and drones which promise to change profoundly our work and personal lives. The European Union has recognised the relevance of the forthcoming AI revolution by launching an AI Communication and Action Plan¹, coordinating efforts and increasing investments to make sure that Europe keeps pace with international competition. At the same time, Europe has chosen to deal also with the potential risks of Artificial Intelligence, aiming for a human-centered AI, characterised by the respect for human autonomy, prevention of harm, fairness and explicability (for example, transparency of automated decision-making processes). And a pre-condition to achieve this ethical balance is to make sure that the datasets feeding into AI are collected and managed respecting the principles of privacy protection and basic human rights.

Given this scenario, monitoring the dynamics of the data market and of the data economy in Europe is more important and interesting than ever. This report presents the most recent key findings of the European Data Market (EDM) Monitoring Tool, designed by IDC in collaboration with the Lisbon Council to provide the European Commission with a comprehensive view of the data-driven economy, through annual reports. Maximising the growth of the Data Economy is a key objective of European policies and specifically of the Digital Single Market (DSM) Strategy, deployed through the many policy initiatives launched in 2016-18, such as the Digitizing European Industry initiative, the European Cloud initiative, the AI Action Plan. The EDM Tool provides a key contribution to measuring the progress towards these policy objectives, as well as a baseline for the forthcoming initiatives such as the Digital Europe Programme (DEP: 9.2 billion Euro of investment, 2021-2027),

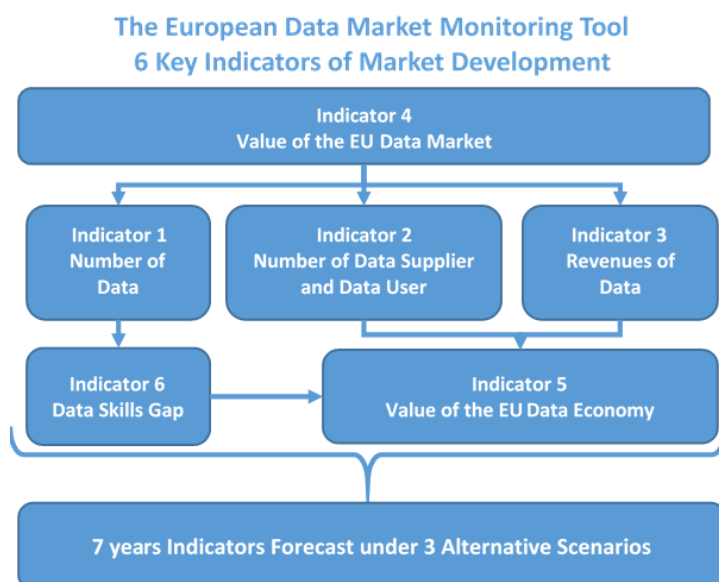
¹ COM(2018) 795 final, <https://ec.europa.eu/digital-single-market/en/news/coordinated-plan-artificial-intelligence>

This year 2019 will also see the completion of the mandate of the current European Commission and Parliament, with a new Commission to be appointed by the end of the year. There will be changes and new policy priorities. Nevertheless, the need for Europe to capture the digital opportunity will remain at the forefront of European strategies. Next year, European Parliament and the Council will finalise the new Multi-Annual Financial Framework 2021-2027 proposed by the Commission making decisions which will influence the size and directions of the investments in digital technologies and policies. In this scenario, market intelligence is needed more than ever to inform and support strategic decisions.

The EDM Monitoring Tool provides a unique perspective of the development of the data ecosystem in Europe, through 6 main indicators measuring its key components (see Figure 1): the skills (the number of data professionals and the gap between demand and supply of data skills); the enterprises and their roles (both data suppliers and data user companies); the demand-side value (the market) and the supply-side value (the data suppliers revenues); and finally the overall impacts on the economic system, through the estimate of the European Data Economy as a share of EU GDP. This report presents the main indicators for the year 2018 and the potential development paths of the EU28 Data Market and Data Economy to 2025 under the three updated scenarios presented in the Second Report on Facts and Figures²: Baseline scenario, High Growth scenario, and Challenge scenario. These scenarios provide a snapshot of the range of magnitude of the potential economic gains or missed opportunities facing the Data Economy.

Finally, the EDM Monitoring Tool measures a more limited set of indicators for three other international economies, the U.S., Brazil and Japan. The report presents a snapshot of the indicators and looks more closely at the U.S., examining the competitiveness implications. The full set of indicators is available in the “Facts and Figures” report. Further results of the study are published on the website www.datalandscape.eu.

Figure 1: The European Data Market Monitoring Tool



² Update of the European Data Market Study, SMART 2016/0063, D2.1 Second Report on Facts and Figures

2. THE EU DATA MARKET GROWTH IN 2018

The year 2018 sees all the indicators measured by the EDM tool in a positive growth dynamic from 2017, as the European economy continues a positive cycle of development. The value of the Data Economy, which measures the overall impacts of the Data Market on the economy as a whole, is to exceed the threshold of 300 Billion Euro in 2018 for EU28, with a growth of nearly 12% over the previous year. Brexit uncertainties, however, play an important role in affecting the results for the EU28, which shows lower growth in 2018 compared to the EU27 (12.6%). The positive trend in the growth of the Data Economy is confirmed by the EU28 Data Market value in 2018, which is displaying a growth rate well above the one exhibited by the total IT spending, at 9.7% year-on-year, reaching 71.5 Billion Euro. This positive dynamic is registered in all Member States, even though the pace of growth varies, with small economies pushing forward their digitisation strategies, such as Slovakia, Lithuania, Slovenia and Latvia, thus exhibiting significantly higher growth rates than the EU average. A faster growth of the Data Market is also registered among the more traditionally ICT-oriented economies: as a matter of fact, the Data Market continues to grow significantly in France, Sweden and Germany, confirming the positive correlation between the size of the Data Market, the economic strength of the Member States, and their national spend on ICT. Overall, six Member States (the U.K., France, Germany, Italy and Spain – the so called “Big 5” – plus the Netherlands) account for approximately three quarters of the EU28 Data Market amount in 2018. In this framework, however, the U.K., while still confirming itself as the largest Data Market in Europe, exhibits for the first time year-on-year growth rate below the EU average.

As far as supply and demand are concerned, data suppliers are estimated at more than 283,000 units in the EU28 for 2018, exhibiting a year-on-year growth of 4.2%. Data users, instead, are projected to grow at 3.4% in 2018, amounting to more than 715,000 units. Following increasing growth rates over the prior four years, these figures show a picture of consolidation of data companies in the EU.

Revenues generated by data suppliers have increased by 12% to reach 77 Billion Euro in the EU28 with the U.K., still in the leading position, Germany, France, Italy, the Netherlands and Spain showing the highest share of data revenues per country - together accounting for more than three quarters of data revenues in the European Union.

According to the latest estimates, the number of data professionals in the EU28 reached 7.2 million in 2018, corresponding to 3.4% of the total workforce, with an increase of 8% over the previous year. However, in 2018, the EDM Monitoring Tool continues to register an imbalance between the demand and the supply of data skills in Europe as the estimated gap grew by 18% reaching approximately 571,000 unfilled positions in the EU28, corresponding to 7.2% of total demand. This gap is not expected to decrease over the next few years, pointing to the need for policy intervention to further develop data skills in Europe.

The European Data Market Monitoring Tool – Key Numbers 2018 for EU28

Indicator 1: Data Professionals

Workers who collect, store, manage, analyse, interpret, and visualise data as their primary or as a relevant part of their activity.



Indicator 6: Data Professionals Skills Gap

The indicator captures the potential gap between demand and supply of data skills in Europe.



Indicator 2: Data Companies

Data suppliers have as their main activity the production and delivery of digital data-related products, services, and technologies.

Data suppliers



Data users

Data users are organisations that generate, exploit collect and analyse digital data intensively and use what they learn to improve their business.



Indicator 3: Data suppliers' revenues

The aggregated value of all the data-related products and services generated by EU Data suppliers companies.



Indicator 4: Value of the Data Market

The marketplace where digital data is exchanged as "products" or "services" as a result of the elaboration of raw data.



Indicator 5: Value of the Data Economy

The Data Economy measures the overall impacts of the data market on the economy as a whole.



Source: EDM Monitoring Tool, IDC 2019

3. THREE SCENARIOS FOR THE EUROPEAN DATA ECONOMY

By the year 2025 Europe will develop a thriving data-driven economy, reaping the benefits of a coherent and effective effort of digital innovation across the EU: or maybe not, as the choices made today, as well as the influence of external factors, may hinder the achievement of this growth potential. These are the alternative evolution paths of the European Data Market (EDM) and Data Economy, described in this report as 3 potential scenarios, driven by different macroeconomic and framework conditions, shaped by critical turning points to be faced in the next years by governments, businesses and social actors. The scenarios presented here are an update of those presented in March 2018³, building on the updated EDM dataset and forecasts⁴ and insights from last year's events. The 2025 scenarios main focal issues are confirmed as following:

- **The Data Market's pace of growth:** how fast will data-driven innovation grow in Europe? The scenarios outline the 3 alternative possibilities of slow, medium or fast pace of innovation, **including the speed of AI solutions take-up**, which will clearly be a differentiating factor, given the interdependence between the availability of high-quality data and AI services and applications.
- **The potential evolution of the model of data governance**, in terms of how the ownership, access, control and exploitation of data assets will be managed. To put it more bluntly: who will have power on data and what will governments do about it? The scenarios outline future models ranging between two potential extremes: on the one hand, a data governance model where a few data holders (private or public) control most of data assets; on the other hand, an open and participatory data governance model, based on sharing and transparency. **Using the terminology developed in the last year for AI, this should be the trustworthy and human-centric Data Economy Europe aspires to.**

Since data flows are global, this data governance model will not be a set of rules decided by a single government, but the result of the interplay of conflicting interests and decisions of main private and public stakeholders in the next years. It will be shaped by the slow emergence of globally shared and accepted principles of data governance from the discussion in international fora. The strong debate about the possible risks and the social challenges posed by the potential abuse of data has driven Europe to take the first steps towards developing ethical guidelines for a socially responsible and human-centric AI⁵, which may well become the reference framework for a balanced model of data governance ensuring the respect of human rights, but also the exploitation of opportunities and the fair distribution of benefits.

The Data Economy scenarios therefore are positioned at the intersection of these two main focal issues as follows (see also the Figure below):

- The **Baseline scenario** is characterised by a healthy growth of data innovation, a moderate concentration of power by dominant data owners with a data governance model protecting personal data rights, and an uneven but rather wide distribution of data innovation benefits in the society. This is considered the most likely scenario.

³ "How the power of data will grow the EU Economy", First report on Policy Conclusions, Update of The European Data Market Study, April 2018, SMART 2016/0063, <http://datalandscape.eu/study-reports>

⁴ "Second Report on Facts and Figures", Update of The European Data Market Study, March 2019, SMART 2016/0063, <http://datalandscape.eu/study-reports>

⁵ "Ethics Guidelines for Trustworthy AI", High Level Experts Group on AI, April 9 2019.

- The **High Growth scenario** (Data-driven reality) is characterised by a high level of data innovation, low data power concentration, an open and transparent data governance model with high data sharing, and a wide distribution of the benefits of data innovation in the society;
- The **Challenge scenario** (Digital Maze) is characterised by a low level of data innovation, a moderate level of data power concentration due to digital markets fragmentation, and an uneven distribution of data innovation benefits in the society.

The scenarios explore the drivers and framework conditions which may lead to maximise the benefits of a balanced Data Economy and to avoid the risks of an unbalanced one, highlighting the consequences of policy actions.

Figure 2: Overview of the 2025 Scenarios



Source: The European Data Market Monitoring Tool, IDC, 2019

Table 1: Macroeconomic Assumptions

MACROECONOMIC ASSUMPTIONS	Baseline Scenario	High Growth Scenario	Challenge Scenario
		Data-driven Reality	A Digital Maze
Economy trends	Moderate GDP growth trends in the period with a short slowdown around 2020	Strong GDP cumulative growth trends driven by continuing worldwide prosperity	Trade wars and political conflicts slow down cumulative GDP growth rates over the period
EU 27 GDP growth CAGR 2018-2025	1.7%	2.1%	1.2%
EU 27 ICT spending growth CAGR 2018-2025	1.4%	1.9%	0.9%
EU27 Data Market as a share of ICT spending	15.2%	19%	13.7%
EU 28 GDP growth CAGR 2018-2025	1.7%	2.2%	1.2%
EU 28 ICT spending growth CAGR 2018-2025	1.6%	2.1%	1.1%
EU28 Data Market as a share of ICT spending	15.1%	19.5%	13.7%

13 June 2019

Table 2: Policy-Regulatory Assumptions

POLICY-REGULATORY ASSUMPTIONS	Baseline Scenario	High Growth Scenario	Challenge Scenario
		Data-driven Reality	A Digital Maze
Personal Data Protection and privacy protection	GDPR implementation successful with some MS slow in complementing its norms and supporting its application	GDPR becomes worldwide standard, successfully increases trust and confidence by business and consumers	GDPR is implemented, but does not succeed in building some enterprises refrain from data-innovation for fear of GDPR fines
Free Flow of Data (FFoD) Regulation (EU) 2018/1807 – entering into force May 2019	FFoD succeeds in preventing data localisation constraints across the EU, facilitates cross-border business and stability for SMEs and start-ups – but industry codes of conduct slow and uneven	In addition to baseline, successful development of industry-specific codes of conduct facilitating a structured and seamless sharing of data – supports scaling-up of innovative data services	Many MS find ways to still request data localisation, so that cross-border data flows remain partially hindered – weak industry codes, some cloud customer lock-in especially for SMEs
Digital Single Market, incentivising data sharing and cross-border trading	Gradual but partial implementation of DSM	Clear, pan-European legal data governance framework enables the monetisation of data assets	Continuing legal uncertainty insufficient implementation of DSM
Copyright Directive approval (15 April 2019)	Directive transposed by 2021 in most MS – but digital platforms have difficulty in enforcing protection – uneven impacts on cross-border flows of digital contents	Directive transposed by 2021 in most MS – strikes balance btw authors, publishers and digital platforms- encourages digital content fair protection and distribution cross-border	Slow transposition of Directive, digital platforms reluctance, uncertainty about users-created content, result in limited impacts on cross-border flows of content
Fostering Open Data policies, standardization, interoperability	Gradual development of standards, positive development of open data	Fast achievement of ICT standardization plan goals by 2020	Failure of open standards, lack of interoperability across the EU
Launch of Digital Europe Programme 2021-2027	DEP launch and initiatives start to improve digital transformation, digital capacities and the development and deployment of open platforms and standards	Fast start of DEP successfully accelerates digital transformation, digital capacities and the development and deployment of open platforms and standards	DEP increases investments and builds digital capacities but more slowly than expected, with patchwork impacts on the EU economy
Developing a skills base for the Data Economy	Education/training system reforms gradually increase supply of data skills – support from DEP initiatives	Supply of data skills grows faster than in Baseline, but still lags demand - boost from Digital Europe Programme (DEP)	Insufficient public and private investments in data skills – limited DEP impact – persistent data skills gap particularly in some MS
Competition, anti-trust issues in Data Economy	New policies start emerging but impacts still limited	EU leads development of new global policies restraining excessive power of private online platforms	EU cannot find common policies, some Member States take autonomous decisions, fragmented landscape
Regulating new ethics, liability and safety issues	Policy discussion on robots/ drones/ automated vehicles liability and safety start creating enabling conditions AI Ethics Guidelines published, start making an impact on trust and boosting AI	Policy succeeds in accompanying innovation but still providing appropriate safeguards AI Ethics Guidelines make a strong impact improving trust and confidence	Fear of new risks leads to restrictive policies, slows down innovation in Europe AI Ethics Guidelines are not taken seriously, breaches and negative impacts reduce trust and confidence in data economy

Table 3: Data Market Assumptions

DATA MARKET ASSUMPTIONS	Baseline Scenario	High Growth Scenario	Challenge Scenario
		Data-driven Reality	A Digital Maze
Data technologies supply-demand dynamics	Data industry drives technology innovation, lower costs, data holders gradually increase demand.	The adoption of big data technologies spreads beyond pioneers to mainstream users; a fully developed data ecosystem powers a positive demand-supply growth cycle – boost by the DEP	European innovation forces become lost in a maze of digital barriers (incomplete Digital Single Market). Only the best enterprises and the richest regions keep pace with the technology race
Development of the data ecosystem in Europe	Emergence of multiple vertical/horizontal industrial and personal data platforms providing secure data sharing and trading environments for data industry and data owners	The industrial and personal data platforms converge in interoperable EU infrastructures with clear governance models, fostering participation of SMEs	Insufficient development of the data ecosystem, limited diffusion of data sharing platforms
Rate of diffusion of digital transformation and data-driven business models	Fast adoption by large companies and innovative SMEs; public sector gradually catches up during the period; slower adoption by traditional SMEs	Widespread diffusion of digital transformation, EU SMEs learn to adopt data monetization solutions; successful impact of DEP and other policies supporting fast digital transformation	Slower adoption of digital transformation and data-driven business models hindered by lower private investments, lower expectation of take-up of innovative services, lack of trust and confidence in data sharing
Deployment of 5G infrastructures	Commercial deployment starts around 2020, uneven diffusion across Europe	5G networks and services deployment accelerated and fully interoperable across Europe by 2025	Slow deployment of 5G networks and services undermine IoT/ advanced services diffusion
Cybersecurity	EU cybersecurity capacities develop gradually, networking improves promoting timely solutions (with help of DEP investments); some countries lag behind	Advanced cybersecurity capacities built and deployed in the EU; existing capacities scaled up and networked across the EU; latest solutions widely deployed; cybersecurity skills gap reduced (with help of DEP investments)	Uneven availability of cybersecurity capacity across Europe, insufficient networking and collaboration of competence centres, EU cybersecurity industry still fragmented (insufficient effectiveness of DEP)

Table 4: Global Trends

Global Trends	Baseline Scenario	High Growth Scenario	Challenge Scenario
		Data-driven Reality	A Digital Maze
Investments and diffusion of Artificial Intelligence	The AI action plan starts being implemented, increasing availability of data and algorithms for European AI – launch of AI PPP - impacts felt at the end of the period	The AI action plan is successfully implemented ensuring fast adoption of AI solutions, common dataspace and a competitive European human-centric AI industry, impacts already felt by 2022 onwards	AI action plan does not succeed in fostering collaboration and economies of scale, fragmentation of investments and initiatives leads to slower deployment and take-up and dominance of non-EU industry
Diffusion of IoT	Fast growth hindered by EU cross-borders on data flows	Fast growth especially of combination IoT-analytics	Slower growth and markets fragmentation hinder full exploitation of analytics in IoT
Commercial service robotics	Europe's sales of commercial service robots and components, service and robotics grow fast in Europe (forecast CAGR 15%, period 2017-2022, source IDC) but slower than in Asia-Pacific or the US (approximately 20%)	Europe's sales of robotics grow faster than foreseen catching up with the other world regions	Europe's sales of commercial robotics are slower than expected with automation hindered by inertia, reluctance to transform production processes and lack of investment.

3.1 Baseline Scenario

This scenario predicts a healthy growth of data-driven innovation and increase of investments in the new wave of digital innovation, pioneered by the most advanced, competitive and innovative enterprises, mostly large (both as technology providers and users) with a minority of competitive SMEs, savvy in the use of ICTs. In this scenario, leading companies and regions will increase their advantage as more traditional companies and sectors struggle to move at the same speed. Another potential factor could be the uneven diffusion across Europe of 5G infrastructures needed to support next generation online services and especially IoT.

In this scenario, the EU GDP cumulative growth average in the period 2018-2025 (+1.7%) will sustain the investments in the digital economy and consumer willingness to spend. As a result, the Data Market is forecast to reach 83 billion Euro in the EU27 and 106 billion in the EU28, with a compound annual growth rate of 6.5% and 6.4% respectively between 2025 and 2020. The Data Economy will grow faster than the Data Market, thanks to a positive multiplier impact of data innovation on the economy, reaching a value of 555 billion Euro in the EU27 and 680 billion Euro in the EU28, doubling its incidence on EU GDP to 4% and 4.2% respectively, compared to 2.2% for EU27 and 2.4% for EU28 in 2017. Enterprises will add more than 3 million data professionals' positions between 2020 and 2025. However, this will increase the potential data professionals skills gap to approximately 925,000 unfilled positions in the EU27 and more than 1 million unfilled position in the EU28, corresponding respectively to 10% and 9.2% of total data skills demand. The lack of skills may become a bottleneck for some enterprises or regions, as data talent "wars" will likely develop for the most skilled professionals.

Responding to globalisation and international competition, European enterprises will accelerate their digital transformation process, enabled by data-centric processes and new digital business models. By the year 2025, companies able to monetize data assets and employ digital multi-user, cloud-based platforms will exploit B2B data sharing and achieve the relative business benefits, proving the business case for data-driven innovation. Already, IDC estimates that by 2020, 50% of large enterprises will be generating Data-as-a-Service revenues from the sale of data assets. Several business trends will push the demand of data services: the industry move towards "servitisation", transforming products into services (for example selling mobility services instead of cars), the need to keep costs under control, the decreasing costs of data technology, the diffusion of "digital twins" of products and services built through data to simulate/anticipate faults, performances, check quality. Demand-supply dynamics will move towards a mix of continuing technology push with demand pull.

The leading global players (Google, Facebook, Amazon, Apple) will maintain their dominance of personal data flows, but will have to negotiate allowing individual users more control on their personal data and accepting some transparency measures. Anti-trust and competition authorities across Europe and the Americas will work hard to develop tools and methods able to contain the power of the big platforms and impose fiscal obligations. There are already some signs of this happening. Europe's antitrust chief Margrethe Vestager imposed a 1.49 billion euro fine to Google (the largest ever) for blocking rival online advertisers, and soon afterwards cautiously welcomed Google's attempts to boost rivals and offer Android users a choice of browser and search apps in order to comply with her orders in two separate cases. Open data platforms and multiple industry platforms will increase their role in non-personal data flows creating a more open and competitive data sharing environment and therefore sustaining the Data Market. This scenario therefore is positioned between the two extremes of high and low concentration of power and data control.

This is not a scenario where policy fails, rather one where policy has only a partial success. In 2019 we start seeing the effects of some policy measures aiming at building the Digital Single Market, first of all the General Data Protection Regulation (GDPR) and the Free Flow of non-personal Data Regulation (FFoD). GDPR has established a worldwide standard for privacy protection and is being emulated across the world, including by the US (California has approved a law called “GDPR-lite”, and the federal government is considering its options). However, implementations’ hurdles remain, especially concerning the tension between extracting value added from data but still respecting GDPR principles. The emergence of AI technologies with their need for datasets is only sharpening this debate. We foresee the GDPR to create gradually a successful harmonisation of regulation across the EU, but we suspect that there will be a need for adjustments and revisions. Removing barriers to the flow of non-personal data across Europe is a critical success factor to unlock the exploitation of European datasets at a scale and scope sufficient for the new data-driven processes such as machine learning. In short, the completion of the Digital Single Market will progress and possibly be completed only at the end of the forecast period. In this scenario, European investments in digital innovation will increase strongly through the Horizon Europe and the new Digital Europe Programme, with support by industry through the Public-Private Partnerships (PPP) and their collaborations (currently there are agreements between BDVA (Big Data Value Association) – ETP4HPC (European Technology Platform for High Performance Computing), AIOTI (The Alliance for Internet of Things Innovation), and expectations for a new AI PPP).

The European Data Market Monitoring Tool – Baseline Scenario 2025 for EU28

Indicator 1: Data Professionals

Workers who collect, store, manage, analyse, interpret, and visualise data as their primary or as a relevant part of their activity.



Indicator 6: Data Professionals Skills Gap

The indicator captures the potential gap between demand and supply of data skills in Europe.



Indicator 2: Data Companies

Data suppliers

Data suppliers have as their main activity the production and delivery of digital data-related products, services, and technologies.



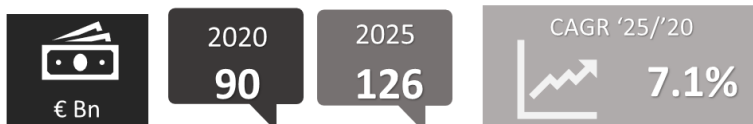
Data users

Data users are organisations that generate, exploit collect and analyse digital data intensively and use what they learn to improve their business.



Indicator 3: Data Suppliers' revenues

The aggregated value of all the data-related products and services generated by EU Data suppliers companies.



Indicator 4: Value of the Data Market

The marketplace where digital data is exchanged as "products" or "services" as a result of the elaboration of raw data.



Indicator 5: Value of the Data Economy

The indicator captures the potential gap between demand and supply of data skills in Europe.



Source: EDM Monitoring Tool, IDC 2019

The European Data Market Monitoring Tool – Baseline Scenario 2025 for EU27

Indicator 1: Data Professionals

Workers who collect, store, manage, analyse, interpret, and visualise data as their primary or as a relevant part of their activity.



Indicator 6: Data Professionals Skills Gap

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Indicator 4: Value of the Data Market

The marketplace where digital data is exchanged as "products" or "services" as a result of the elaboration of raw data.



Indicator 5: Value of the Data Economy

The indicator captures the potential gap between demand and supply of data skills in Europe.



Source: EDM Monitoring Tool, IDC 2019

3.2 High-Growth Scenario

In Data-Driven Reality, the growth of the European Data Market will enter a faster growth trajectory than in the Baseline scenario and the adoption of data technologies will spread beyond the minority of pioneers to a wider population of mainstream users. Digital transformation, data monetization, B2B data sharing on multi-user cloud platforms will spread faster than in the Baseline scenario. All industries will keep pace, also the public sector, even though the intensity of data innovation will grow faster in Finance, Manufacturing, Professional services, ICT and Media. The supply-demand dynamics will change from technology-push to demand pull, with a fully developed ecosystem generating positive feed-back loops between data companies and users.

In this scenario, the EU GDP compound annual growth rate in the period 2020-2025 (+2.2%) will be 2.5 times higher than in the Challenge scenario and 1.5 times higher than in the Baseline scenario. This will accelerate the investments in the digital economy and consumer willingness to spend. In the European Union public and private investments will accelerate in Artificial Intelligence, advanced robotics, automation as well as new skills. As a result, the Data Market is forecast to reach 107 billion Euro in the EU27 and 142 billion Euro in the EU28, with a compound annual growth rate of 12% and 12.7% respectively between 2025 and 2020. The Data Economy will reach a value of 829 billion Euro in the EU27 and 1,054 billion Euro in the EU28, with an incidence on EU GDP of 5.8% and 6.3% respectively, compared to 2.4% and 2.6% in 2018. Enterprises will add more than 4 million data professionals' positions between 2020 and 2025 (compared to 3 million in the previous scenario). However, the potential data professionals skills gap will grow exponentially to 1.5 million unfilled positions in the EU27 and 1.7 million unfilled positions in the EU28, corresponding respectively to 14% and 13% of total data skills demand. This risk will need to be managed in advance or the lack of skills will become a serious constraint for data-driven companies and data suppliers.

The potential drivers of this scenario combine economic and social factors. Thanks to the diffusion of data innovation to all sectors, public services such as healthcare become more effective and efficient creating social welfare. The increasing concentration of population in urban centres is accompanied by investments in technical innovation and the rise of smart cities, which enable economic growth and social well-being. Technologies are implemented in such a way to enable decentralised power and individual control of data. Thanks to standardisation and interoperability, multi-user platforms multiply and compete, while the collaborative economy flourishes as well as data sharing. Blockchain becomes a key component of data value chains where small players have equal or more say than large players, insuring transparency and security. Policy making also starts adopting blockchain-based ledgers. Market forces accompanied by smart regulation reduce the power of the dominant players such as Google, Amazon, Facebook. The pervasive growth of Internet of Things with smart sensors everywhere (smart dust) and the take-off of cognitive computing and AI promote the diffusion of hyper-personalised services, digital assistants and Privacy Enhancing Technologies (PETs), improving quality of life. At the same time the pervasiveness of digital services and digital assistants creates risks of alienation and isolation.

European policies have a relevant role to play in this scenario. The completion of the Digital Single Market within the forecast period is a key success factor: this requires rapid and successful implementation of the GDPR and the Free-Flow of non-personal data initiative, with true liberalisation of data flows across Europe. R&D investment at EU and national level must be particularly effective and the Network of Excellence Centres must succeed in becoming innovation beacons in every region as well as increasing the supply of scarce data skills. In short, in this scenario Europe captures in full the digital opportunity, as advised by McKinsey.

The European Data Market Monitoring Tool – High Growth Scenario 2025 for EU28

Indicator 1: Data Professionals

Workers who collect, store, manage, analyse, interpret, and visualise data as their primary or as a relevant part of their activity.



Indicator 6: Data Professionals Skills Gap

The indicator captures the potential gap between demand and supply of data skills in Europe.



Indicator 2: Data Companies

Data suppliers

Data suppliers have as their main activity the production and delivery of digital data-related products, services, and technologies.



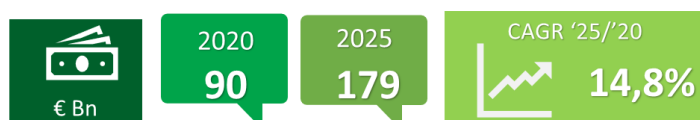
Data users

Data users are organisations that generate, exploit collect and analyse digital data intensively and use what they learn to improve their business.



Indicator 3: Data Suppliers' revenues

The aggregated value of all the data-related products and services generated by EU Data suppliers companies.



Indicator 4: Value of the Data Market

The marketplace where digital data is exchanged as "products" or "services" as a result of the elaboration of raw data.



Indicator 5: Value of the Data Economy

The indicator captures the potential gap between demand and supply of data skills in Europe.



Source: EDM Monitoring Tool, IDC 2019

The European Data Market Monitoring Tool – High Growth Scenario 2025 for EU27

Indicator 1: Data Professionals

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The indicator captures the potential gap between demand and supply of data skills in Europe.



Source: EDM Monitoring Tool, IDC 2019

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3.3 Challenge Scenario

In the Challenge scenario, European innovation forces become lost in a maze of barriers and are unable to overcome them, resulting in much slower Data Market and Data Economy growth. This is a more extreme version of the Baseline scenario, where markets fragmentation and the failure to complete the Digital Single Market exacerbate regional and industry differences, so that only the best enterprises and the richest regions keep pace with the technology race. This scenario foresees a negative self-reinforcing circle, where less positive global economic conditions discourage investments and weaken global demand with a negative impact on European growth. A slower pace of digital innovation deprives the economy of the boost to growth potentially given by data-driven services and products, while enterprises find competing in international markets more difficult.

In this scenario, the EU GDP compound annual growth rate in the period 2020-2025 will be only 0.9%, that is substantially lower than the other scenarios. A lower pace of global economic growth could be caused by relevant geo-political shocks in critical regions, such as North Korea or the Middle East; or maybe trade wars fostered by new protectionist policies; or else a new financial crisis, foreshadowed by the ongoing downward correction of the stock markets. If any or more than one of these events occur, the ultimate impacts on EU growth will depend on the resilience of the European economy.

A major driver of this scenario is an unexpected resistance to digital transformation by enterprises and the population due to reluctance to change, and difficulty in adopting new processes and ways of working, compounded by a relatively old working population and lack of specialist skills. Major security breaches of personal data and a widespread mistrust in social media and data platforms may also create a social backlash requiring a longer period of social negotiation before the adoption of innovation, such as digital assistants, is accepted. The need to create new rules for drones or robots to interact with humans avoiding accidents and managing risks also slow down their adoption. The leading global players (Google, Facebook, Amazon, Apple) will maintain their dominance of personal data flows: the major counterforce will be reluctance to use, as well as the protection of the GDPR.

As a result, in this scenario the Data Market is forecast to approach 72 billion Euro in the EU27 and 93 billion in the EU28, respectively marking a compound annual growth rate of 3.6% between 2020 and 2025. In the same context, the Data Economy will reach a value of 444 billion Euro in the EU27 and 546 billion Euro in the EU28 with an incidence on GDP of 3.3% and 3.5% respectively, compared to 2.4% for EU27 and 2.6% for EU28 in 2018, or to 4% and 4.2% respectively in the Baseline scenario 2025.

The number of data professionals will still increase to 8.5 million in the EU27 and 10.3 million in the EU28 in 2025, adding 2 million data professionals' positions compared to 2020. We estimate a potential data skills gap of approximately 775,000 unfilled positions in the EU27 and 829,000 unfilled positions in the EU28 in 2025, corresponding respectively to 9% and 8% of total demand, as demand will still grow faster than supply. The lower supply will be due mainly to lower market entries from other careers and less upskilling-retraining initiatives, because of the lower attractiveness of the Data Market. The uneven diffusion of data innovation will result in a mismatch between demand and supply by geographical area across the Union, with unemployment in some regions and unsatisfied demand in others.

Concerning the role of policies, this scenario is driven as much by the failure of the Digital Single Market and of innovation investments than by global economic trends. The risk of insufficient digital

capacities and networking powering data innovation across Europe would create a disadvantage for the European industry and a growth gap with other world regions, particularly Asia-pacific.

The European Data Market Monitoring Tool – Challenge Scenario 2025 for EU28

Indicator 1: Data Professionals

Workers who collect, store, manage, analyse, interpret, and visualise data as their primary or as a relevant part of their activity.



Indicator 6: Data Professionals Skills Gap

The indicator captures the potential gap between demand and supply of data skills in Europe.



Indicator 2: Data Companies

Data suppliers

Data suppliers have as their main activity the production and delivery of digital data-related products, services, and technologies.



Data users

Data users are organisations that generate, exploit collect and analyse digital data intensively and use what they learn to improve their business.



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The marketplace where digital data is exchanged as "products" or "services" as a result of the elaboration of raw data.



Indicator 5: Value of the Data Economy

The indicator captures the potential gap between demand and supply of data skills in Europe.



Source: EDM Monitoring Tool, IDC 2019

The European Data Market Monitoring Tool – Challenge Scenario 2025 for EU27

Indicator 1: Data Professionals

Workers who collect, store, manage, analyse, interpret, and visualise data as their primary or as a relevant part of their activity.



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Source: EDM Monitoring Tool, IDC 2019

4. VALUE FROM DATA, THE NEW PRIORITY OF DATA USERS

While in the early phase of development of the data market enterprises focused on the collection and management of data, now business users prioritize strongly the extraction of value from data, which includes also data monetization. In the EDM Monitor, data users are defined as enterprises which make a strategic use of data to improve their business and their number has grown in 2018 to 715,000 organizations in the EU28 (+3.5% on the previous year). There has been a growth of awareness by data users of the need to move from analytics for business intelligence, to exploitation of data transform business processes. This is in fact the definition of the digital transformation process, where enterprises digitise their business processes to exploit the opportunities of digital innovation. As shown in the Figure below, data flows are at the heart of the model of the digital transformed enterprise, connecting internal and external processes through an intelligent core and enabling value-added engagement within and without the organization, with customers and with partners in the ecosystem. In this context, recent IDC research has found that multiple managerial figures in the company tend to be involved in the extraction of value from data. They can be grouped under two main typologies of data value processes (Figure 4): decision support and automation processes, which may involve all the top manager roles, including the Chief Digital Officer (CDO) and the Chief Information Officer (CIO), but also Line of Business (LoB) managers; and data monetization, more closely concerned with the development of data-driven new products or services, which tend to be the domain of the CDO or strategic production managers, with a strong involvement of customers.

In this chapter therefore we will focus on the evolution of the behaviour of data users and data companies (the supply side of the data market), providing insights through case studies of data monetization and of the combination Big Data and Artificial Intelligence. We will explore the way in which Big Data is driving the emergence of AI and how this is bound to affect profoundly the data market and the data economy in the next few years. We will also provide a view of the evolution of the data landscape, the overview of the data industry with a specific focus on start-ups, monitored and periodically updated by the EDM Monitoring Tool.

Figure 3 The role of data at the centre of the digital transformation platform (IDC)

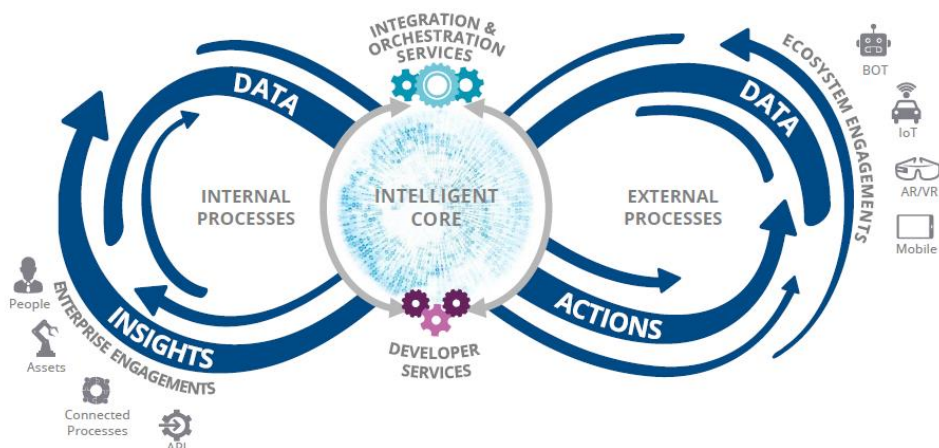
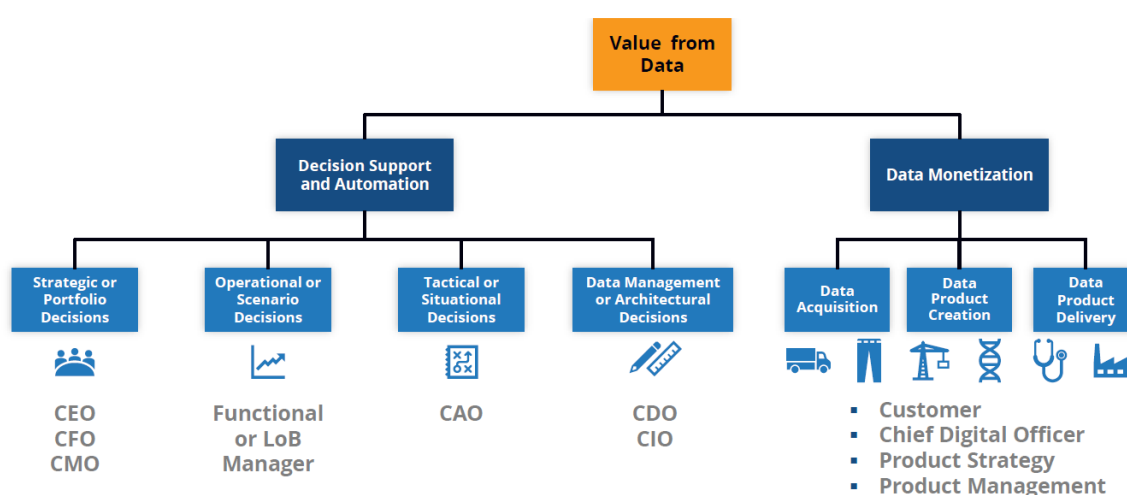


Figure 4 Data value process: main actors and roles⁶



4.1 Exploring Data monetization⁷

Constant advances in the process of digital transformation are putting a growing number of companies in the position to use, re-use and exchange data to generate growth. As a result, while still in its infancy, data monetisation already constitutes a powerful means to generate additional revenues by using data to add new services to existing offerings, developing new business models, and even directly selling data-based products, services or utilities.

We have identified three primary paths towards realizing that value for data:

1. Direct revenue from data sale/licensing;
2. Additional revenue from bundling data with other services or products;
3. Exchange premiums/trade advantages or discounts.

The first path to data monetisation (Type 1) is revenue generated directly from data sales or some form of data licensing. This is notably the case of companies in the information services industry, such as credit bureaus, which collect data about people or organization and then sell the credit ratings as a service. Type 2 (Additional revenue bundled with other solutions) is obtained when a service provider (e.g. a software provider) combines its “regular” solution with additional value-added services. Exchange premiums or trade discounts (Type 3) does not entail net-new revenue for the data. Instead, something else than money is exchanged.

To better understand how enterprises actually implement data monetization, we carried out three case studies which are briefly summarized in the table below.

⁶ Source: (“How do you build a successful Data-as-a-service business?” Dan Vesset, IDC, Group VP Analytics, IDC Directions 2018

⁷ Source: “Data Monetization”, D.3.3, October 2018

Table 5 Overview of Case Studies of Data Monetization

Name	Industry	MS	Core Business	Data business model
DAWEX	Information Technology / Start Up	FR	Data marketplace where organizations meet, buy and sell data, directly and securely.	The company makes profit from the data transactions between data suppliers and users – it can request a per-transaction percentage commission, a subscription, or a set of variable fees based on optional services. Since its foundation, Dawex has progressively enlarged its data offer in distinct sectors and recruited 2,000+ companies on board of their platform, of which 45 % are based in Europe (with a majority of them in France), 38 % in the United States, and the remaining 17 % in other countries (mostly based in Asia).
Pirelli	Manufacturing	Italy	Multinational tyre manufacturer	In 2017, Pirelli officially launched the <i>Connesso</i> system, a digital connected platform that continuously collects and tracks data from tyres on the road. This provides drivers with constant updates on their tyres' status, while allowing fleet managers to enhance replacement scheduling and efficiency optimization. The business model is a pay-per-use fee: the driver pays to access the data obtained by its car and to use the value-add services provided by Pirelli.
TfS (Transport for London)	Local government / Transport	U.K.	Local government body responsible for the transport system in Greater London,	TfL does not have a strategy to directly monetise data but rather to provide cost saving through optimisation through 3 main tasks: a. Making data available through the TFL open Data Portal: b. <u>Partnerships with private organisations</u> c. Provision of an Open API for data fusion and integration
BT Radianz (British Telecom)	Telecoms - ecommerce	U.K.	Business-to-business e-commerce company owned by BT that provides IP networking and scalable connectivity to the global financial community	The company provides a marketplace for financial operators to trade data with a business model based on a per-transaction fee or subscription fee paid by the subscribers of the financial community.

Source: IDC 2019

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While certainly helpful from a theoretical perspective, the case-studies featured in this paper unveil a rather more complicated situation in Europe.

- **A clear-cut form of data monetisation is hard to find.** In fact, a data exchange resulting in the creation of straight revenue streams for data holders as a result of a direct sale (Type 1), or in the form of additional revenue in conjunction with the offering of other services (Type 2), does not appear to be very common in Europe today.
- **Benefits such operational efficiency, cost optimization, and enhanced quality seem to prevail vis-à-vis data monetisation per se.** Indeed, the case studies reveal the prominence of indirect benefits such as operational efficiency, cost optimization, enhanced quality obtained through the data sharing rather than the generation of direct revenue streams.
- **Platforms are the preferred means to perform and enable data monetisation.** Buyers and sellers of data rarely connect directly. A technical platform in the form of a data marketplace or a simpler solution such a website is usually preferred to exchange and monetize data.
- **Medium to large companies are at the forefront of data monetisation.** While certainly open to all sorts of companies, the services offered by most platforms enabling data sharing, and hence data monetisation, appear to be used primarily by medium to large companies.
- **Wide differences in digital maturity, uncertainty surrounding data access rights, persisting risks related to data privacy and lack of data skills still hamper the development of data monetisation.** What is more, differences in digital maturity across industries (for example, financial services and retail on the one hand and education and public sector on the other hand) represent a serious obstacle to the development of data monetisation practices.

Based on this analysis, there is room for policy intervention. A few, preliminary conclusions can be summarized as follows:

1. Raise awareness about the advantages offered by data monetisation.

Data holder and supplier companies alike, and in particular SMEs, need to become more aware of the opportunities offered by their data in terms of new revenue generation, additional income obtained in conjunction with the offering of other solutions and possible premiums or other forms of business advantages that can be achieved by sharing their data with other organizations. Data re-users, on the other hand, need to better understand the advantages of acquiring data from other companies for their internal usage (to improve productivity, better manage costs, and enhance customer relationships) or with the aim of creating brand new business opportunities.

2. Create a trusted environment around data monetisation.

The case studies demonstrate that extra-efforts in user-friendly data exchange mechanisms, confidentiality, licensing and pricing agreements and, not least, clarity on data access rights, help build trust between data holders and data re-users thus fostering new possibilities of data monetisation.

3. Improve clarity on the legal framework affecting data monetisation.

While a lot has been done to enhance data protection and privacy in electronic communications and to remove restrictions pertaining to non-personal data, most of the interviewed companies seem to have little knowledge about these efforts and indicate a lack of legal clarity regarding data ownership rights and/or about what can be lawfully done with datasets (usage of data), or again the difficulty in understanding/meeting the legal requirements on data protection in B2B transactions as the main reasons for not fully engaging in data monetisation exchanges. As companies cherish contractual freedom and direct bilateral agreements, awareness-raising measures, voluntary

schemes, non-legislative interventions and enhanced regulatory guidance are likely to produce beneficial effects.

4. Increase funding for SMEs to engage in data monetisation.

The case studies featured in this research indicate the lack of financial resources as one of the main hindrances to data monetisation practices, especially for SMEs and micro companies. To allow this fundamental sector of the European economy to fully benefit from data monetisation, additional funding and ad-hoc investment measures are needed. Indeed, the companies interviewed in this research, and other studies on data-sharing in the B2B environment pointed to the limited available financial resources as one of the key obstacles for European companies to effectively monetise data. SMEs in particular could greatly benefit from targeted financial aid aimed at scale up data sharing technical solutions or help companies to invest in marketing solutions and communication activities to increase awareness among potential data users.

5. Extend research on data monetisation.

Data monetisation may take several forms, evolve towards additional practices not yet known, and provide extra benefits not yet considered. More research on data monetisation mechanisms at play in other parts of the world, especially in the United States, Japan but also in China and India, could be beneficial to help the European data economy grasp new opportunities related to data sharing and monetisation.

4.2 A brief definition of AI

Somewhere between the expectation of the end of the human race displaced by super-intelligent machines, beloved by Elon Musk and many other believers in the “singularity”, and a rapid descent into the “trough of disillusionment” of over-hyped technologies, the reality of Artificial Intelligence (AI) exists, is growing and is actually driving deep transformation processes in the economy and the society⁸.

The European Commission has adopted a wide-ranging definition of Artificial intelligence that refers to the concept of “system” (or “systems”) specifying that these systems can undertake decisions and be made of software or embedded in hardware devices. *“AI refers to systems that display intelligent behaviour by analysing their environment and taking actions – with some degree of autonomy – to achieve specific goals. AI-based systems can be purely software-based, acting in the virtual world (e.g. voice assistants, image analysis software, search engines, speech and face recognition systems) or AI can be embedded in hardware devices (e.g. advanced robots, autonomous cars, drones or Internet of Things applications)”*⁹.

According to IDC, global spending on AI increased by 57% in 2018 compared to 2017 (from \$16 to \$25 billion) and will explode to \$79 billion by 2022¹⁰. Stronger computational power, more sophisticated algorithms, breakthroughs in machine learning techniques and the increasing availability of vast amounts of data have been the primary elements concurring to the rapid advancement of AI, which is expected to be a catalyst for the near future success of other data-

⁸ FTI Consulting, “The global policy response to AI”, February 2018, <https://euagenda.eu/upload/publications/untitled-128126-ea.pdf>

¹⁰ IDC Worldwide Semiannual Artificial Intelligence Systems Spending Guide, March 2019

intensive technologies such as IoT, autonomous vehicles but also mobile and multi-channel consumer technologies¹¹. These advances have been a tremendous boost for the data market and data economy. Big Data makes the data available: AI makes the data actionable and this is why it generates such excitement in the business world.

Moreover, AI is emerging as the key to accelerate digital transformation, a very important factor for European policy strategies dealing with the need to stimulate the digitization of European industry. However, the generation of AI technologies entering the market is far from mature and its full exploitation will require deep transformation of organizational and business processes as well as skill changes and new ways of working. As every new technology, AI will need to be “domesticated” by the socio-economic system to reach its full potential. Issues such as trust, transparency, ethic and social challenges will need to be managed, as is clearly understood by Europe’s strategic objective to develop a “human-centered AI”.

4.3 How Big Data is driving AI: selected business cases

From banking to retail, from the manufacturing industry to the insurance and finance sector, a myriad of AI-applications based on Big Data and Analytics (BDA) are rapidly emerging and Europe is no exception in this respect. Within the context of this project, we have recently carried out a study to explore the state of the art of AI take-up in Europe, including the analysis of 5 case studies of business implementations of AI by European enterprises¹². At worldwide level, European organizations are still struggling when it comes to the full adoption and deployment of AI applications. According to a recent IDC survey conducted in July and August 2019 about the status of AI in Europe, the adoption of AI technologies and solutions is still relatively low in Europe — around 14% of organizations today — but it is increasing quickly with a positive trend set to continue in the coming years

While AI can be deployed in virtually every sector and for the most disparate reasons, most organizations in Europe are using AI and BDA to enhance customer experience and satisfaction. IDC’s AI survey¹³ reveals that 66% of the respondents adopt, or are considering the adoption, of AI systems to increase quality of products and services alongside with creating improvements in customer support. Interestingly, Big Data and Analytics are viewed to serve similar purposes – 44% of the respondents maintain that the main business value driving the adoption of BDA tools and technologies is to improve business process, 43% are using BDA to improve market understanding and 42% indicated product improvement as the third main driver for adoption. Again, a customer-centric approach revolving around better business processes, enhanced products and services, increased market understanding, and improved customer services lies behind the interaction and adoption of AI and BDA.

The findings obtained through the desk research and the in-depth interviews carried out to feature the five case-studies presented in this research point to the same direction. AI solutions are adopted to advance the organization’s predictive capabilities, allowing for a better interpretation of customer needs and improved forecast accuracy. This is the case of Voyage Privé (an online travel agency) and its ability to better interpret customers’ preference signals or AXA (a global insurance company) and its advanced predictive model thanks to deeper self-learning capabilities. AI is further embraced to

¹¹ Davenport T. H., Ronanki R., “Artificial Intelligence for the Real World”, Harvard Business Review, January–February 2018 issue, <https://hbr.org/2018/01/artificial-intelligence-for-the-real-world>

¹² “How Big Data is driving AI: Selected Examples of AI Applications across European Industries”, Story 4, Update of the EU Data Market Study

¹³ AI I Europe: Key Findings of IDC’s 2018 AI User Survey; IDC Survey, 2018 (Doc #EMEA44220518, Aug 2018 – IDC Survey)

extend the quality of products and services (AXA claims an increase in forecast reliability of 78%, for example, and Airbus – the aerospace company – signals an error rate passing from 11% to 3% thanks to the use of AI), as well as to obtain overall business benefits in sales & marketing campaigns (+6% in one year for Voyage Privé) and customer loyalty programmes (+11% for Coyote System, a real-time road information company).

Several challenges remain to be overcome as there is still too little understanding of the elaboration mechanisms deployed by AI applications, especially when Machine Learning and Deep Learning techniques are involved and a general lack of trust in the results produced by this technology is still widespread. For these reasons, regulatory initiatives and policy-related interventions are starting to arise. A fundamental step in this direction has been taken by the European strategy¹⁴ recently set forth by the European Commission to promote a human-centric AI approach that places people at the centre of the development of AI.

4.4 The Evolution of the European Data Landscape

The current trends sustaining the European Data Market and the Data Economy are reflected in the EU Data Landscape database that has been devised since the beginning of the European Data Market study (SMART 2013/0063) and constantly updated over the years to capture the latest dynamics among the key players of Europe's data economy environment.

Indeed, the European Union data environment is showing clear and continuous growth with the addition of new companies but also the scaling up of the older ones. The EU Data Landscape database as measured at the beginning of 2019 grew by 16% from 2018. The research conducted in the Second EU Data Landscape Report (D4.2) focused on Key Data Companies, adding 150 new entries in this category. Key Data Landscape companies are major drivers of growth and reflect the size, scale of the data economy as well as its future potential. The updated database includes now 1459 companies spread over 41 countries – The EU28 plus Belarus, Bosnia and Herzegovina, Georgia, Iceland, Israel, Kenya, Moldova, Norway, Serbia, Switzerland, Turkey, Ukraine and the United States.

The United Kingdom data sector continues to dominate the European market. Data companies with headquarters in the UK account for 24.4% of the total EU Data Landscape database. The second country with the most data companies in the EU is Spain with 13.2%, third comes Germany with 8.8% followed closely by France at 8.6%. In the middle of the league, we find the Netherlands and Belgium with 4.6% and 4.1% respectively. Sweden, Switzerland, Ireland, Poland, Austria and Finland complete the list of top 13 countries in the database. In terms of categories of data companies, Analytics data companies continues to dominate the data landscape, followed by the Enabling Players category and by the Vertical Applications category that grew by three percentage points reaching 17% of the database (from 169 companies in 2018 up to 246 in 2019). Given the prominent role that artificial intelligence and machine learning technologies are gaining in Europe, the Landscape features a specific category of companies belonging to the AI and Machine Learning, the highest number of which is found in the U.K. (25% of the total), followed by Spain (12%), Germany (11%) and France (11%).

¹⁴ Artificial Intelligence for Europe", COM (2018) 237 final, 25.4.2018; "Coordinated Plan on Artificial Intelligence", COM(2018) 795 final, 7.12.2018

4.5 European AI and R&D policies influencing the EDM scenarios

April 2019 saw the third edition of Europe's "Digital Day", a high-level political meeting of the EU and the Member States aimed at pooling efforts and investments to accelerate the diffusion of digital technologies contributing to economic growth and social welfare. In the past two years, the Digital Day was the occasion to launch important cooperation initiatives in the areas of supercomputing, digital industry, connected and automated driving, AI, blockchain and eHealth. This year, the participating Member States signed Declarations of cooperation¹⁵ on:

- Empowering women's participation in digital;
- Smart and sustainable digital future for European agriculture and rural areas;
- Digitising cultural heritage.

In addition, the EU presented the "Guidelines for a Trustworthy AI" developed by the High-Level Expert Group on Artificial Intelligence (HLEG)¹⁶ - a 52-member large group of experts on AI from academia, industry, civil society and research charged with the elaboration of recommendations on future-related policy development and on ethical, legal and societal issues related to AI, including socio-economic challenges.

If these policy initiatives are successful, they may have strong impacts on the development of Europe's digital future and shape the future scenarios of the Data Market and Data Economy: therefore they have been integrated into the assumptions of the EDM 2025 scenarios, as illustrated above (Table 2, 3 and 4 on scenario assumptions). Here we will summarize them and show how we have factored these policies into our scenarios.

The most relevant effort so far has been concentrated on Artificial Intelligence. According to IDC¹⁷, European enterprises in the next 5 years are forecast to invest only two thirds of what US enterprises will spend in so-called innovation accelerator technologies, including Artificial Intelligence (AI), Robotics, Cybersecurity, Augmented/Virtual Reality, IoT and 3d Printing. Alarmed by a gap in R&D investments in innovative technologies compared with China and the US, the EU has launched an ambitious strategy for Artificial Intelligence (Communication on AI, April 2018¹⁸) and a comprehensive Action Plan¹⁹ (December 2018). The main goal is for Europe to become the world-leading region for developing and deploying cutting-edge, ethical and secure AI. The initiative has led to a Declaration of Cooperation on AI (launched in April 2018 and endorsed by the European Council in June 2018), which was subsequently signed by 24 Member States and Norway with the aim to maximise the impact of investment at the EU and national levels, encourage cooperation across the EU and exchange best practices in the field of AI. The vision described in these initiatives is very close to the one described by the High Growth scenario of a Data-driven society.

To support the implementation of this strategy the EC has also set-up the AI High Level Expert Group and the AI Watch²⁰. Launched at the end of 2018, in parallel with the Coordinated Plan and the Flagship Report, the AI Watch serves as a knowledge platform constantly monitoring, collecting and updating data and information on the development, uptake and impact of AI in Europe and putting

15 <https://ec.europa.eu/digital-single-market/en/news/digital-day-2019>

16 <https://ec.europa.eu/digital-single-market/en/news/ethics-guidelines-trustworthy-ai>

17 "Western Europe risks losing the Technology Race", Marc Dowd and Mark Yates, IDC, 2018, <https://www.idc.com/getdoc.jsp?containerId=CEMA44531918>

18 Artificial Intelligence for Europe, COM(2018) 237 final

19 Coordinated Plan on Artificial Intelligence, COM(2018) 795 final

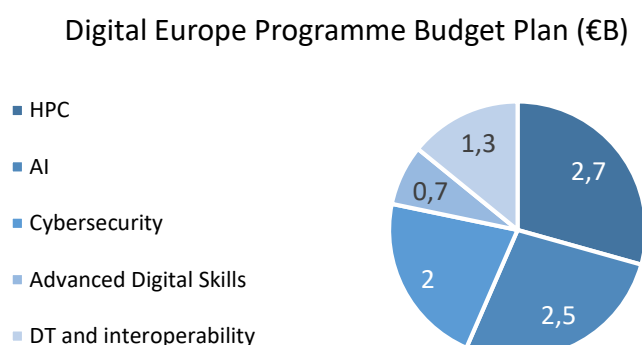
20 https://ec.europa.eu/knowledge4policy/ai-watch/about_en

online resources, publications, events and other AI-related news to the disposal of national and European policy-makers.

In December of the same year, the Joint Research Centre (JRC) of the European Commission contributed to the debate on AI at European level by publishing the flagship report “Artificial Intelligence – a European Perspective”²¹. The report highlighted the importance for the EU to find a distinct European approach to embrace the opportunities offered by AI in a way that is human-centred, ethical, secure, and true to our core values. Unlike other world powers, Europe can indeed build on areas of strength including excellent research, leadership in some industrial sectors like automotive and robotics, a solid legal and regulatory framework, and very rich cultural diversity also at regional and sub-regional levels; this is where European policy makers should focus in the years to come.

Finally, a key differentiating factor for the EDM scenarios is the level of R&D&I investments, which should be boosted in the next Multi-Annual Financial Framework 2021-27, particularly through the new initiative of the **Digital Europe Programme (DEP)**, proposed by the EC in June 2018. The DEP aims at responding to an increasingly evident upstream investment gap in strategic new technologies, constituting the main drivers of digital transformation of economy and society. The main goal of the DEP is to reinforce Europe's capacities in key digital technology areas and widen their diffusion and uptake in areas of public interest and the private sector, with a total planned budget of €B 9.2, divided among the main 5 investment areas (Figure 6). The new Programme is designed to complement the role of the Horizon Europe Programme, focused on research and pre-commercial development, and the Connecting Europe Facility 2 (CEF2), focused on building digital high-speed infrastructures. Together these programmes may play a critical role in accelerating the digital economy in Europe in the next years.

Figure 5 The Digital Europe Programme Budget Plan



More specifically, the unmet needs and demand-supply gap in the 5 areas addressed by the DEP are as follows:

- The deployment of next generation HPC infrastructures planned by the EU HPC strategy is hindered by procurement limits and rigidity under the Horizon 2020 (H2020) and Connecting Europe Facility (CEF) Programmes: Europe provides only 5% of worldwide HPC resources but its scientists and engineers consume 1/3 of them, sourcing them from outside the EU²²;

21 <https://ec.europa.eu/jrc/en/artificial-intelligence-european-perspective>

22 European Parliamentary Research Service (2017) Developing Supercomputers in Europe

- European AI R&D investments are increasing rapidly, but still lagging behind the rest of the world; AI competence centres and capacities are fragmented; the availability of high-quality data sets and AI solutions is limited across Europe, hindering the competitiveness of European business and organizations²³.
- Cybersecurity investments are one tenth of the US. European competence centres and infrastructures are fragmented, and the industry is highly dispersed²⁴;
- There is a high skills gap in these three fields, with some sources estimating more than 350,000 EU uncovered vacancies²⁵. There are insufficient investments for the development of these advanced digital skills in Europe. The European Data Market Monitoring Tool estimates the data skills gap between demand and supply (on big data and analytics, essential for AI as well) at 571,000 in 2018, corresponding to 7.2% of demand²⁶.
- Finally, sectors of public relevance such as government, healthcare, education and public transport lag behind private industry in digitisation. The CEF mid-term evaluation acknowledged that the programme efforts could only support the very first steps towards an EU wide digitisation of these sectors, and was insufficient to meet latest technology challenges and political priorities (for example in cybersecurity).

By satisfying these unmet needs and improving the digital capacities, the DEP can maximise the chances for Europe to move towards the High Growth scenario development path of the digital economy and build the basis for improved European competitiveness, contributing to the pace of industry digitization, another key objective of European policies²⁷.

²³ "Artificial Intelligence: the next digital frontier? Mc Kinsey Global Institute, 2017; COM(2018) 237 final: Artificial Intelligence for Europe

²⁴ JRC Technical reports: European Cybersecurity Centres of Expertise 2018

²⁵ Based on an analysis of vacancies in 7 Member States by Victory Database

²⁶ Report on Facts and Figures, January 2019, Update study of the EU Data Market Monitoring Tool, SMART 2016/0063, www.datalandscape.eu

²⁷ COM(2016) 180 final Digitising European Industry

5. THE ROLE OF THE UK IN THE EUROPEAN DATA ECONOMY

On 10 April 2019, the European Council unanimously, and in agreement with the U.K. Government, extended the deadline for withdrawal of the U.K. from the European Union until 31 October 2019. The aim of this decision was to give British policymakers more time to create clarity on important questions concerning adoption of the Withdrawal Agreement that was reached in November 2018 and that was repeatedly rejected by the House of Commons in the following months. future relationship. The lack of consent on the U.K. side to the agreement bespeaks the vast amount of uncertainty surrounding the future relationship between the EU and the UK and represents another key policy-making element to be considered when drawing conclusions about Europe's Data Market and Data Economy. As in the First Report on Policy Conclusions (D2.2), this chapter introduces a selected set of indicators for the U.K. separately and presents some considerations about the potential consequences of Brexit on the EU Data Market and Data Economy.

The prominence of the U.K. as a leading data-driven economy in Europe remains unchallenged. According to the 2018 Digital Economy and Society Index (DESI)²⁸ tracking the progress made by EU Member States in terms of their digitisation process, the United Kingdom confirms its rank of 7th out of 28 EU Member States (see Figure 6 below) and indeed shows an improved performance in all DESI domains with a general score that slightly increased in 2018 vis-à-vis the same measurements of the year before²⁹.

Figure 6: Digital Economy and Society Index (DESI) – 2018 Ranking

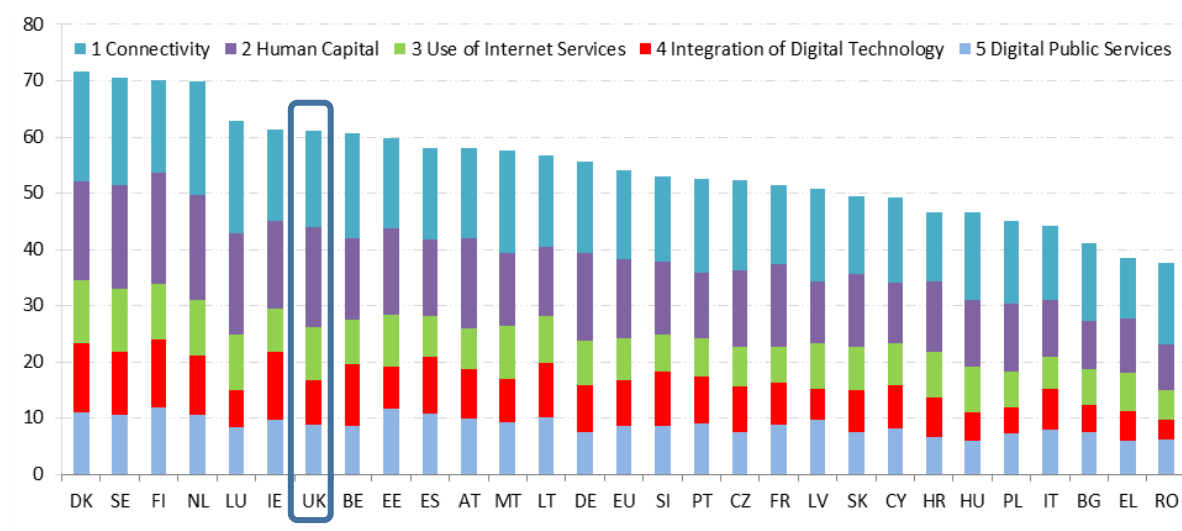


Figure 7 displays a modest but undisputable improvement of the U.K.'s score in the DESI 2018 with respect to the DESI 2017 in both its own cluster of Member States ('High-Performing Countries'), as well as vis-à-vis the whole of the EU.

²⁸ <https://ec.europa.eu/digital-single-market/en/desi>

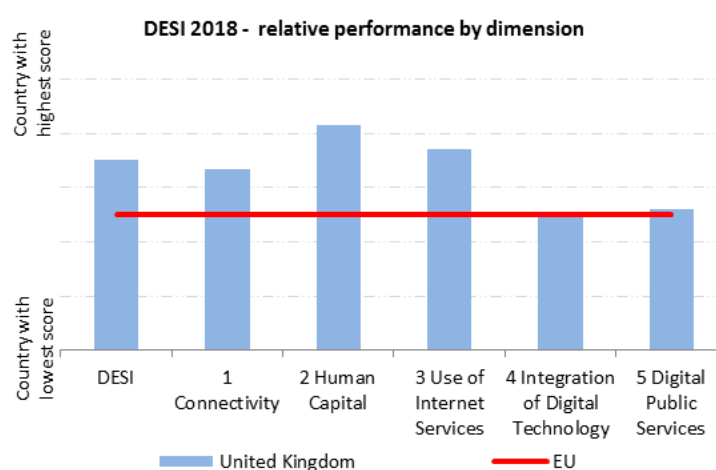
²⁹ http://ec.europa.eu/information_society/newsroom/image/document/2018-20/uk-desi_2018-country-profile_eng_B4415D06-056C-DDB7-6B695AFEDFB5F952_52236.pdf

Figure 7: DESI 2018 – U.K. ranking & score and comparison with cluster ('High Performing Countries') and total EU

	United Kingdom		Cluster	EU
	rank	score	score	score
DESI 2018	7	61.2	64.0	54.0
DESI 2017	7	58.6	61.2	50.8

While performing above average in all the 5 dimensions of DESI, the U.K. has particularly strengthened its position in the connectivity area showing significant progress in the fixed broadband take-up and fast broadband coverage & take-up, and in the realm of integration of digital technology by businesses where indicators such as the electronic information and data sharing, use of social media and eCommerce (SMEs selling on-line) have all marked a clear improvement with respect to the previous year. The U.K.'s relative performance in the EU by dimension is summarized by the Figure below.

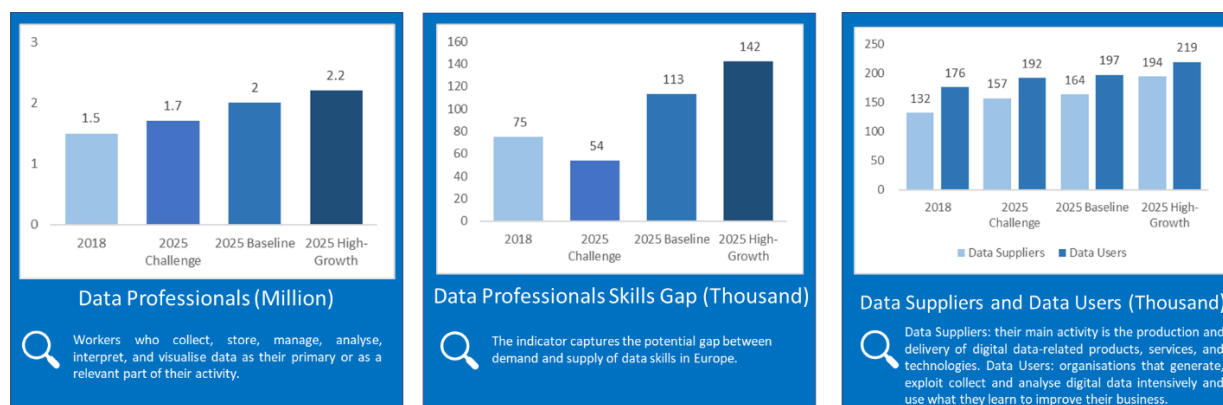
Figure 8: DESI 2018 – U.K.'s relative performance by dimension



5.1 The U.K. - A Leading European Data Economy

The U.K.'s leadership on the overall Data Economy in Europe is confirmed when looking at data professionals (both in terms of units as well as in terms of skills gap) and at the role that data companies play across the Channel (see Figure below).

Figure 9: Data Professionals, Data Professionals' Skills Gap, Data Suppliers and Data Users in the UK (2017; 2025; 3 scenarios)



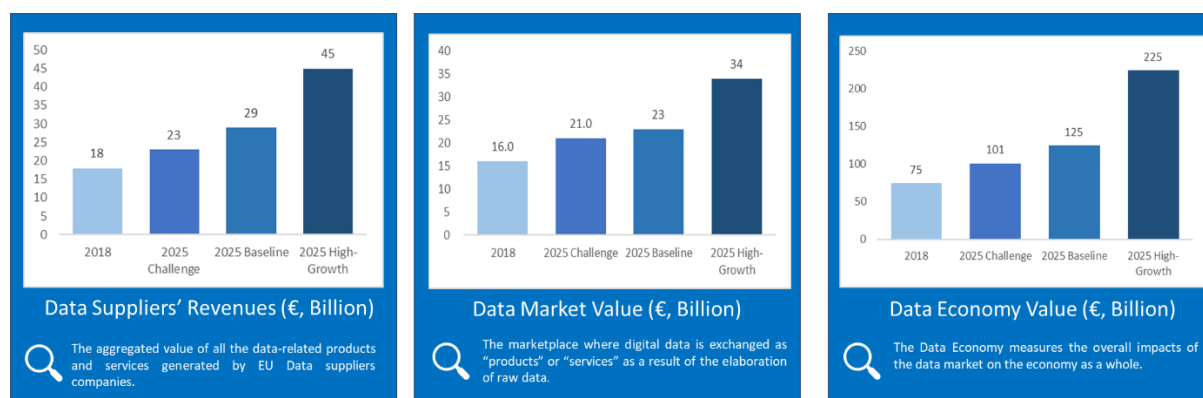
Source: European Data Market Monitoring Tool, IDC 2019

With more than 1.5 million data professionals in 2018, projected at 2.3 million in 2025 under the High-Growth scenario, the U.K. holds the second highest number of workers in the Data Economy being overtaken only by Germany with 2.6 million professionals in 2025, with all the other Member States well behind in this respect. Similarly, the lack of data professionals measured as the gap between data professionals' demand and data professionals' supply, in the U.K. in 2018 accounts for approximately 75 thousand units – a relatively high gap but still slightly lower than the gap measured in Germany, the EU's largest Data Economy. Indeed, the U.K.'s data professional's skills gap is expected to increase in 2025 under all three scenarios but it is also projected to remain below the gaps measured in the three other largest data economies in the EU - France, Germany and Italy.

Figure 6 also points to the U.K.'s centrality in terms of the distribution of data companies. The latest release of the European Data Market Monitoring Tool assigns a total of 132 thousand data supplier companies to the U.K. in 2018 – a buoyant 49% of the overall number of data suppliers in the EU28 in the same year. Britain's leading role on the European data suppliers' scene is confirmed by the high penetration level of data suppliers in data-intensive sectors in the U.K. Indicator 2.2 – share of data supplier companies – measures the percentage share of data suppliers on the total companies in the ICT and Professional services industries. In 2018 this share amounts to 15% on average in the EU28. In the U.K., though, the same indicator arrives at 22%, second only to another boosting Data Economy – Ireland. A similar picture emerges when considering the number of data users which are estimated at more 176 thousand units in 2018 and expected to reach the threshold of 220 thousand in 2025 under the High-Growth scenarios. If these estimates are correct, the U.K. will display an absolute predominance on the data demand scene, well ahead of all the other principal European data economies.

The same applies when looking at the indicators measuring the revenues and spending in terms of data suppliers', Data Market and the Data Economy (see Figure below).

Figure 10: Data Suppliers' Revenues, Data Market Value, Data Economy Value in the UK (2025, 3 scenarios)



Source: European Data Market Monitoring Tool, IDC 2019

The revenues generated by data supplier companies in the U.K. amounted to more than 18.1 billion Euro in 2018 and may reach 45.1 billion in 2025 under the most favourable scenario: an undiscussed primacy across the EU, well above Germany and the other traditional EU data economies.

The overall market of data-driven products and services is estimated at about 71.6 billion Euro in 2018 in the EU28. Of this, the U.K. generates 16.8 billion Euro, ahead of Germany (15.7 billion Euro), France (9.1 billion Euro) and Italy (5.4 billion Euro). The U.K. captures therefore the largest share of the Data Market value according to our most recent estimates with a relative portion of 22.5% of Europe's Data Market value. This percentage is expected to remain stable in 2020 and in 2025 – with only minor variations by scenario. The British economy, as a result, will continue to represent almost one fourth of the European Data Market in the next few years.

In terms of the Data Market impact on the economy as a whole (the "Data Economy"), our recent estimates continue to see the U.K. at the forefront of the European scene with 75 billion Euros of combined direct, indirect and induced impacts measured in 2018 – second only to Germany, thus representing more than one fifth of the EU28 Data Economy in this year. The U.K.'s economy is not only high in absolute terms but also as a portion of the country's GDP. The U.K.'s Data Economy as a percentage of GDP is significantly above the EU28 average: in 2018 it measured 3.5% - up 0.3 percentage points from the previous year versus 2.6% in 2018 and 2.4% in 2017 in the EU28.

5.2 Free Flow of Data and Data Protection after Brexit

The depth and breadth of the European Data Economy depends more and more on data - their accessibility, usability and, more importantly, their unhindered mobility. Given the strengths of the U.K.'s Data Market and Data Economy, keeping data flowing between the EU and the U.K. is crucial both for Britain itself and for the rest of Europe.

On 9th November 2018, the European Council and the European Parliament formally approved a regulation aiming to secure the free flow of non-personal data in the EU³⁰. Entering into force in May 2019, the regulation prohibits data localisation restrictions imposed by Member States on the geographical location for storing or processing non-personal data, unless such restrictions are justified on grounds of public security. The regulation creates preconditions for more competitive and integrated internal market for data processing services in the EU. However, given the lack of

³⁰ <https://ec.europa.eu/digital-single-market/en/free-flow-non-personal-data>

clarity surrounding the future relationship between the U.K. and the EU, the timing and extent to which these provisions could apply to the U.K remain profoundly uncertain.

The ability to continue accessing the Digital Single Market is key for British businesses and has made the U.K. an attractive place for non-EU countries to expand their businesses and operations in Europe. Losing the access to the DSM through a No-Deal solution would be harmful to both U.K. businesses looking to export to a larger market, and for the U.K.'s image as a business hub. Access to the DSM by non-EU countries is indeed possible but the U.K businesses are increasingly fearing that a withdrawal of the U.K. from the EU would translate into data-related services and products that could not be made available to the rest of the European market from the U.K.

The uncertainty surrounding the accessibility, usability and mobility of non-personal data extends to the realm of personal data. The U.K. has fully implemented EU data protection laws, namely the recent General Data Protection Regulation (GDPR), via the UK's own Data Protection Act 2018. The Government has also published plans for technical amendments to this legislation to ensure it continues to apply in the U.K. if there is no deal with the EU. That means that, in principle, a no-deal Brexit will not change the way in which companies have to handle personal data.

However, the default position of the U.K. once the U.K. leaves EU is the one of a 'third country' and, as such, no longer automatically considered a suitable place for EU data to be stored and processed. Until the EU Commission decides on the U.K.'s adequacy or the UK negotiates an international treaty, the U.K. will be like any other country outside the EU which has not achieved adequacy. EU exporters (controllers and processors) will therefore need to ensure appropriate export mechanism (standard contractual clauses between the sender and the receiver of the personal data or binding corporate rules) or rely on a derogation (for example, consent of the data subject or a public interest exemption). Additionally, the U.K. data protection version of GDPR imposes its own restrictions to export of personal data from U.K. to other countries. That appears to be another obstacle to cross-border personal data flow. Also, businesses operating across U.K. and EU will need to deal with individual data protection authorities in each EU member state or establish a representative for their business in the EU³¹.

As part of its No-Deal contingency plan, the U.K. Government has stated it would not restrict data transfers to EEA member states; that it would continue to recognise Standard Contractual Clauses approved by the European Commission; and that it will preserve the effect of existing EU adequacy decisions³². These steps cover transfers from the U.K. to other countries, apart from the United States, which will require a separate agreement. However, transfers of personal data to the UK would be considerably impacted by leaving the EU without a deal.

To mitigate the influence of the policy consequences on data flows, many companies have already begun the shifting of existing contracts to identify where they might need to insert Standard Contractual Clauses, but this will take time and significant legal costs. The impact on U.K. business competitiveness when dealing with EU businesses could well be that the offer of contracting with a

³¹ <https://ico.org.uk/for-organisations/data-protection-and-brexit/data-protection-if-there-s-no-brexit-deal/the-gdpr/international-data-transfers/>

³² <https://ico.org.uk/for-organisations/data-protection-and-brexit/data-protection-if-there-s-no-brexit-deal/the-gdpr/international-data-transfers/>

U.K. entity becomes less competitive compared to doing so with another EU member that will be able to rely on a strong legal basis for the free flow of data³³.

As recently as January 2019, the U.K Information Commissioner's Office (ICO)³⁴ published a concise checklist³⁵ highlighting a few essential steps that British law enforcement authorities should take to prepare for data protection compliance in the case the U.K. leaves without a deal. In essence, the document continues to call for compliance with the principles, rights and obligations set out in Part 3 of the Data Protection Act of 2018 and encourages U.K. businesses and organizations to constantly review their privacy information, internal processing records and logs that will need updating when the country leaves the EU. Nevertheless, apart from a general call for organisational awareness, the checklist appears to be lacking the necessary guidance to defuse the uncertainty surrounding this matter.

³³ <https://www.techuk.org/insights/news/item/14625-how-would-a-no-deal-brex-it-impact-tech>

³⁴ ICO is the U.K.'s independent authority set up to uphold information rights in the public interest, promoting openness by public bodies and data privacy for individuals.

³⁵ <https://ico.org.uk/for-organisations/data-protection-and-brex-it/>

6. THE EU DATA POLICY AND THE INTERNATIONAL DIMENSION

6.1 The International Indicators and the EU in 2018

According to the second round of measurements of the international indicators from the European Data Market Monitoring Tool, the EU28 continues to represent the second-largest Data Economy worldwide after the U.S., followed by Japan and Brazil (the three extra-European countries analysed in the framework of the Update to the European Data Market Study).

While the value of the Data Market is expected to increase in all the regions between 9% and 10%, the EU positions itself as the only regional market which is able to challenge the U.S.' leading position. In fact, while Japan's Data Market is similar to the European one in terms of growth and investments, it is still only half the size. At the same time, the impact that the EU Data Market generates on the economy as a whole (the "Data Economy") has become more and more visible over the past few years, thus rapidly catching up the gap with the American economy.

The U.S. also confirms their leadership in the number of data professionals, even if Europe leads in terms of growth, with a year-on-year growth rate close to 8.5%, nearly twice of the one of the U.S. and five times the one of Japan.

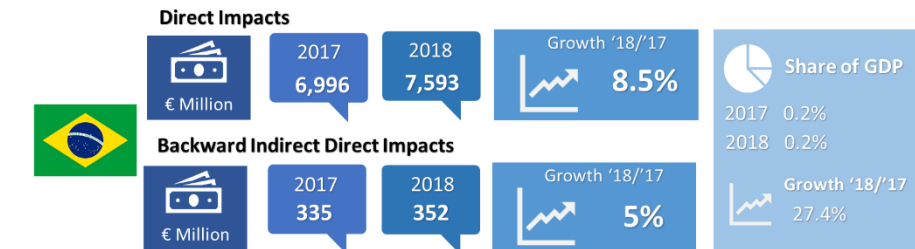
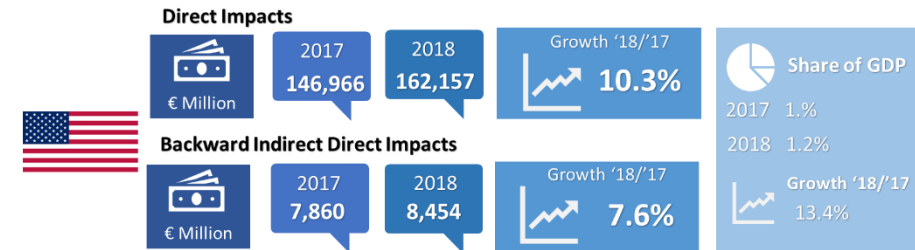
In terms of data suppliers, however, in 2018 Europe's growth fell to the lowest of the group (0.2%), as the U.S. moved significantly ahead (1.8%). The EU, however, continues to boast the second-largest number of data suppliers, preceded only by the U.S and followed by Japan and Brazil.

The European Data Market Monitoring Tool – The International Indicators and the EU28

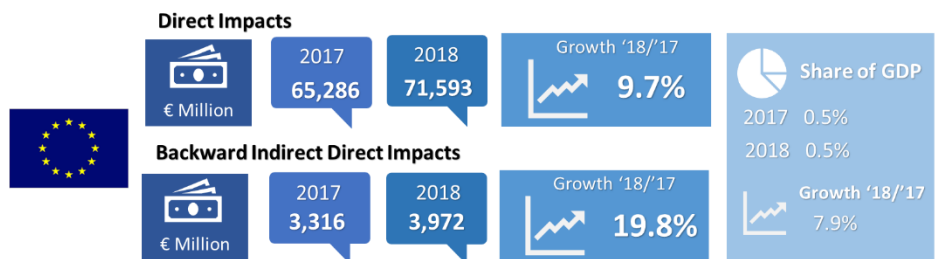
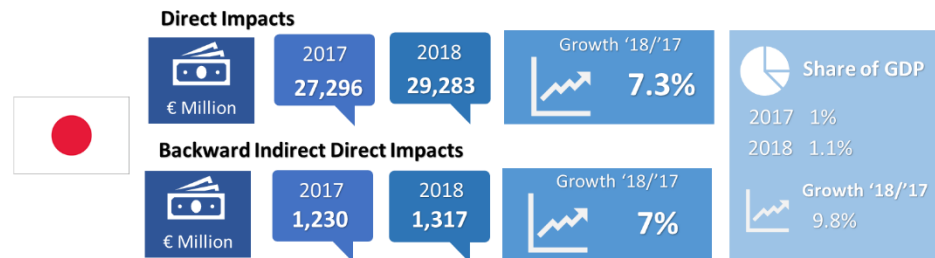
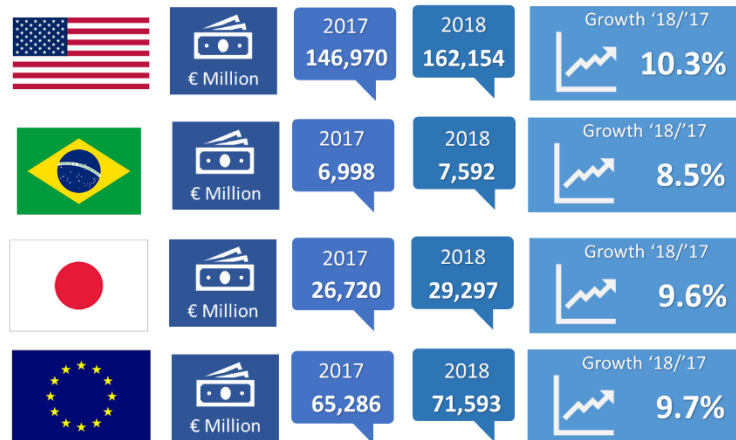
Number of Data Suppliers



Value of the Data Economy



Value of the Data Market



6.2 What the International Indicators really say

Based on our latest estimates, Europe still presents a growing and dynamic data ecosystem on both the Data Market and the Data Economy fronts: in terms of size and growth, the value of the EU Data Market (as defined by the European Data Market Study) is second only to the U.S.; Europe, however, lags behind both the U.S. and Japan in terms of the incidence of the Data Economy in terms of direct and backward indirect impacts on GDP.

The U.S. have in fact continued to show a positive economic picture in 2018. Apart from the challenges ahead concerning the relationship with China, the U.S. position themselves as the most competitive country according to The Global Competitiveness Report³⁶, mainly thanks to continued job growth, sustained investment spending and inflation rates under control. Larger organisations in the U.S. understand the value of the Data Economy and are continuing to invest in some of the key innovation areas that are crucial for the digital transformation, such as Artificial Intelligence and Cognitive Computing. Europe, on the other hand, lags behind in terms of digital infrastructure and number of data professionals, even if the latter show a higher year-on-year growth compared to the U.S. As underlined in the First Report on Policy Conclusions (D2.2), not only does Europe suffer from high levels of fragmentation when it comes to the use of digital technologies across companies, but is also affected by the lack of the big tech corporations: America is home to fifteen of the world's twenty most valuable tech firms³⁷ (among which there are also the so called "GAFA", "Google, Amazon, Facebook and Apple"), which represent two of the main reasons linked to Europe's relative delay³⁸.

Filling this gap would also be essential for the future of work in the EU. Speaking particularly of digital competences, four out of ten Europeans currently lack basic digital skills, which represents a worrying picture³⁹. Upskilling will therefore be crucial as technological advances in AI, robotics, IoT, 3D printing and quantum computing, just to name a few, are having a very significant transformative effect on work. The rise of automation and AI can not only increase production rates while lowering costs but can also allow for improved quality. At the same time, the deployment of AI and other innovative technologies could lead to increased safety conditions and job satisfaction, as workers are substituted by machines in carrying out dangerous and repetitive tasks. On the other hand, this may imply significant social challenges, which will have to be addressed at European level.⁴⁰

As regards Japan, EU's second biggest trading partner in Asia (after China), even if its Data Market is similar to the European one in terms of growth and investment, it is still only half the size. In fact, even if it competes with the EU as regards data professionals and data suppliers, its growth is still significantly lower than for Europe. Japan's economy continues to suffer from weakening internal demand, which as a consequence slows IT spending and pose limits to the Data Economy and the Data Market potential. A significant opportunity for both the EU and Japan in the field of the Data

³⁶ Schwab K., "The Global Competitiveness Report", World Economic Forum, October 2018, <http://www3.weforum.org/docs/GCR2018/05FullReport/TheGlobalCompetitivenessReport2018.pdf>

³⁷ The Economist, "Europe takes on the tech giants", 23-29 March 2019, <https://www.economist.com/leaders/2019/03/23/why-big-tech-should-fear-europe>

³⁸ Denning S., "The Fight For Europe's Future: Digital Innovation Or Resistance", Forbes, May 2018, <https://www.forbes.com/sites/stevedenning/2018/05/20/the-fight-for-europes-future-digital-innovation-or-resistance/#5711add648c0>

³⁹ Navracsics T., "Preparing Europeans for the future of work", 10 October 2018, https://ec.europa.eu/commission/commissioners/2014-2019/navracsics/announcements/preparing-europeans-future-work_en

⁴⁰ EGE European Group on Ethics in Science and New Technologies, "Future of Work, Future of Society", 19 December 2018, https://ec.europa.eu/info/sites/info/files/research_and_innovation/ege/egy_future-of-work_opinion_122018.pdf

Economy, however, will be offered by the EU-Japan Economic Partnership Agreement which has entered into force on the 1st February 2019⁴¹. An important achievement in this field has been the adoption of the EC's adequacy decision on Japan, signed on the 23rd January 2019, by which the EU and Japan agreed to recognise each other's data protection systems as equivalent and allow data to flow freely, thus creating the world's largest area of free flow of data. Thanks to this, European companies will benefit from free data flows with a key commercial partner, as well as from privileged access to the 127 million Japanese consumers⁴².

Efforts in this sense have also been undertaken by the EU in order to foster cooperation with Brazil and, more generally, with Latin America, supporting the development of a new data highway connecting the two regions. Brazil's economic recovery continued over the past year: the country has registered continuous growth in data companies and the Data Economy, although the number of data professionals declined marginally. However, the country still has some catching up to do when compared with European investment in the Data Economy. Within this framework, a contract to construct a fibre optic cable running under the Atlantic Ocean from Portugal to Brazil entered into force in January 2019. By 2020, the cable is expected to provide high broadband connectivity and boost business, scientific and cultural exchanges between companies in the two continents, allowing them to further develop a Data Economy. Furthermore, as a direct link without intermediate connection points, the cable will also foster higher levels of data privacy⁴³.

6.3 Preliminary Policy Implications: Europe as a new role-model?

The international indicators emerging from the second round of measurements of the updated European Data Market Monitoring Tool continue to highlight the prominence of the U.S. in terms of the size of the Data Market and the Data Economy, even if Europe has undertaken significant steps in 2018 towards a more coordinated approach and a progressive removal of the barriers identified by the Digital Single Market Strategy. In particular, noteworthy measures in this respect have been the entry into force of the General Data Protection Regulation⁴⁴ in May 2018, the signature of the Regulation on the free flow of non-personal data⁴⁵ in November 2018, as well as the entry into force of the Regulation addressing unjustified geo-blocking⁴⁶ in December 2018. In 2019 other important steps have been made through the European Parliament's and Council of the European Union's approval of the new Copyright Directive during last March and April⁴⁷, while intensified efforts towards the adoption of an ePrivacy Regulation, necessary to complete the EU's framework for data protection and confidentiality of communications, will probably foster discussion in the next period⁴⁸.

Europe's competitiveness at international level will benefit from the development of a common data space – which has been defined as “a seamless digital area with the scale that will enable the

⁴¹ <http://ec.europa.eu/trade/policy/in-focus/eu-japan-economic-partnership-agreement/>

⁴² EC, “European Commission adopts adequacy decision on Japan, creating the world's largest area of safe data flows”, 23 January 2019, http://europa.eu/rapid/press-release_IP-19-421_en.htm

⁴³ EC, “New data highway will bring Europe and Latin America closer”, 8 January 2019, <https://ec.europa.eu/digital-single-market/en/news/new-data-highway-will-bring-europe-and-latin-america-closer>

⁴⁴ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=celex%3A32016R0679>

⁴⁵ <https://ec.europa.eu/digital-single-market/en/free-flow-non-personal-data>

⁴⁶ <https://eur-lex.europa.eu/legal-content/EN/TXT/?uri=uriserv:OJ.LI.2018.060.01.0001.01.ENG>

⁴⁷ EC, “Copyright reform clears final hurdle: Commission welcomes approval of modernised rules fit for digital age”, 15 April 2019, http://europa.eu/rapid/press-release_IP-19-2151_en.htm

⁴⁸ European Data Protection Board, Statement 3/2019 on ePrivacy Regulation, 13 March 2019, https://edpb.europa.eu/sites/edpb/files/files/file1/201903_edpb_statement_eprivacyregulation_en.pdf

development of new products and services based on data”⁴⁹. European companies, in particular, would be supported by increased data sharing in the scientific and private sector but also through accessibility and re-use of public and publicly funded data. The re-use of these data can in fact not only contribute to the growth of the European economy, but also to the development of Artificial Intelligence and the fight against societal challenges. It is exactly in the field of AI that Europe has recently launched new policy initiatives aimed at filling the gap with other world regions, and in particular the U.S., as far as innovation and R&D are concerned. The Coordinated Plan on Artificial Intelligence released in December 2018 builds on the European Strategy on AI from April 2018 in order to provide a strategic framework for national AI strategies and eliminate all the obstacles arising from market fragmentation. The EU, however, does not only plan to encourage the scale-up of AI in the region but also to foster the development of human-centred and trustworthy AI technologies. This effort is currently being undertaken by the independent High-Level Expert Group on AI appointed by the European Commission with the aim to draft the ethics guidelines for trustworthy Artificial Intelligence. The first draft of the guidelines was published in December 2018 and followed by an open consultation collecting more than 500 comments. The final document was published in April 2019 and will be followed by a piloting phase kicking-off in summer 2019. Apart from promoting a human-centric approach and ethics-by-design principles, these guidelines, developed with a global perspective, also aim to strengthen Europe’s role in the development and use of AI for good, a field where Europe can and should become a global leader.

Besides the vast opportunities, there are also new challenges ahead: as AI takes off and the demand for information is becoming higher, data is positioning itself as a valuable resource whose control gives an immense power, in particular market power. Within this framework, Europe’s efforts in setting standards not only as far as ethics principles are concerned, but also as regards data protection, privacy and fair competition, have led to greater attention towards these topics on an international level and can put the grounds for Europe to be a role model for other countries. Europe’s firm and pioneering position supporting individuals’ control over their own data and profits coming from them, for instance, could prompt the set up of sharable standards which, if adopted on a wide-scale, could benefit users and constrain the power of the big tech corporations (among which the above mentioned GAFA) currently exploiting the power of data in what is a semi-monopolistic way.

Europe’s approach clearly offers a new vision, in which individuals, more specifically consumers, have control over their privacy and how their data are monetised, users can benefit from interoperability from service providers, companies act in the public interest and are refrained from locking out competitors, while regulators take the responsibility to ensure privacy and antitrust concerns are duly taken into consideration and reflected into rules. This type of approach, which led to the entry into force of the General Data Protection Regulation, for instance, is raising interest at international level and also in the U.S., where data protection and privacy regulations are currently a hot topic for discussion in many States. However, the European approach also faces risks such as difficulties to achieve true interoperability, increased concerns over privacy and potential isolation, in case it is not adopted elsewhere. If proven successful, however, Europe’s policies and actions embed the potential to set an example thus opening up new paths to innovation⁵⁰.

⁴⁹ COM(2018) 232 final, "Towards a common European data space", 25 April 2018, <https://ec.europa.eu/digital-single-market/en/news/communication-towards-common-european-data-space>

⁵⁰ The Economist, “Europe takes on the tech giants”, 23-29 March 2019, <https://www.economist.com/leaders/2019/03/23/why-big-tech-should-fear-europe>

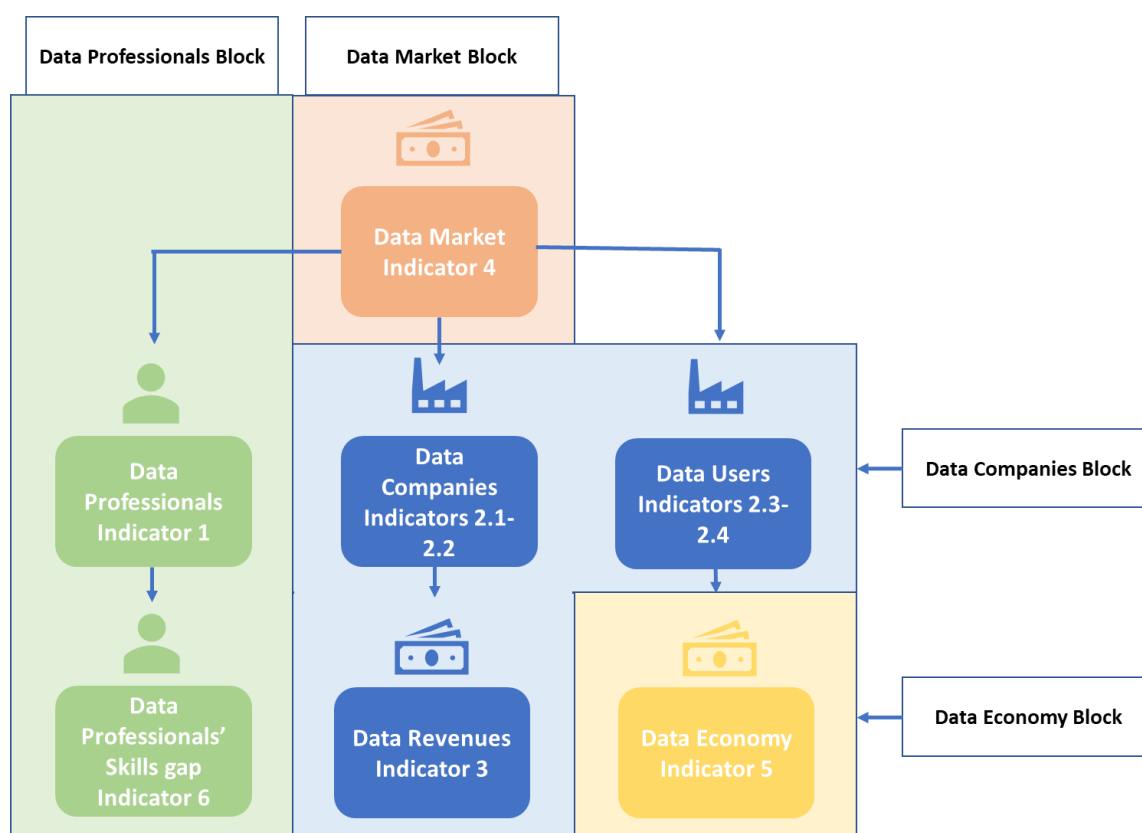
7. CONCLUSIONS

Notwithstanding the general slowdown in the aggregate measure of production in Europe, mainly linked to a decrease in demand and uncertain political conditions affecting some of the strongest economies, the process of digital transformation endures unabated across the Continent. The European Data Economy and Data Market have been estimated on the increase in 2018, and most of the indicators developed in the framework of the EDM Monitoring Tool have shown general improvement.

The six interrelated indicators apprehending Europe's Data Economy in 2018, and through the year 2025, can be seen holistically along four main building blocks:

- The data professional area measuring the workers employed by data companies actively participating to the building of the Data Economy;
- The data companies' area measuring both the suppliers as well as the demand of data-driven products and services;
- The Data Market area representing the actual market where data-driven products and services are exchanged;
- The Data Economy area measuring the overall impacts of the Data Market on the economy as a whole.

Figure 11: The European Data Market Monitoring Tool: Interrelated Indicators and Building Blocks



Source: European Data Market Monitoring Tool, IDC 2019

7.1 Data Professionals

According to the second round of measurements of the European Data Market Monitoring Tool, data professionals are estimated at a total of 5.7 million in the EU27 and at 7.2 million in the EU28 in 2018, showing a significant increase over the previous year (8.6% and 8.4% year-on-year respectively). As regards the employment share and the intensity share components of the data professionals' indicator, these are also expected to improve in 2018 and 2020 if compared to our previous estimates (now estimated at 3% and 3.4% in 2018 and 2020 in the EU27 and 3.3% and 3.7% for the same years in the EU28). When compared to the year 2018, the 2020 would register a CAGR of 7.2% and 6.9% at the level of EU27 and EU28 respectively. The number of data professionals is also forecast to grow significantly under all the three scenarios at 2025. Under the Baseline scenario, data professionals are projected to amount to 9.3 million in the EU27 and 11.3 million in the EU28 at 2025, while in the Challenge and High Growth scenarios, data professionals would be more than 8.6 million and 10.8 million in the EU27 and 10.3 million and 13.1 million in the EU28 respectively.

As far as data professional skills are concerned, in 2018 the strong increase of demand of data professionals continued (+7%) and the estimated gap grew by 18% reaching approximately 571,000 unfilled positions in the EU28 (496,000 without the UK), corresponding to 7.2% of total demand (7.9% without the UK). The data skills gap estimated for 2018 shows stress in the market, which is expected to continue to 2020 and beyond under the 3 scenarios. By 2020 we expect the gap to expand to 641,000 unfilled positions in EU28, corresponding to 7.8% of total demand (9.1% without the UK, where slower growth is expected due to the impacts of Brexit). The forecast gap ranges from 9% of demand in the Challenge one, to 10% in the Baseline, to 14% in the High Growth (EU27). The slightly lower dynamic of data skills demand in the UK (due to slightly slower forecast of the Data Market growth) means that the gap share of demand is smaller in EU28 than in EU27. The persistence of a structural imbalance between demand and supply of data skills in Europe underlines the essential need for policy action to prevent and minimize this gap in the next years.

7.2 Data Companies

As far as data companies are concerned, the number of data suppliers continue to grow at a faster pace than the number of data users in the longer term – out to 2025. Data suppliers are estimated at more than 145,000 in the EU27 and at more than 283,000 units in the EU28 for 2018, exhibiting a year-on-year growth of 4.1 and 4.2% respectively. Data users, instead, are projected to grow at 3.4% in 2018, amounting to more than 534,000 in the EU27 and to 715,000 units in the EU28. These figures are also reflected in a stable share of data companies over the total number of companies in Europe. The share of data suppliers on total companies in the ICT and Professional services industries is estimated at 11.6% in the EU27 and 15.3% in the EU28. The data users' penetration rates are also stable in 2018 in both the EU27 and EU28.

Data companies revenues increased by more than 12% in 2018 to reach nearly 59 Billion Euro in the EU27 and 77 Billion Euro in the EU28. The share of the data suppliers' revenues on the total companies' revenues in the ICT and Professional services sectors rose to 3.4% in the EU27 and 3.5% in the EU28 in 2018. Out to 2025 revenues are expected to show an annual growth rate of 7.1% - easily outpacing the growth of the total ICT market over the same period (expected to be 1.5% from 2020 to 2025 Baseline). Looking at the Member States, the smaller ones show the highest long-term growth as they have a smaller base from which to grow, but the larger Member States are expected to make the biggest overall contribution to the Data Economy out to 2025.

7.3 Data Market

The value of the European Data Market in 2018 for both the EU27 and the EU28 is showing a growth rate well above the one exhibited by the total IT spending, at 9.7% year-on-year, and is expected to surpass the threshold of 60 Billion Euro in 2020 in the EU27. The industries where the Data Market continues to play a dominant role are the sectors characterised by high levels of data-driven innovation: Manufacturing, Financial services and Professional services in the first place. In terms of year-on-year growth, the Professional services, Information and Communications and Financial services are the sectors experiencing the highest growth rates in 2018 and are expected to exhibit healthy growth rates throughout 2020 and beyond.

According to our latest estimates of the Data Market value in 2025, under the High Growth Scenario it will continue to showcase a buoyant growth of almost 200% with respect to its 2018 estimates in both the EU27 and the EU28. This will correspond to a considerable CAGR for the period 2020-2025 of 12.1% and 12.7% in the EU27 and the EU28 respectively. In the 2025 Baseline scenario, the Data Market will amount to more than 82 Billion Euro in the EU27, against 60.3 billion Euro in 2018 (a 6.5% CAGR 2020-2025), while under the Challenge scenario the Data Market will still represent 72.1 billion Euro, growing at a CAGR of 3.6% from 2020. These latest forecasts for 2025 are slightly lower than the previous forecast, accounted for partly by increased pessimism for a general economic slowdown as well for the uncertainty surrounding Brexit.

7.4 Data Economy

The value of the Data Economy for the EU28 has been estimated to exceed the threshold of 300 Billion Euro in 2018, with an estimated growth of almost 12%. Brexit uncertainties, however, play an important role in affecting the results for EU28, which shows lower 2018 growth as well as lower 2020/2018 CAGR. When comparing the Baseline scenario at 2025 to the Data Economy estimated in 2018, we can see that the value will nearly double along the period, with a CAGR 2020/2018 of 12.5% for EU28 and 13.3% per EU27, lowering down when considering the CAGR 2025/2020 (7.3% EU28 and 7.5% EU27). These results are indeed affected by the new macroeconomic forecasts, expecting economic growth to be slower from 2020. The CAGR 2020/2025 in the EU28 for the High Growth scenario is 17.2% for EU28, that will make the Data Economy for EU28 surpass the threshold of 1 trillion Euro. Similarly, the Challenge scenario will see a slowdown of the economic effects, from 2.8% CAGR 2025/2020, with the Data Economy being just above 500 Billion Euro. We consider this scenario as the most likely, considering the economic slowdown, with macroeconomic and political factors highly correlated and showing their effects after 2020.

A screenshot of the Data Economy by industry shows that the Financial sector, the Manufacturing industry and the realm of Professional services continue to represent the vertical markets in which the impacts of the Data Economy are most strongly felt. Thanks to the significant diffusion of data-related technologies, these industries exhibit high levels of forward and backward impacts and can convey effects at an induced level more quickly and more effectively than other industries. The IoT diffusion and the usage of Cloud Computing, as well as the usage of mobile and social technologies, coupled with the ongoing process of digital transformation, make these industries particularly reactive to induced effects. Emerging technologies such as Artificial Intelligence and blockchain applications, are also gaining momentum in these industries, thus reinforcing the impact of indirect and induced impacts in these sectors.

7.5 2019 and Beyond - A decisive Timeframe

The second round of measurement of the European Data Market Monitoring Tool reveals a positive picture of Europe's data market and data economy with most of the indicators measuring the development of the data ecosystem in Europe steadily on the increase. In 2018, AI conquered a stable position at the top of the European policy agenda with the launch of an ambitious strategy (Communication on AI, April 2018) and a comprehensive Action Plan (December 2018). This strategy has been endowed with additional instruments at the EU level, such as an AI High Level Expert Group and an AI Watch to help Europe become the world-leading region for developing and deploying cutting-edge, ethical and secure AI.

The emphasis put on AI over the past year has stressed the importance of the digital economy and, indeed, of the data economy as no real AI could truly work without data. The centrality of the Data Economy as a key objective of the European policies and, specifically, of the Digital Single Market (DSM) Strategy, is therefore bound to remain unchallenged but new issues and potentially impactful changes linger at the horizon. In 2019 both the European Commission and the European Parliament will end their mandate. This is likely to introduce new policy priorities but, the need for Europe to capture the digital opportunity will remain at the forefront of European strategies and crucial decisions that will influence the way digital technologies will be developed and deployed will be taken.

These choices, as well as the influence of external factors, may further push or hinder the growth potential of the European Data Market and the European Data Economy over the next few years. Our scenarios present the possible, alternative evolution paths driven by different macroeconomic and framework conditions and shaped by critical turning points to be faced in the next years by governments, businesses and social actors. The uncertainty surrounding Brexit, however, will persist in 2019 as every option remains on the table at the time of writing.

From an international perspective, Europe continues to lag behind the U.S. in terms of the size of the Data Market and the Data Economy, but it displays a remarkable potential that will have to be carefully nurtured over the next few years. In this respect, Europe's efforts in setting standards not only as far as ethics principles are concerned, but also with regards to data protection, privacy and fair competition, are gaining international attention and can set the grounds for Europe to be a role model for other countries. Europe's firm and pioneering position supporting individuals' control over their own data and profits coming from them, for instance, could prompt the set-up of sharable standards which, if adopted on a wide-scale, could benefit users and constrain the power of the big tech corporations (among which the above mentioned GAFA) currently exploiting the power of data in what is a semi-monopolistic way.