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THE EUROPEAN DATA MARKET MONITORING TOOL

KEY FACTS & FIGURES, FIRST POLICY CONCLUSIONS, DATA LANDSCAPE AND QUANTIFIED STORIES

D2.9 Final Study Report

Directorate-General for Communications Networks, Content and Technology
2024 EN

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1. EXECUTIVE SUMMARY

This is the Final Study Report (Deliverable D2.6) of the European Data Market Study 2021-2023 (SMART VIGIE 2020-0655), which was entrusted in 2020 to IDC and the Lisbon Council. This report brings together the research results and the activities carried out by the contractors under:

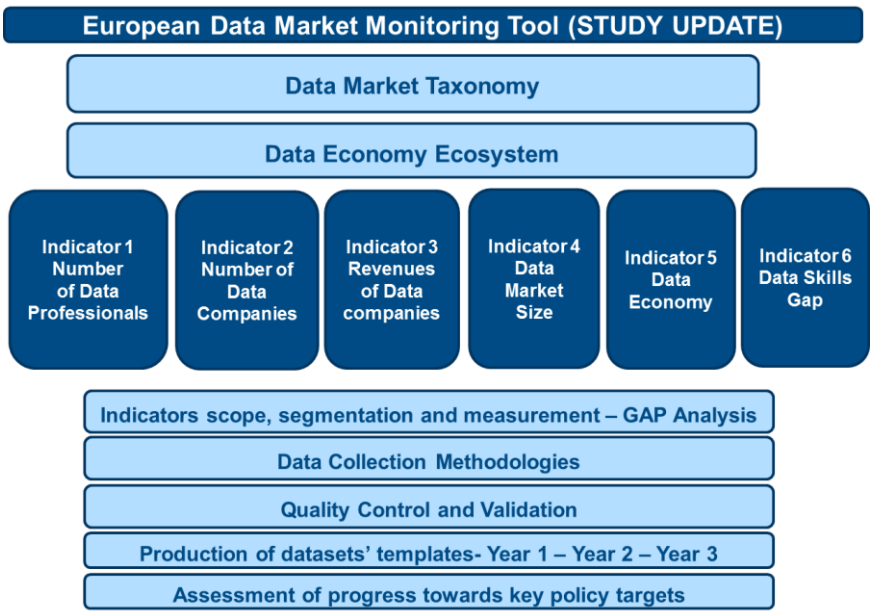
- The Final Report on Facts & Figures (D2.7) presenting an updated measurement of the European Data Market Monitoring Tool for the years 2021-2023 and forecasts to the year 2025 in baseline scenario and to the year of 2030 under three alternative scenarios;
- The Final Report on Policy Conclusions (D2.8) analysing the role of policies in shaping the sizes and trends of the European Data Market and Data Economy as measured by the European Data Market Monitoring Tool.
- The key messages obtained from the quantified stories (D3.7-D3.8, D3.9-D3.10, D3.11, D3.12) produced by the study team and focusing on Mobility Data, Data for Food, Health Data Space, Predictive Policies.
- The Final Data Landscape Report (D4.3) providing an overview of the EU Data Landscape and offering and up-to-date zoom into the database of data market companies in Europe.

1.1 Quantifying the European Data Market – Key Facts & Figures

1.1.1 An updated Monitoring Tool

The new European Data Market Monitoring Tool leverages the tool that was used to measure the Data Market and the Data Economy since 2013. The updated European Data Market Monitoring Tool designed by IDC captures the six main areas along which the indicators were measured to obtain the latest facts and figures about Europe's data market and data economy. They are shown in the Figure below.

Figure 1: The Updated EDM Monitoring Tool



1.1.2 EU Data Market and Data Economy in 2023

The third round of measurements by the European Data Market Study 2021-2023 contrasts with the sluggish growth of GDP in Europe demonstrating a healthy dynamic of the EU27 data market and data economy in the past year, with encouraging forecasts for the next period up to 2030[1]. The value of the data market, defined as the marketplace where digital data are exchanged as "products" or "services", reached **€82 billion in 2023,** with an increase of **11.1%** on the previous year from approximately **€74 billion in 2022**. This is remarkable since it follows the strong rebound of the economy in 2022 after the end of the pandemic. To put this into an historical context, the data market size was of €47 billion in 2013, when the first European Data Market Study was launched. At Member State level, the data market size is correlated with the size of the national economy and with the strong presence of industries where data plays a critical role, with the four leading ones being finance, manufacturing, public administration and information technologies. Given these structural dynamics, Germany is the leading data market in Europe with a share of 27.4%, followed by France with 17.3%. The top five Member States (Germany, France, Italy, the Netherlands and Spain) accounted for 68% of the data market value in 2023 among the EU27, confirming the pervasiveness of data products and services across all sectors of the economy. Romania and Bulgaria, in catching up mode, reported the highest growth rates in 2023, followed by Belgium, France and Ireland. But also Estonia, Austria and Spain showed data market growth higher than the average EU27 in the same year.

As digital transformation becomes mainstream, also the number of European data companies increases in synchrony with the data market. The number of **European data suppliers** (organizations that have as their core business the production and delivery of digital data-related products, services, and technologies) increased to **238,325** in **2023**, a jump of **9.2%** on the previous year, representing **2.1%** of total companies in ICT and professional services versus **1.8% in 2021**. The **data suppliers' revenues** (which includes their exports, while the data market excludes exports but includes data imports from foreign companies) climbed to **€93 billion in 2023** from the **€85 billion of 2022**. The data industry is stronger in Germany, which has overtaken the UK in terms of revenues, followed by France and Italy.

The **data user companies** (defined as organizations that generate, exploit, collect, and analyse digital data intensively for their business) have also climbed in number to **604,280** with a growth rate of **3.5% in 2023**, representing a share of **2.3%** of total companies. The increase of data users may appear slow compared to the fast growth of the data industry, but it starts from a much larger base, with a relatively narrow definition focusing on companies leveraging data intensively and strategically, which belong to highly innovative sectors. Traditional sectors such as construction do include data users, but also a high number of traditional companies using data in a marginal way.

The multiplication of data companies is accompanied by the increase in the number of data professionals, the workers who collect, store, manage and analyse data as their primary activity. In 2023, the **number of data professionals** in Europe went up to a total of **7.7** million corresponding to **4.3%** of the total workforce in the EU27 in 2023, a growth rate of **4.7%.** It is a positive result, considering the difficulty to source data skills as all the other high-tech skills. In 2023 the EU27 **data skills gap** (measuring the excess demand of workers on the supply)

[1] See deliverable D2.7 Second Report on Facts and Figures. All data available at https://digital-strategy.ec.europa.eu/en/library/results-new-european-data-market-study-2021-2023

improved slightly compared to the previous year, at **363,000 jobs** (versus 360,000 in 2022). The unfilled demand of data skills represented a share of **4.7%** of total demand, compared to **4.9%** the year before. While some attrition in the labour market is normal, the size of the data skills gap is relevant and represents a constraint for the diffusion of data innovation.

The positive dynamics of the data market and data companies are reflected by the continuing strong growth of the data economy, which captures the value of the direct and indirect impacts of the data market on the overall economy. The **European data economy** reached **€544 billion** in 2023, with an increase of **9.3%** on the previous year, a remarkable performance considering the strong headwinds constraining economic growth. The **data economy share** of EU27 GDP reached **4.2%** in 2023 compared to **3.9%** in the previous year.

1.1.3 The EU Data Market and Data Economy in 2030

The Update of the European Data Market Study also produced key facts & figures at for the year 2030 according to three alternative evolution paths of the European Data Market and Economy, driven by different macroeconomic and framework conditions, highlighting the critical turning points to be faced in the next years by governments, businesses and social actors. The scenarios focused on the year 2030, taking as a reference starting point the year of 2025.

- **Baseline scenario** with the main assumptions based on the continuation of current growth trends and the evolution of current framework conditions. This scenario is characterised by a robust expansion of data innovation, a modest concentration of power in the hands of dominant data owners, a data governance mechanism that protects individual data rights, and unequal but relatively broad distribution of data innovation benefits across society.
- **High Growth scenario** whereby the data market enters a faster growth trajectory, thanks to more favourable framework conditions. This scenario is characterised by an advanced data innovation and digital transformation across Europe, where data sharing is supported by a globally recognised data governance framework.
- **Challenge scenario** whereby the data market grows more slowly than in the Baseline scenario because of less favourable framework conditions and less positive macroeconomic contexts. This scenario is characterised by a moderate level of innovation.

The EU27 macroeconomic conditions in the Baseline scenario foresee moderate GDP cumulative growth average in the period 2025-2030 (+1.6 %) and **ICT spending** growth of **4.4%,** compared to an almost completely flat growth in the Challenge scenario. The Baseline scenario envisions a healthy European data industry, continuous improvement in the provision of data products and services, and gradual growth in demand, particularly among the most advanced, competitive, and inventive firms, large and small. In aggregate, the economic impact of legislative initiatives such as the Digital Governance Act, the Data Act and the Digital Markets Act, creates a globally recognised data governance framework facilitating competition and data sharing, protecting individual data rights without excessive concentration of power over data assets by few leading stakeholders.

As a result, the **EU27 data market** will reach **€118 billion by 2030** with a CAGR of **3.3%.** In this scenario, we expect the gradual emergence of a healthy data ecosystem based on multiple vertical/horizontal industrial and personal data platforms, providing secure data sharing and trading environments. This will be supported by the at least partially successful development of the European Data Spaces in EU27 providing these platforms for secure data

sharing and trading in the main industries. In this context the European data industry will grow fast, with the number of **data supplier companies** reaching approximately **316,889 in 2030** with a cumulative growth rate of **3.4%,** slightly faster than the data market. By 2030 we expect **data supplier companies** to represent **2.6%** of total companies in the ICT and professional services sectors, up from 2% in 2022.

The number of data user companies will also grow, driven by the fast adoption by large companies and innovative SMEs of AI and data-driven business models. The EU27 **data user companies** will reach **910 thousand by 2030**, with a 6.8% cumulative growth rate for the period 2025-2030. The **data users share** of the total universe of EU enterprises will reach **3.2%** in 2030, from 2.2% in 2022, a remarkable increase.

In the High Growth scenario, Europe's economy will grow faster than in the Baseline scenario (with a CAGR of **2.6 %** between 2025 and 2030), with a stronger emphasis on digital innovation and higher growth of overall ICT investments (+6.9% in the same period). Faster than expected resolution of international conflicts leads to improved economic conditions already by 2024-25 with faster growth than the baseline from 2025 onwards. This scenario remains characterised by advanced data innovation and digital transformation across Europe and a globally recognised data framework. This is also characterised by global supply chains more integrated than previously between Europe, the US, South Korea and Japan and a reduced dependency from China manufacturing by 2030. In this scenario, a positive spillover effect is foreseen as the outcome of larger investment targeted to rebuild Europe strengths in the areas of the Important Projects of Common European Interest (IPCEI) such as semiconductors, hydrogen and the batteries. Also, the positive impact of European Digital and Data Strategy policies is maximised by effective implementation across Europe generating important benefits for growth.

In this scenario, the **EU27 data market** is estimated to reach **€141 billion** by 2030, with a cumulative growth rate from 2025 of **7.1%,** twice as fast as the baseline scenario. The **EU27 data economy** is forecast to reach **€995 billion** in the same year, representing 6.5% of EU27 GDP, with a cumulative average growth rate of **8.6%.** The economy will transform into an emerging digital-first marketplace, with more than half of the GDP driven by products and services from digitally transformed enterprises.

The Challenge scenario envisions a negative self-reinforcing spiral, in which less promising worldwide economic conditions discourage investment and weaken global demand, consequently limiting European growth. It is a combination of a less favourable macroeconomic environment than in the Baseline scenario, less favourable framework conditions, and a slower spread of digital innovation, resulting in a low-growth path for the data market. This context results in strong disparities between countries with rich economies (US, leading EU countries such as Germany and France) continuing to invest in digital technologies and data innovation, and countries with weaker economies less able to keep up with the new technologies race. This scenario is also characterised by fragmented data flows and low level of digital innovation by SMEs, with an incomplete internal digital single market unable to compensate for countries disparities. Because demand-pull will be minimal, the supply-demand dynamics will be dominated by the technology push. As a result, this scenario examines the possible risks and implications of failing to remove impediments to the growth of Europe's data economy.

In this scenario, the EU27 GDP compound annual growth rate in the period 2025-2030 is 0.8%, dramatically lower than the 1.6% growth rate of the Baseline. This slower pace of global

economic growth could be caused by relevant geo-political shocks in critical regions as it is the current case with the Russia-Ukraine war.

As a result, the value of the data market and data economy will be significantly lower in 2030 than in the Baseline scenario. The EU27 **data market** is estimated to reach **€104 billion** by 2030, expanding at a compound annual growth rate of **0.7 per cent** (versus 3.3% in the Baseline). The **data economy** is projected to achieve a value of **€723 billion** in the EU27 by 2030, corresponding to **5.2 per cent** share of EU GDP.

1.1.4 The EU Data Market and the International Indicators

For the first time since the inception of the European Data Market study series, the Monitoring Tool of the European Data Market Study 2021-2023 includes a series of quantitative indicators for China, in addition to the U.S., Brazil and Japan, which were regularly covered in the previous editions.

The EU27 maintains its second-place ranking in the size and robustness of its data market and economy when viewed against the current global landscape. In 2023, the value of the data market in the EU27 was nearly €82 billion, trailing only the United States, which boasted a market value of over €350 billion, and comfortably leading Japan (€53 billion) and China (€49.7 billion). However, China's data market saw a significant increase of 25.3 percent in 2023 compared to the prior year, surpassing the growth rates of the US at 20.6 percent and the EU27 at 13.8 percent. The EU's slower digital technology adoption rate compared to the US, coupled with structural investment barriers in digitalization, fragmented policy approaches, a lack of recognition of digital benefits, and a continuing digital skills gap, are among the primary factors contributing to Europe's significant delay behind the US in data market development.

With a data economy of almost €226 billion (in terms of direct[2] and backward indirect impacts only[3]), the EU27 exhibits the second-largest data economy worldwide after the United States in 2023. With €105 billion in the same year, China does reach the third position in terms of data economy size (direct and backward impacts only) as it outsizes Japan for the first time – Japan’s data economy in terms of direct and backward impacts only is estimated at slightly more than €101 billion in 2023. Brazil, as in the previous measurement of the international Monitoring Tool’s indicators, continues to display the smallest data economy with nearly €23 billion in the same year.

In terms of the data economy incidence on GDP the situation is somewhat different. As in the previous version of the Monitoring Tool, our international indicators measure the effects of the data economy on GDP limited to the direct impact components. In this respect, the U.S. and Japan exhibit the highest impact of the data economy on GDP with an incidence rate in 2023 of 1.46 and 1.42 per cent respectively. China, the second-largest economy worldwide, fares

[2] Direct impacts are the initial and immediate effects generated by data supplier companies on the economy as a whole. Direct impacts correspond to the data suppliers’ revenues from data products and services sold. They are therefore measured as data suppliers companies' revenues

[3] The indirect impacts are the economic activities generated along a company's supply chain by data supplier companies, considering input providers as well as customers of data supplier companies. There are two different types of indirect impact: backward indirect impacts and forward indirect impacts. 1. Backward indirect impacts represent the revenues resulting from changes in sales from input providers to the data suppliers. In order to produce and deliver data products and services, data suppliers need inputs from other stakeholders. 2. The forward indirect impacts include the economic growth generated through the use of data products and services by the downstream industries, i.e. the data users.

better than the EU27, with an incidence of the data economy (direct impact only) on GDP of 0.94 per cent versus a scanty 0.68 per cent shown by the EU27 in 2022. In line with the results obtained in the previous wave of measurements, we continue to observe that China's data economy, while still relatively underdeveloped in absolute terms, does exert a growing impact on its overall economy (China's incidence in 2022 was estimated at 0.92 per cent) and that this impact, in relative terms, is greater than in the EU27.

The United States hold their leadership also in the realm of data professionals with more than 17 million in 2023. China, which, with 12.4 million, marks a year-on-year increase in data professionals of only 0.4 percent but continues to present a relative low number in units if compared to its size of population. As a result, the employment share of data professionals remains considerably high in the U.S. (13.4 per cent in 2023) and significantly low in China (1.4 per cent in the same year) – a clear sign of a still developing data economy. In contrast, the proportion of data professionals within the workforce in the EU remains robust at 4.2 percent, trailing only behind the United States and Japan, which stand at 8.8 percent, and significantly surpassing Brazil's figure of 2.6 percent.

Regarding data provider companies, China significantly outnumbers both the U.S. and the EU27. In 2023, China is home to over 900 thousand data provider companies, compared to the U.S. with more than 337 thousand and the EU27 with about 238 thousand. However, despite the large number of data supplier firms, their contribution to China's data economy is relatively minor due to the smaller scale of China's data market compared to other leading global entities. This indicates that China's data economy has considerable ground to cover to match the levels seen in Western countries. Yet, given China's superior growth rates across nearly all metrics, it might only be a matter of a few years before China closes this gap, surpassing the performance of other global competitors.

The four infographics at the end of this Executive Summary provide a comprehensive overview of the main facts and figures stemming from the Update of the European Data Market Study so far.

1.2 Describing the Data Market – Descriptive Stories

The quantified stories were the result of a mixed effort entailing both secondary and primary research activities and were aimed to add quantitative and qualitative evidence to the indicators measured through the European Data Market Monitoring Tool. The main goal of the stories was, therefore, to ensure both complementarity and support to the study activities while making sure to capture all the relevant aspects that are characterizing the existing data market, related concepts and the building of data spaces in Europe today and in the years to comeThe stories of the third edition of the European Data Market Study focused on the following topics: Data Sharing in Construction; Data for Green Deal; Data for Skills; Digital Sovereignty; Data for Energy; on Data for mobility; Data4Food; Data for Healthcare and Predictive Data Driven Policymaking.

Data Sharing in Construction

This study developed an in-depth understanding of data sharing practices in the construction sector and the challenges ahead in the form of a quantitative story. The main goal of the story was to produce a descriptive analysis the main critical issues of the development of the EU data economy and society in the construction sector, complementing the European Data Market statistical indicators with qualitative and quantitative evidence based on a case study and expert analysis.

More specifically, the report provided information on: what data is produced and can be potentially reused; how to support and increase the development of standards, data certification by third parties to avoid fake data, how to share data with the clients and the authorities, how to share data in new business models, how to share data in user communities/cloud platforms: advantages, challenges and risks,, how to upscale micro SMEs that constitute an important part of the construction sector, policy recommendations.

Data4Green: Why Data- Driven Innovation is Key to Delivering the EU Green Deal

This story showed that data analytics is present across all the priority areas of the European Green Deal with a wide range of impacts. It can help with mitigation, for instance by reducing carbon emissions through precision agriculture. Also, it can help with adaptation, for instance by better predicting floods. The story is built around the following three elements: 1. The opportunities of Data4Green with an overview of the relevant European policy context, an explanation of the green data value cycle, a taxonomy of data-driven applications for the green transition, a reflection on the expected impact of such applications and a look at several startups that are active in the described domains. 2. Specific cases on the ground to provide a more profound insight into the mechanisms through which data can impact the green transition. 3. Policy implications deriving from the analysis of the opportunities and challenges in the preceding sections

Skills for Data: How to Overcome Skills Gaps and Develop Competent Data Professionals

This Story was the result of the research done on the great divide between the digital skills and the data workforce in the EU. It demonstrated through five case studies, each of which offers a unique and cross-sectoral perspective from the private sector, examples on how to develop data-driven professionals and thus enable European business success.

Digital Sovereignty in the EU: A convoluted Journey

Over the past two years, the notion of digital sovereignty has become more widespread among EU policy makers and governments and has been given additional tangible strength with the establishment of GAIA-X, whose goal is to create the next generation of data infrastructure for Europe as the EU embarks upon its digital journey. The concept has further been made more concrete through a number of legislative proposals such as the Digital Services Act, the Data Market Act, the Data Governance Act and the Data Act. In the same vein, with the Chips Act, the EU is asserting its determination to regain a leading role in the semi-conductor sector and avert shortages in the future. Finally, the outbreak of the Covid-19 crisis has shed light on the EU's economic vulnerability and interdependency. Its impact thus has reinforced the sense of urgency and relevancy around the general notion of digital sovereignty. The upcoming descriptive story will therefore introduce the concept of digital sovereignty, examine some of the most relevant business and economic impacts and reference to the international dimension of the digital sovereignty and its implications on the EU Competitiveness as a whole.

Data4Energy: How Energy Data Can Accelerate the Green Transition

Energy policy has taken centre stage due to the combination of strategic goals of the Green Deal and short-term events related to Russia's war on Ukraine. Energy production and consumption make up 75% of greenhouse gas emissions in the EU, hence increased energy efficiency and green energy play a major role in achieving the net zero emissions targets by 2050. Data and digitization are essential to this transition, as recognized by recent EU policies

that recognize the important role of energy digitization, mandating increased data transparency and sharing. The data story provides an overview of data start-ups active in the energy area, and three deep dive case studies. To showcase the variety of applications, the cases cover the micro level (Opower, on smart meters and customers empowerment), the meso level (EDA, on data sharing in distributed grid management) and the macro level (LEAP4SME/OECD, using energy data to track the green transition).

Data for Mobility

This study investigates the market trends affecting changes in mobility, by looking at the evolution of three main attributes of people and goods mobility. For each attribute, the study provides a comprehensive analysis, encompassing demand-side trends, supply-side contributors, and illuminating case studies. Its insights and findings are designed to empower decision-makers to make strategic choices regarding the future of mobility customer experiences, operations, and ecosystem collaboration.

Data4Food

The data story provides an overview of data start-ups active in the agri-food area, and four deep dive case studies. One of the showcases provides some insights into how data intermediaries (DjustConnect data exchange platform) can make the agri-food sector thrive using the data in a legal, ethical and fair data exchange process. The second showcase provides relevant information on how using smart trays improves the food supply chain and contributes to reducing food waste. The third showcase (AgriFood Data Space Finland) promotes and initiates data-sharing activities between the stakeholders of agriculture and food systems to concretely help the agri-food industry in Finland. The fourth showcase (DIH AGRI-FOOD Data Space, Slovenia), a federally organised data-sharing platform, allows any interested data owner, data provider or any stakeholder from the agri-food sector to provide/share data or use data through the platform, using pre-known policies and rules defined by the data governance model.

Data for Healthcare

The European Health Data Space EHDS stands as a transformative force, providing essential elements that promotes a safe and compliant exchange of health data. By establishing rules, common standards, infrastructure, and a governance framework for both primary and secondary use, EHDS holds the potential to unlock the inherent value of health data. As the trilogue negotiations for the approval of the definitive version of EHDS regulation continue, this story delves into the European healthcare context in which EHDS will function, assesses the current status of the EHDS2 Pilot advancements and its initial lessons learned.

The pilot project is designed to support five distinct use cases, each aimed at demonstrating the potential of EHDS in facilitating the cross-country reuse of health data including research, innovation, policy-making, regulatory activities, and potentially personalized medicine. The project's use cases focus on specific cross-border research or public policy projects, necessitating data access from multiple countries. They encompass a wide range of research topics, like: Infectious disease surveillance (AMR), Thrombosis in COVID-19 patients, Covid-19 testing, vaccination and hospitalisation, Cardiometabolic diseases and Colorectal cancer.

Predictive Data Driven Policy Making

The data story provides an overview of public sector initiatives based on emerging technologies (e.g., artificial intelligence and blockchain), and three deep-dive case studies. One of the showcases (Preventing Medicare Fraud) provides some insights into how

predictive analytics technologies help identify and prevent the payment of fraudulent claims in the Medicare Fee-For-Services Program in the United States. The second showcase (Spotlight: Fighting Human Trafficking) provides relevant information on how data analytics helps investigators visualise the complexity of a juvenile's trafficking situation and helps them fight underage human trafficking victims. The third showcase (MITOS: Digitising Administrative Procedures and Services in Greek Public Service) offers an overview of the Greek National Registry of Administrative Procedures, a state-of-the-art information system (IS) that aims to host and manage all administrative procedures related to Greek Public Administrations (PAs).

1.3 Mapping the Data Market – The Data Landscape and the Data Market Monitoring Tool

The final new EU Data Landscape review under the Update of the European Data Market Study was performed in November 2023. This final edition of the EU data landscape is a continuation of the previous report, uses the same data source (Dealroom) and aims to build a time series of data that will provide relevant information about the data start-ups and scale-ups environment in the 27 EU member states. The data landscape database continues to provide a solid mapping of the main key players in the data economy. It maintains the same objective and well-defined criteria to select the most promising big data companies in Europe with a special focus on the "key data companies" category (e.g., active companies, headquartered (or R&D department) in the EU and with a valuation of at least 100 million euros). The mapping exercise is a dynamic process that follows the trends in the data economy (fintech, internet of things, artificial intelligence, secondary use of data, and others) and the additional information will help expand and better understand the EU data landscape as well as the stakeholders' characteristics and their activities. The third run of the query in the Dealroom database returned 4,091 data start-ups and scale-ups entries matching the selection criteria, distributed across the 27 EU member states. In 2023, the selection volume of data companies increased by 18% compared to 2022 and by 31% compared to 2021, having an overall compound annual growth rate of 14% for the period 2021-2023. Compared to 2022, there are 814 new companies, while 92 previously selected companies have dropped from the list. Therefore, the current analysis will focus on the selection of 4,091 data start-ups and scale-ups.

1.4 The European Data Policy Framework

The digital strategy of Europe, highlighted as one of the top six priorities by the present Commission, saw substantial progress between 2021 and 2023. This period was marked by the enactment of several important legislative initiatives and the approval of corresponding implementation actions, especially in the realm of data governance.

As the new policies reshape the digital regulatory framework and deeply influence markets (one example for all: the DMA, Digital Markets Act), private stakeholders are forced to pay attention, adapting to the new environment and refocusing their digital investments.

In this chapter we consider both the policies designed specifically for data governance (such as the Data Act) and those setting the framework conditions for the development of the data market, for example shaping the competitive game (DMA Act) and the emerging new rules of the game for online platforms (DSA, Digital Services Act). Online platforms are one of the main sources of the data used to train the generative AI systems.

1.4.1 Europe's Data Market and Data Economy Evolution: Policy and the Three Scenarios

The methodology framework of the scenarios is the same successfully implemented in the three editions of the EDM study. The indicators are projected from 2022 (current actual measurement) to 2025 (short term forecasting with a low level of uncertainty). From 2025 to 2030 we project the three alternative development paths of the indicators, providing measurements for the year 2030.

The main storylines of the scenarios have been updated to consider recent disruptive events, specifically the potential consequences of the Russia-Ukraine war and the worsening macroeconomic conditions.

Baseline scenario: the main assumptions are based on the continuation of current growth trends and framework conditions. Because of the worsening macroeconomic conditions, growth rates to 2025 are somehow weaker than expected in previous forecasts, with a new acceleration foreseen after 2025. Thanks to the resilience of the data market, though, the diffusion of data innovation is still relevant. This scenario is characterised by a modest concentration of power in the hands of dominant data owners, a data governance mechanism that protects individual data rights, and unequal but relatively broad distribution of data innovation benefits across countries and society.

High Growth scenario: The data market enters a faster growth trajectory, thanks to more favourable framework conditions. This could happen if the Ukraine war could be ended by a lasting peace agreement in the short term (by 2024 at the latest) with renewed stable conditions in Eastern Europe driving robust macroeconomic growth from 2025 onwards. Better economic conditions would enable a faster adoption of data innovation than in the baseline scenario, in a context of data sharing supported by a globally recognised data governance framework. This scenario is also characterised by global supply chains more integrated than before between Europe, neighbours such as Ukraine, the US, South Korea and Japan and a reduced dependency from China manufacturing by 2030.

Challenge scenario: a continuing geopolitical crisis environment, for example if the Ukraine war was followed weak cease-fires rather than a stable peace, or/and high inflation combined with stagnation, could substantially reduce the growth of the data market by 2025, and in turn weaken the growth potential by 2030. Hard economic conditions in this scenario result in strong disparities in data innovation adoption between countries with solid economies (Germany for example) and more fragile ones. This scenario is also characterised by fragmented data flows and a low level of digital innovation by SMEs.

1.4.2 Common European Data Spaces

Significant progress has been made in data spaces, with work underway on essential components through EU projects funded by the Digital Europe Programme.

Key pillars include:

1. Community of practice & network of stakeholders
2. Data sets:
3. Technical building blocks:
4. Governance schemes and business models

Funding for European Data Spaces is primarily sourced from the EU's Digital Europe Programme, with a planned budget of €7.5 billion over 7 years. For the 2021-2022 period, around €410 million was allocated for data space roll-out, and the recently adopted Work

Programme for 2023-2024 includes €113 million supporting the deployment of Common Data Spaces.

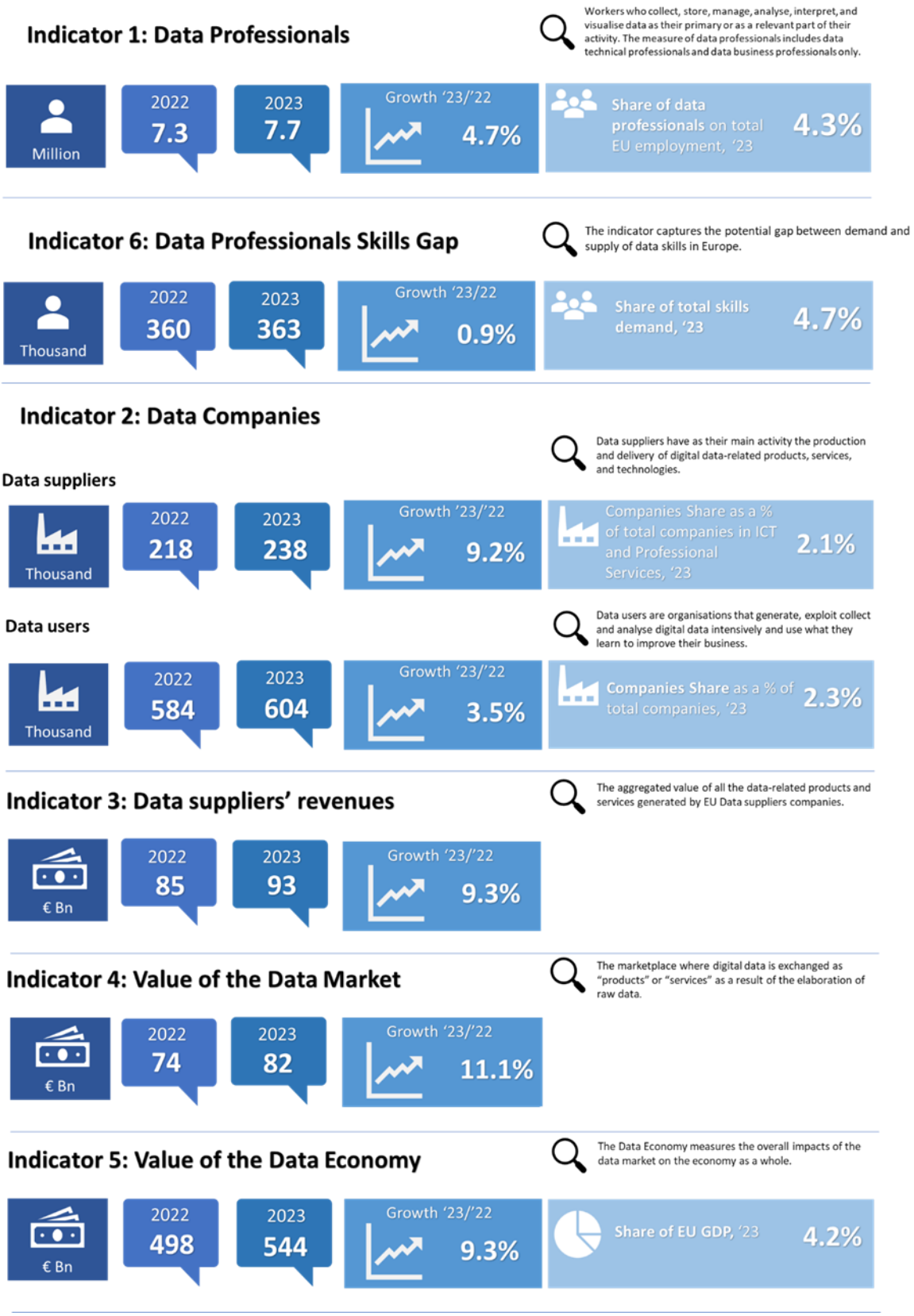
Together with the Data Space Support Centre, the Coordination and Support Actions involve launching small projects focused on specific sectors or application domains within the ecosystem established by the Digital Europe Programme. These projects aim to create common assets, including high-value data sets, technical blueprints, governance frameworks, and new business models. The sectors covered include the Green Deal, manufacturing, agriculture, tourism, smart cities, communities, mobility, and skills, implemented through the CSA instrument.

Additional sector-specific activities are supported through different funding instruments, such as tendering processes, and are complemented by Horizon Europe projects. These initiatives expand the data space portfolio, adding value to various domains addressed by the Coordination and Support Actions.

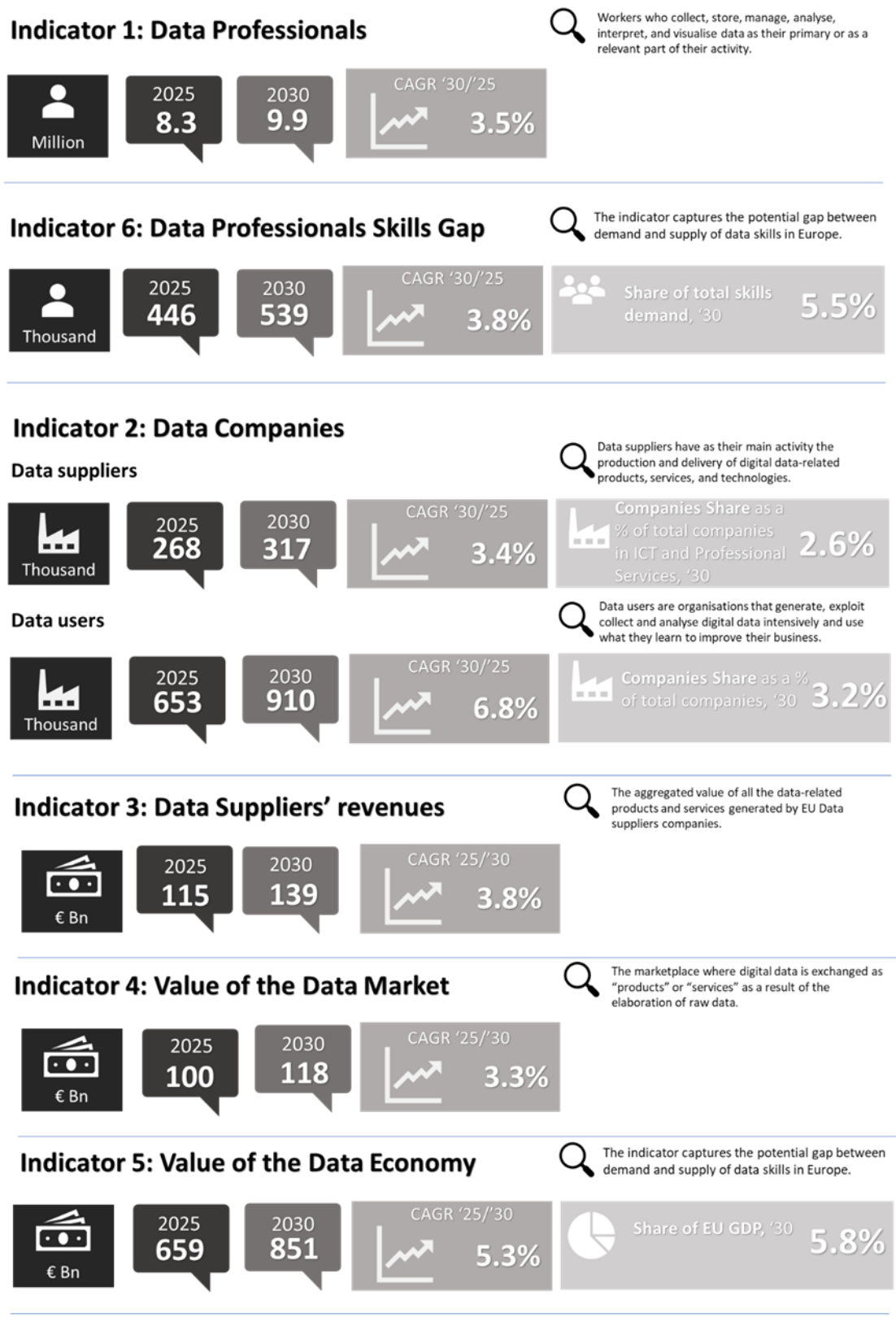
1.4.3 The International Competitiveness and the Role of Policy

In a global scenario of increasing strategic competition between major powers, the digital technologies market is one of the critical arenas where countries strive to build strength and competitive advantages. For this reason, Europe needs to monitor closely the international digital markets, to develop and protect its own independence and digital sovereignty. This is particularly important for the data economy, where international data flows and knowledge sharing enable relevant benefits – for example for the productivity of global supply chains – but also generate relevant potential risks of data misuse and threats for national security.

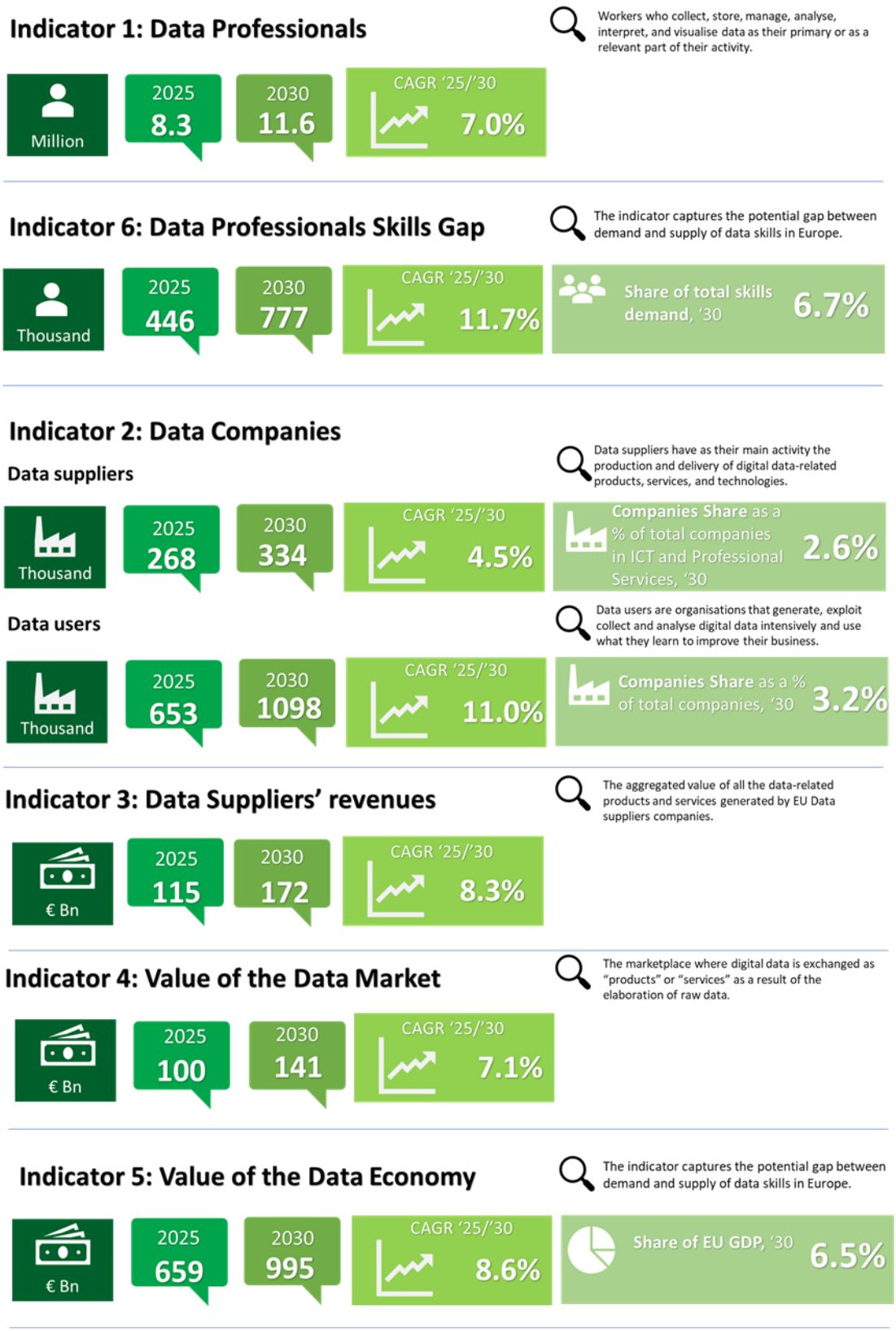
The European Data Market study provides an ongoing observatory of the international data economy which for the second year covers China, as well as the United States, Japan, and Brazil, based on the EDM monitoring indicators. Monitoring China's positioning in the international data market is of strategic relevance for Europe, given China's increasing competitiveness in the digital technologies field and the tensions generated by its new assertiveness in the global political scenario, particularly with the United States.



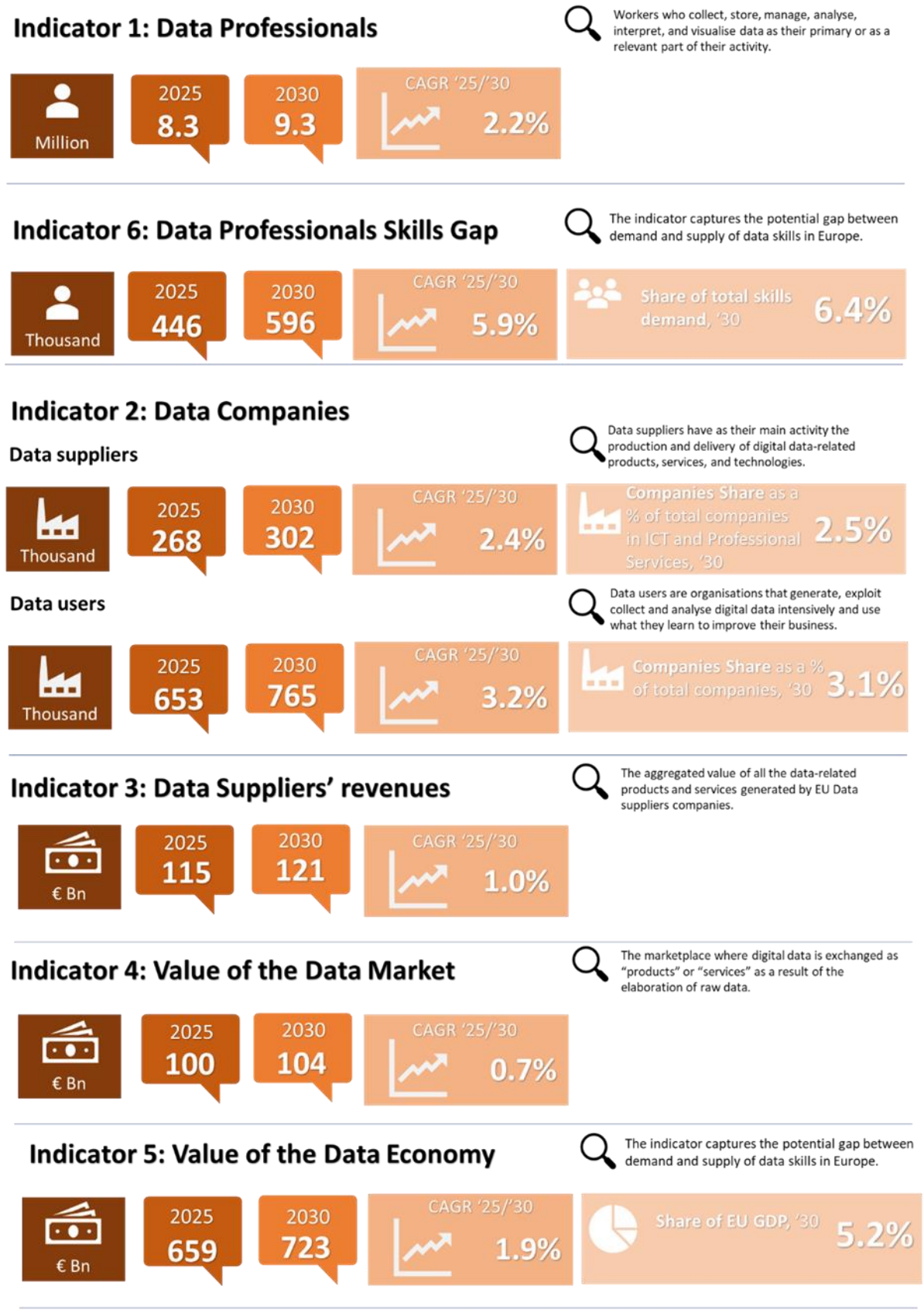
Source: EDM Monitoring Tool, IDC 2022



Source: EDM Monitoring Tool, IDC 2022



Source: EDM Monitoring Tool, IDC 2022

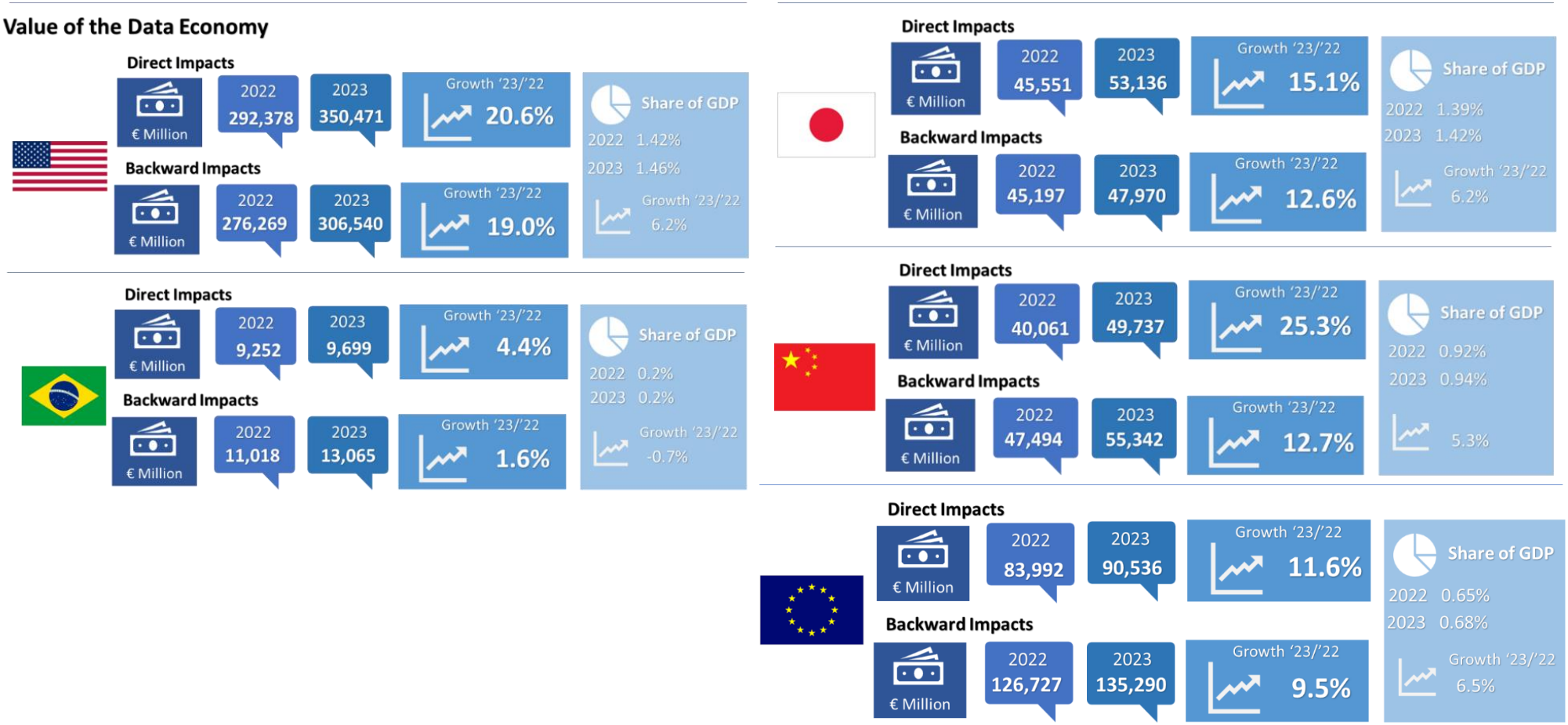


Source: EDM Monitoring Tool, IDC 2022

The European Data Market Monitoring Tool – The International Indicators and the EU27

Value of the Data Market

Number of Data Suppliers


Value of the Data Economy
Direct Impacts
€ Million
2022
292,378
2023
350,471
Growth '23/'22
20.6%
Share of GDP
2022 1.42%
2023 1.46%
Growth '23/'22
6.2%
Backward Impacts
€ Million
2022
276,269
2023
306,540
Growth '23/'22
19.0%
Direct Impacts
€ Million
2022
9,252
2023
9,699
Growth '23/'22
4.4%
Share of GDP
2022 0.2%
2023 0.2%
Growth '23/'22
-0.7%
Backward Impacts
€ Million
2022
11,018
2023
13,065
Growth '23/'22
1.6%
Direct Impacts
€ Million
2022
45,551
2023
53,136
Growth '23/'22
15.1%
Share of GDP
2022 1.39%
2023 1.42%
Growth '23/'22
6.2%
Backward Impacts
€ Million
2022
45,197
2023
47,970
Growth '23/'22
12.6%
Direct Impacts
€ Million
2022
40,061
2023
49,737
Growth '23/'22
25.3%
Share of GDP
2022 0.92%
2023 0.94%
5.3%
Backward Impacts
€ Million
2022
47,494
2023
55,342
Growth '23/'22
12.7%
Direct Impacts
€ Million
2022
83,992
2023
90,536
Growth '23/'22
11.6%
Share of GDP
2022 0.65%
2023 0.68%
Growth '23/'22
6.5%
Backward Impacts
€ Million
2022
126,727
2023
135,290
Growth '23/'22
9.5%

2. INTRODUCTION

The first European Data Market Study (SMART 2013/0063) was launched by the European Commission in 2013 to measure the progress, size and trends of the European Data Economy with the objective of supporting the Data Value Chain policy of the European Commission. The study designed, developed and implemented a European Data Market Monitoring Tool providing facts and figures on the size and trends of the EU Data Market and Data Economy in the form of a series of quantitative indicators. The study also covered quali-quantitative aspects of the European Data Economy in the form of descriptive stories investigating elements of the Data Market that were not captured by the Monitoring Tool. Finally, the European Data Market Study included a data landscaping tool offering a continuously updated picture of data companies in Europe and comprehended a series of webinars to disseminate the research results.

To continue gathering reliable and fact-based evidence on the EU Data Economy and measure the progress of the data-driven economy policies within the general framework of the Digital Single Market Strategy, the European Commission commissioned a third edition following the first-two editions from 2013 and 2016 of the European Data Market Study (VIGIE 2020-0655).

The present document constitutes the **Final Study Report (D2.9)** of the Update of the European Data Market Study (VIGIE 2020-0655), which was entrusted in 2020 to IDC and the Lisbon Council.

This report brings together the research results and the activities carried out by the contractors under:

- **The Final Report on Facts & Figures (D2.7)** presenting an updated measurement of the European Data Market Monitoring Tool for the years 2022-2023 and forecasts to the year of 2025 with a forecast to a baseline scenario and the year of 2030 under three alternative scenarios;
- **The Final Report on Policy Conclusions (D2.8)** analysing the role of policies in shaping the sizes and trends of the European Data Market and Data Economy as measured by the European Data Market Monitoring Tool.
- The key messages obtained from the last four **descriptive stories (D37-8, D3.9-10, D3.11 and D3.12)** produced by the study team and focusing on the mobility of data, data for food, health data space and predictive policy-making.
- **The Final Data Landscape Report (D4.3)** providing an overview of the EU Data Landscape and offering and up-to-date zoom into the database of data market companies in Europe.

2.1 Objectives

As for the previous study, the Update of the European Data Market Study (VIGIE 2020-0655) pursues three main objectives closely interrelated, which together allow to develop a complete and coherent picture of the European Data Market and Data Economy. They are as follows:

- Measuring the EDM indicators, providing facts and figures on all the key features of the European Data Market and Economy, regularly updated during the life of the project,

building on the taxonomy and methodology approach previously developed and successfully implemented;

- Analysing relevant issues for the development of the data ecosystem, providing Data Market stories based on factual evidence, case studies and complementary data to the EDM indicators, following on the 12 stories already published by the previous study;
- Mapping and visualising the stakeholders populating the EU Data Market, building on the stakeholders' landscape and community developed in the previous study.

2.2 Methodological Approach

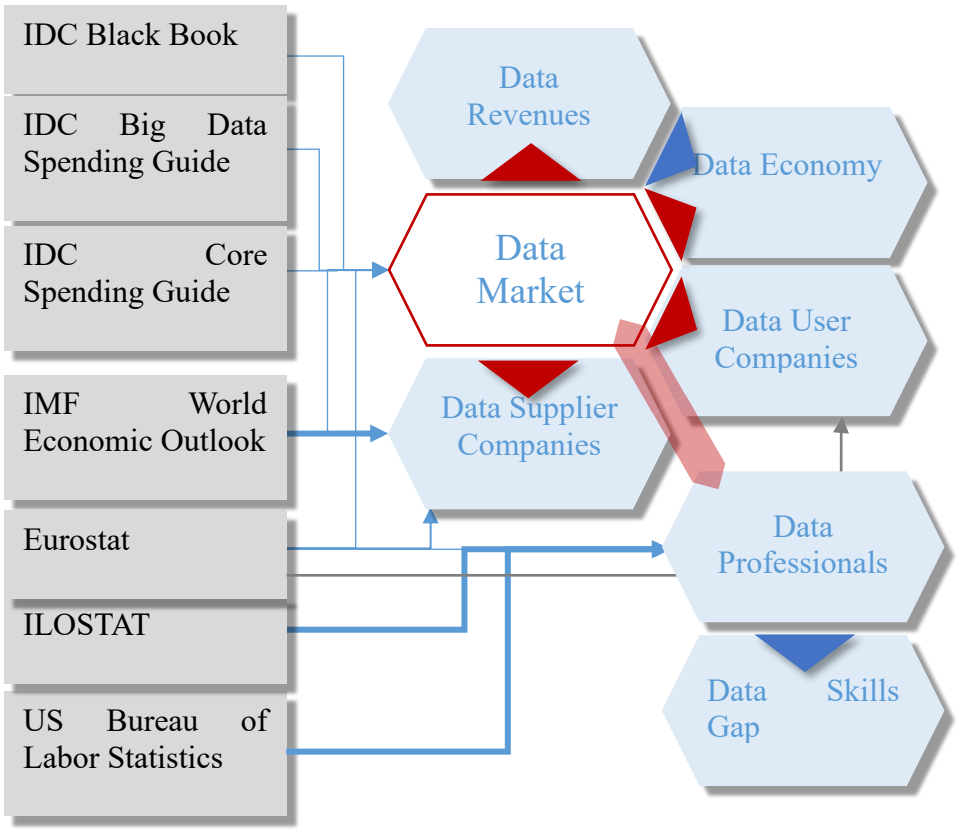
2.2.1 The indicators

The indicators of the European Data Market Monitoring Tool were developed according to a logical interlinked process to best leverage the data collected. The indicators' models are interconnected because they must be coherent: for example, if the data market grows fast in a certain country or industry, the data economy in the same country or industry cannot grow much more slowly. If data professionals increase in a country or industry, the number of data user companies should also increase and vice versa. A cross-indicator which allows to monitor this coherence for example is the average number of data professionals by company.

The seven quantitative models developed for the six indicators (the data companies have two, one for the user companies and one for the supplier companies) are also correlated in sequence based on their development process.

Data sources, their use are as follows:

Figure 2 Data Sources and Interaction of Data Models



The EDM Monitoring tool datasets includes data starting from the year 2013. The economic crisis created by the Covid-19 pandemic has already created a break in the growth trends. Since we are modifying the definition of the data professionals' indicator and the measurement method of the data market and the data companies, there will be a relative discontinuity in the historical series of the indicators. This however reflects the maturing of the market. These methodological changes are commonly practice for all composite indicators, for example the EU DESI index has already undergone a couple of changes in the past years resulting in variations of the baseline data.

The indicators data is provided for each of the EU27 Member States and the total EU; for the UK and Switzerland separately; for the rest of EEA (Norway, Iceland and Lichtenstein) in an aggregated way. The geographical scope is specified for each indicator. For the data skills gap the data is provided as always for the 6 largest EU countries and the rest of EU27 in an aggregated way, mainly because of the difficulty to measure data skills job vacancies for each individual Member state. The table below presents a summary of the main statistical sources to be used and their frequency of updates.

Table 1 Summary of main data sources by indicator

Data Source	Used in	Frequency of updates
Eurostat Business Demographic Statistics	Data professionals Data supplier companies Data user companies	Annual
Eurostat annual Structural Business Statistics	Data professionals Data supplier companies Data user companies	Annual
Eurostat chain linked Volumes (GDP)	Data Market	Annual

Data Source	Used in	Frequency of updates
	Data Revenues	
IDC Core IT Spending guide	Data Market Data Revenues	Bi-annual
IDC IT Big Data and Analytics spending Guide	Data Market	Bi-annual
IDC Worldwide Black Book (standard edition)	Data Market Data Professionals Data supplier Companies Data User Companies Data Revenues	Quarterly
IDC European Vertical Markets survey	Data Market	Annual
IDC Technology Employment Impact Guide	Data Professionals	Bi-annual
Cedefop	Data Professionals	Annual
IMF World Economic Outlook	Data Market Data Revenues Data Economy	Annual
Consensus Forecasts – Consensus economics	Data Market Data Revenues Data Economy	Monthly
ILOSTAT statistics and databases	Data Professionals	Annual

2.3 The Report on Policy Conclusions

Extensive desk research and additional literature review were conducted to produce the Final Report on Policy Conclusions (D2.8) accompanying the quantitative results of the Final Report on Facts & Figures (D2.7). To better investigate the role of policies in shaping the current and future development of the European Data Economy, the study team leveraged a mix of IDC research and other sources.

A selected list of these sources is offered in the Table below:

Table 2 Policy Report Sources

Document
European IT Spending Forecast, 2022-2026: The Role of Technology in Shaping the Future Enterprise
IDC FutureScape: Worldwide IT Industry 2024 Predictions
IDC's Worldwide Black Book: Live Edition, September 2023
Recovery Plans in Europe and Investments in Traditional and Emerging Technologies: An IDC Overview
European Industry Acceleration Survey, October 2023

The baseline scenario in 2025 and the three alternative scenarios in 2030 were developed by leveraging the results of the previous study featuring the Data Market and Data Economy future development paths at 2020.

2.4 The Descriptive Stories

One of the key objectives of the study is to produce descriptive stories analysing the main critical issues of the development of the Data Economy and society, complementing the EDM statistical indicators with qualitative and quantitative evidence based on case studies and expert analysis. The stories have proven a flexible and valuable tool to investigate issues and questions raising from evolving data policy priorities during the life of the project.

Extensive secondary research on available public sources, specialised press and academic literature was undertaken to obtain an actionable and up-to-date understanding of private and scientific data for public interest and innovation together with a comprehensive picture of the phenomenon in Europe and worldwide.

2.5 The EU Data Landscape Report

In the previous editions the data landscape report relied on the crowdsourcing of knowledge through an open process, where stakeholders could directly suggest the companies to be included in the database. The mapping of the data landscape focuses exclusively on the EU27 Member States. The mapping exercise sought to achieve a balanced and comprehensive coverage of the different geographies, different typologies of companies (SMEs, large companies, research institutions etc.) and the different data sectors.

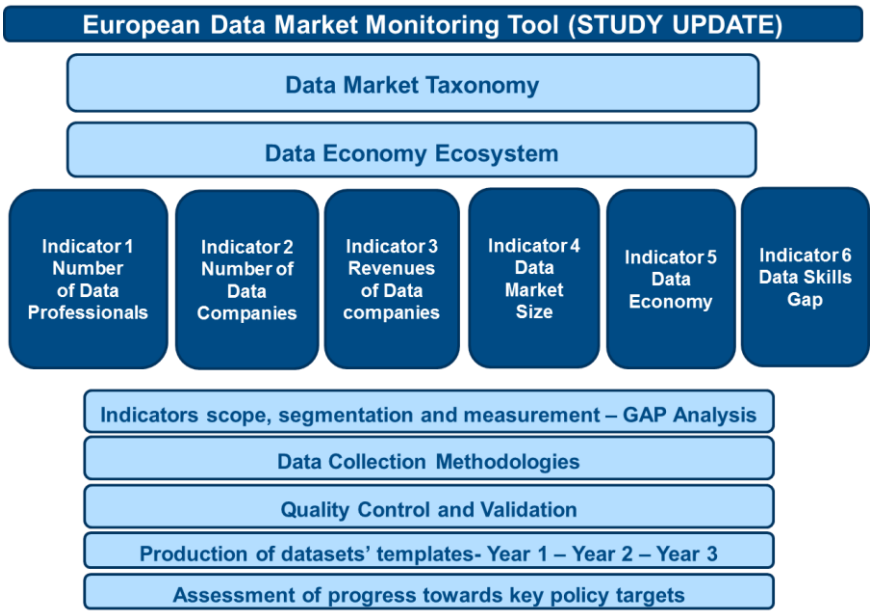
The Final EU Data Landscape Report presented a new version of the database by using new data source of Dealroom a leading provider of data on tech company and partner of the EuropeanStartups.co. As a result, the new report is not comparable with the previous versions. It includes several changes such as the United Kingdom is not counted since it left the European Union

New categories have been also added to the mapping: Business angels; Business angels' networks; Federations of business angels' networks; Early-stage venture capital funds; Business accelerators; Business incubators; Associates/other early-stage market players; Universities and scientific parks
Section 4 presents the new categorisation in detail.

2.6 The European Data Market Monitoring Tool

Based on a modular and flexible structure, the European Data Market Monitoring Tool for the Update of the European Data Market Study leverages the existing tool that was used to measure the Data Market and the Data Economy during the period 2021-2023. The updated European Data Market Monitoring Tool designed by IDC is shown in the Figure below and its main components are further described in the following sections.

Figure 3 The Updated EDM Monitoring Tool



2.7 The Structure of this Report

This report is built along the following sections:

- The first section – corresponding to Chapter 2 – summarises the results of the Final Report on Facts & Figures (D2.7) that was delivered in January 2023 and approved by the European Commission in February 2024.
- The second section – corresponding to Chapter 3 – provides additional qualitative and quantitative aspects on the European Data Market as obtained by the quantified stories produced by the study team in 2023 and 2024.
- The third section – corresponding to Chapter 4 – presents an updated overview of the data landscape and interactive Data Market Monitoring Tool.
- The fourth section – corresponding to Chapter 5 focuses on the policy conclusions delivered in D2.8 in January 2024 and approved in February 2024.
- The final section provides for a set of concluding remarks drawing from all the different components (and deliverables) of the Update of the European Data Market study so far.

3. Quantifying The Data Market – Key Facts & Figures

This Final Report presents the results obtained through the last round of measurements of the European Data Market Monitoring Tool revised and extended in the Update of the European Data Market Study (SMART 2016/0063).

The key facts & figures chapter focuses on the following set of indicators:

Measuring data professionals:

- Indicator 1: Number of data professionals.
- Indicator 1.2: Employment share of data professionals.
- Indicator 1.3: Intensity share of data professionals.

Measuring data companies

- Indicator 2: Number of data supplier companies.
- Indicator 2.2: Share of data supplier companies.
- Indicator 2.3: Number of data user companies.
- Indicator 2.4: Share of data user companies.
- Indicator 2.5: Share of data user & data supplier companies that offer data for re-use.

Measuring data companies' revenues

- Indicator 3: Revenues of data supplier companies.
- Indicator 3.2: Share of data supplier companies' revenues.

Measuring data market

- Indicator 4: Value of the Data Market.
- Indicator 4.1: Data monetisation.

Measuring data economy

- Indicator 5: Value of the Data Economy.
- Indicator 5.2: Impact of the data economy on GDP.

Measuring the data professional's skills gap

- Indicator 6: Data professionals' skills gaps.

Each indicator is measured at the level of the total EU and for each individual Member State, when available and applicable. The UK and Switzerland were measured separately, as was the EEA (Norway, Iceland, and Lichtenstein) in an aggregated way.

This chapter embraces the Data Economy beyond the European Union and includes a specific section on four non-European countries, namely the United States, China, Brazil and Japan. For each of these countries, this report presents the following selected indicators:

- Indicator 1: Number of data professionals.
- Indicator 1.2: Employment share of data professionals.
- Indicator 1.3: Intensity share of data professionals.
- Indicator 2: Number of data supplier companies.
- Indicator 3: Revenues of data supplier companies.
- Indicator 4: Value of the Data Market.
- Indicator 5: Value of the Data Economy.
- Indicator 5.2: Impact of the data economy on GDP.

The table below provides a summary of the main statistical sources to be used and their frequency of updates.

Table 3 Summary of main data sources by indicator

Data Source	Used in	Frequency of updates
Eurostat Business Demographic Statistics	Data professionals Data supplier companies Data user companies	Annual
Eurostat annual Structural Business Statistics	Data professionals Data supplier companies Data user companies	Annual
Eurostat chain linked Volumes (GDP)	Data Market Data Revenues	Annual
IDC Core IT Spending guide	Data Market Data Revenues	Bi-annual
IDC IT Big Data and Analytics spending Guide	Data Market	Bi-annual
IDC Worldwide Black Book (standard edition)	Data Market Data Professionals Data supplier Companies Data User Companies Data Revenues	Quarterly
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IMF World Economic Outlook	Data Market Data Revenues Data Economy	Annual
Consensus Forecasts – Consensus economics	Data Market Data Revenues Data Economy	Monthly
ILOSTAT statistics and databases	Data Professionals	Annual

3.1 Three future Development Paths: The Data Market in 2030

This Final Report focuses on the results obtained through the third round of measurements of the European Data Market Monitoring Tool for the 2020–2023 period, with forecasts for 2025 and for 2030 under three distinct scenarios. The 2030 scenarios outline different pathways of the evolution of the European Data Market (EDM) and Data Economy in the next years, exploring the different mix of factors and policy choices which may lead to achieving the EU's ambitious objectives or, on the contrary lead to a setback. The scenarios are structured as follows:

- **Baseline scenario**, with the main assumptions based on the continuation of current growth trends and the evolution of current framework conditions.
- **High Growth scenario**, whereby the data market enters a faster growth trajectory, thanks to more favourable framework conditions.
- **Challenge scenario**, whereby the data market grows more slowly than in the Baseline scenario because of less favourable framework conditions and a less positive macroeconomic context.

Important to highlight that the scenarios are not predictions but potential development paths. Their value-added lies especially in thinking through the potential consequences of different market trajectories and therefore providing a guide to action, particularly for policy makers.

3.2 Measuring the Data Professionals

Data professionals[4] *are workers who collect, store, manage, and/or analyse, interpret, and visualise data as their primary activity or as a relevant part of their activity. Data professionals must be proficient with the use of structured and unstructured data, should be able to work with a huge amount of data, and should be familiar with emerging database technologies. For 2021–2023, the definition of data professionals was refined to differentiate the roles played by different data users: These are Data Technical Professionals, Data Business Professionals, and Data Consumers. The measure of data professionals includes data technical professionals and data business professionals only.*

An overview of Data Professionals is included below.

N.	Region	Name	Description	2021	2022	2023	Growth Rate 2022–2023
1.1	EU27	Number of data professionals	Total number of data professionals in EU (000s)	6,957	7,319	7,660	4.7%
1.2	EU27	Data professionals share of total employment	Share of data professionals on total employment in EU (%)	4.0%	4.1%	4.3%	5.4%
1.3	EU27	Intensity share of data professionals	Average number of data professionals per user company (units)	12.4	12.5	12.7	1.1%

[4] The previous European Data Market Study (SMART 2013/0063) included an indicator measuring "data workers", which was based on a similar, but slightly more restrictive, definition. In line with the First Report on Facts & Figures (D2.1), in this document, we measure "data professionals" – that is, workers with a wider range of data-related roles. Indeed, data professionals are not only data technicians, but also users who, based on sophisticated tools, take decisions about their business or activities after having analysed and interpreted the available data.

The number of data professionals continues to increase as this role becomes an increasingly attractive career for graduates, and visibility of data-based decision-making increases. The increase in the number of data professionals continues to reflects the growth in data use – particularly in the areas of artificial intelligence. Changes in economic growth because of degrading economies and the war in Ukraine had little impact in the number of data professionals across the Member States.

3.2.1 Forecasting Data Professionals: 2025 and Three 2030 Scenarios

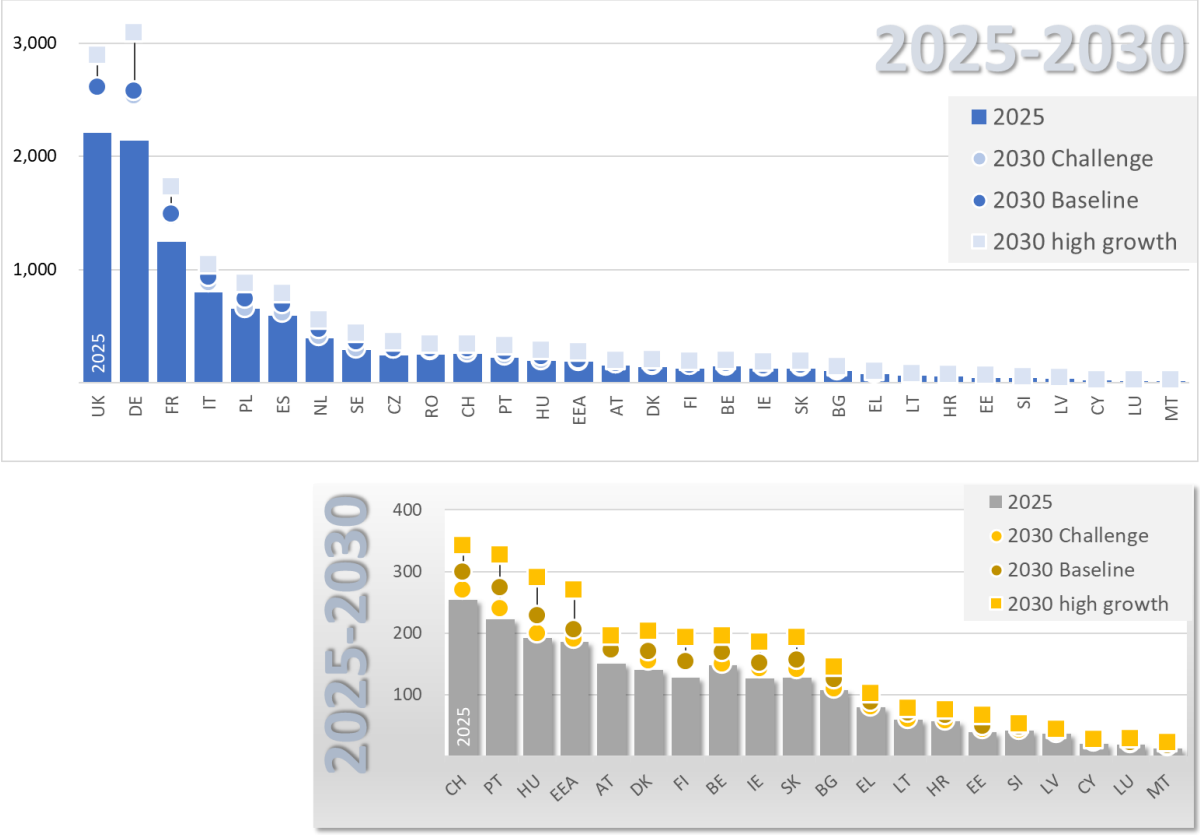
We continue to anticipate strong growth in the number of data professionals over the period of the forecast, from 2020 to 2030. The three scenarios for 2030 accommodate potential upsides and downsides affecting the social, economic, technological and political factors underpinning the data market and the data economy over the coming seven years (2023-2030). According to our estimates, the demand for data professionals remains high, and the supply is still not meeting this demand, although the forecast shows a demand that is rapidly being fulfilled. Long term growth to 2030 (Baseline) for the EU27 Member States matches that for the other geographies under consideration as we are slightly more optimistic about the EU longer-term outcomes with the acceleration of artificial intelligence technology uptake, which will stimulate demand for data professionals. The table below summarises the outlook to 2025 and the three scenarios to 2030.

Table 4 - Data Professionals Forecast: 2025; 2030 Challenge, Baseline, and High Growth Scenarios (000's); and CAGRs (%)

	2025	2030, Challenge	2030, Baseline	2030, High Growth	CAGR: 2020–2025	CAGR 2020-2030, Challenge	CAGR 2020-2030, Baseline	CAGR 2020-2030, High Growth
EU27	8,317	9,287	9,885	11,638	2.6%	2.2%	3.5%	7.0%
EEA	186	190	205	270	#N/A	0.5%	2.0%	7.7%
Total All Countries	10,965	12,345	13,000	15,138	2.5%	2.4%	3.5%	6.7%

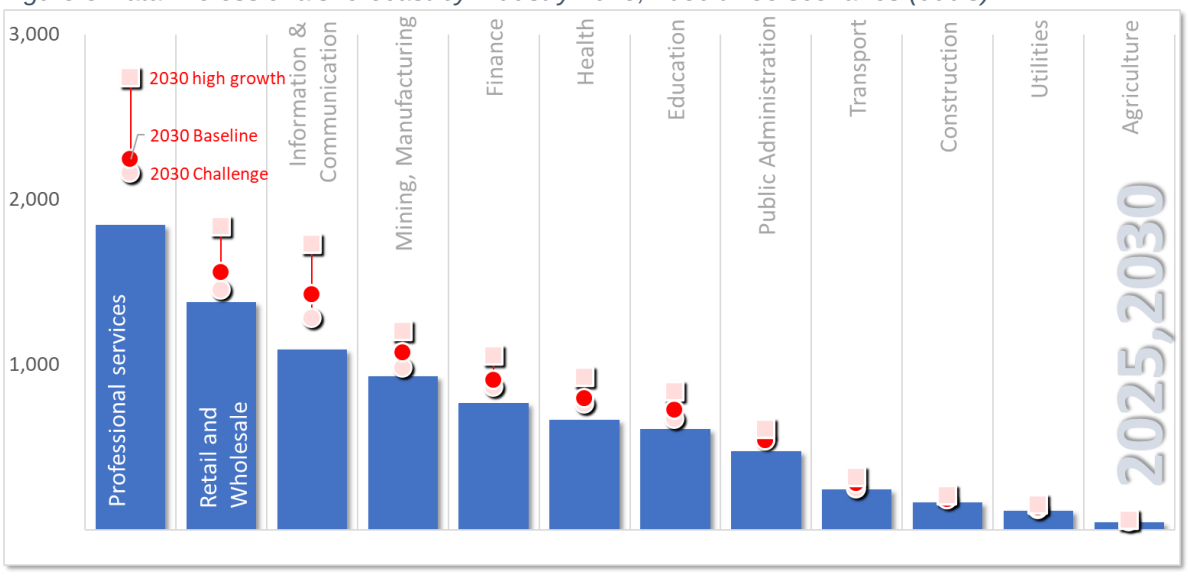
Among the Member States Germany still displaying the largest number of data professionals in 2030 among the EU27. The country is forecast to grow above average to 2030 – and in this forecast it is joined by France with the two still the only two Member States among the top five economies to grow at a higher-than-average rate to 2030 (Baseline).

Figure 4 Data Professionals by country 2025, 2030 three scenarios (000's)



Looking ahead by industry, the main drivers of the consumption of data professionals to 2025 and 2030 remains the professional services and retail & wholesale industries. The top three industries account for more than half (52%) of data professionals by 2030 (Baseline forecast), and the top four industries account for nearly two-thirds (64%) of data professionals by this time, leaving the eight industries to compete for the remaining 36%.

Figure 5 Data Professionals forecast by Industry 2025, 2030 three scenarios (000's)



3.3 Measuring the Data Companies

Data companies *are organisations that are directly involved in the production, delivery, and/or usage of data in the form of digital products, services, and technologies. They can be both data supplier and data user organisations:*

- ***Data suppliers*** *have as their main activity the production and delivery of digital data-related products, services, and technologies. They represent the supply side of the data market.*
- ***Data users*** *are organisations that generate, exploit collect, and analyse digital data intensively and use what they learn to improve their business. They represent the demand side of the data market.*

The number of data supplier companies in 2022 was 218,340, an increase of 14% from 2021. The number is forecast to rise by 9.2% in 2022 to 238,325. Data Suppliers grew to 583,581 in 2022 and is forecast to grow to 604,280 in 2022. Our forecast for data supplies for 2023 is slightly higher than the previous forecast (by 1.1%) as the outturn for 2022 was also slightly higher than forecast (by 1.0%).

Data users grew to 583,581 in 2022 and are forecast to grow to 604,280 in 2023.Our forecast for data users for 2023 is slightly higher than the previous forecast (by 1.1%) as the outturn for 2022 was also slightly higher than our previous estimates (by 1.0%).

Table 5 Indicator 2: Data Companies 2021-2023 and 2022-2023 growth

N.	Name	Description	Market	2021	2022	2023	Growth 2023/2022
2.1	Number of data suppliers	Total number of data suppliers measured as legal entities based in the EU ('000s)	EU27	190,796	218,340	238,325	9.2%
2.2	Share of data suppliers	Percentage share of data companies of total companies in the NACE II industries of A, C, E, G, H, J, K, M, P, and Q	EU27	1.8%	2.0%	2.1%	6.7%
2.3	Number of data users	Total number of data users in the EU, measured as legal entities based in one EU country	EU27	560,596	583,581	604,280	3.5%
2.4	Share of data users	Percentage share of data users of total companies in the EU industry	EU27	2.1%	2.2%	2.3%	2.9%

Source: European Data Market Monitoring Tool, IDC 2023

3.3.1 Forecasting Data Supplier Companies: 2025 and Three 2030 Scenarios

We anticipate the number of data supplier companies in the EU27 will grow at a compound rate of 8.8% between 2020 and 2025 (an increase over the previous forecast of 0.4 percentage points) and grow at a slightly slower rate of 3.4% between 2025 and the 2030 Baseline forecast. Compared to previous forecasts, the growth is slightly higher up to 2025, and slightly lower between 2025 and 2030 than previously forecast. This reflects the changes in economic growth among the Member States during 2022 and the outlook for

2023 with economies showing slightly higher growth than anticipated at the time of the prior forecast. In contrast to earlier predictions, there is a slight increase in growth projected until 2025, followed by a moderate decrease in growth between 2025 and 2030 compared to previous estimates. This adjustment mirrors a series of shifts in economic growth across Member States in 2022 and the 2023 outlook, where economies are experiencing slightly higher growth than initially anticipated in the prior forecast.

The continued warfare in Ukraine continues to moderate the forecast, but the primary factors dictating higher or lower growth remain the ability of new companies to exploit the monetisation of data markets. In addition, the emergence of new ways of using data – particularly in artificial intelligence applications will also impact the growth in the number of data supplier companies. Generative AI is the most visible of these, but this tends to be adopted by organisations that are familiar with data use within their organisation and already accounted for in the forecast the data supplier companies. However, Generative AI encourages new ways of using data and there are emerging companies that exploit these new capabilities, incrementing the total number of data suppliers marginally.

Table 6 Data Supplier Companies Forecasts: 2025, Three 2030 Scenarios, and Growth (%)

	2025	2030 Challenge Scenario	2030 Baseline Scenario	2030 High Growth Scenario	CAGR 2020–2025	CAGR '25–30, Challenge	CAGR '25–30, Baseline	CAGR '25–30, High Growth
EU27	267,648	301,644	316,889	333,887	8.8%	2.4%	3.4%	4.5%
EEA (NO, LI, IS) +CH	7,854	8,832	9,507	10,395	9.2%	2.4%	3.9%	5.8%
Total, all countries	534,051	607,321	629,085	660,210	8.7%	2.6%	3.3%	4.3%

Source: European Data Market Monitoring Tool, IDC 2023

3.3.2 Forecasting Data User Companies: 2025 and Three 2030 Scenarios

The increased use of data ensures a considerable growth in the number of data use companies across the Member States out to 2030.

This growth is moderate due, partly, to the economic conditions resulting from the war in Ukraine and the subsequent impact on energy costs. However, we interpret this as a local and temporary condition so the forecast out to 2025 is more positive in this forecast than in the previous one, as the growth in data technologies, particularly the rising use of artificial intelligence, overcomes the downturn resulting from the conditions in Ukraine. The outlook is slightly more moderated out to 2030 (Baseline) though as growth is pulled forward into 2025. However, while the longer-term growth is slightly lower, this reflects the better 2025, as the 2030 Baseline is increased by just under 1% when compared to the previous forecast in 2022.

Data is still used primarily to reduce cost and increase efficiency – this is unchanged from the previous forecast, but there are still emerging companies that see the opportunity data technology offers to enhance existing products and develop new ones and change the way business is conducted. Current examples of new ways of conducting business include the transition from purchasing software to paying a per-user or per-period fee, and new

methods for conducting business will emerge in the period out to 2030. Potential examples could include the change from selling data to selling the analysis of the data and what the data indicates – this gives significantly higher value to data monetisation.

Table 7 Data User Companies Forecasts: 2025, Three 2030 Scenarios, and Growth (%)

	2025	2030 Challenge Scenario	2030 Baseline Scenario	2030 High Growth Scenario	CAGR: 2020–2025	CAGR 2020-2030, Challenge	CAGR 2020-2030, Baseline	CAGR 2020-2030, High Growth
EU27	653,198	764,931	909,735	1,098,210	3.8%	3.2%	6.8%	11.0%
EEA (NO, LI, IS) +CH	8,329	10,085	12,217	14,976	3.3%	3.9%	8.0%	12.4%
Total, all countries	882,972	1,027,968	1,219,742	1,470,010	3.3%	3.1%	6.7%	10.7%

Source: European Data Market Monitoring Tool, IDC 2023

3.4 Measuring Data Companies' Revenues

Data companies' revenues *correspond to the aggregated value of all the data-related products and services generated by Europe-based data suppliers, including exports outside the EU. This indicator measures the revenues of the data suppliers identified and classified by Indicator 2 (see the products and services specified in our definition of the data market). Data companies' revenues do not include data monetisation as part of the data market.*

Data companies' revenues for all companies grew by 9.3% in 2023, arriving at €92.8 billion in the EU27. As in the previous forecast, in 2023, data companies' revenues grew faster than all company revenues as a whole. However, should macro-economic conditions improve in the medium to long term, the growth of data companies' revenues will stabilise as more companies will adopt a data-based approach to conducting business, and these companies are not immune to the overall health of the economy.

Table 8 Data Companies' Revenues (€M) and share (%) 2021-2023

N.	Region	Name	Description	2021	2022	2023	Growth 2022–2023
3.1	EU27	Total revenues of data companies in the EU	Total revenues of the data suppliers calculated by Indicator 2	75,287	84,970	92,849	9.3%
3.2	EU27	Share of data companies' revenues	Ratio of data suppliers' revenues to total companies' revenues – NACE II industries A, C, E, G, H, J, K, M, P, and Q	0.4%	0.4%	0.4%	

Source: European Data Market Monitoring Tool, IDC 2023

3.4.1 Forecasting Data Companies' Revenues

Data companies' revenues will continue to grow at a healthy rate as the market for data expands. This is still and emerging technology and will transform all businesses, but it will

take time for the technology to filter down to the later adopters of using data to run and manage their companies. Emerging technologies such as AI and Generative AI will have an impact and Generative AI is expected to grow to close to 30 percent of all AI by 2027 according to IDC's most recent Generative AI forecast, and this is considered incremental revenue – i.e., adding to the total market. The table below shows data companies' revenues will reach €115 billion in 2025 for EU27 Member States, rising to almost €139 billion by 2030 (Baseline scenario). This is a compound growth of 3.8% over the 2025-2030 period, a minor reduction when compared to the previous forecast and reflects more a stronger 2025 rather than a weaker 2030.

Table 9 Data Companies Revenues Forecasts: 2025 (€M), Three 2030 Scenarios (€M), Compound Growth (%)

	2025	2030 Challenge Scenario	2030 Baseline Scenario	2030 High Growth Scenario	CAGR 2020–2025	CAGR 2025–2030, Challenge	CAGR 2025–2030, Baseline	CAGR 2025–2030, High Growth
EU27	115,415	121,317	138,932	171,647	10.2%	1.0%	3.8%	8.3%
EEA (NO, LI, IS) + CH	3,689	3,940	5,438	7,011	8.1%	1.3%	8.1%	13.7%
Total, all countries	155,959	172,355	199,579	242,817	9.6%	2.0%	5.1%	9.3%

3.5 Measuring the Data Market

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

The EU27 market grew by 11.1% in 2023 to a value of €81.9 billion, up from €73.8 billion in 2022. The slightly slower growth seen in 2022 will be easily overtaken by that seen in 2023 as the EU economy recovers from Covid, and the growth brake provided by that is eased. Data adoption accelerated in 2023 although the greatly hyped Generative AI had little impact as this evolving market is in its early stages. Revenues and spending associated with Generative AI are low as most technology only began to appear in late 2022, and many services are provided free. In the longer-term Generative AI will have a bigger impact on the market, but much of the spending is likely to be displacement – i.e., it will be spent on Generative AI instead of on other data technologies. This market already accommodates the expected increase in spending on AI in a wide range of data software, client interaction tools and business management tools.

Table 10 Value and Growth (%) of the Data Market (€M), 2021-2023

N.	Market	Name	Description	2021	2022	2023	Growth 2022-2023
4.1	EU27	Value of the Data Market	Estimate of the overall value of the Data Market	64,820	73,754	81,940	11.1%

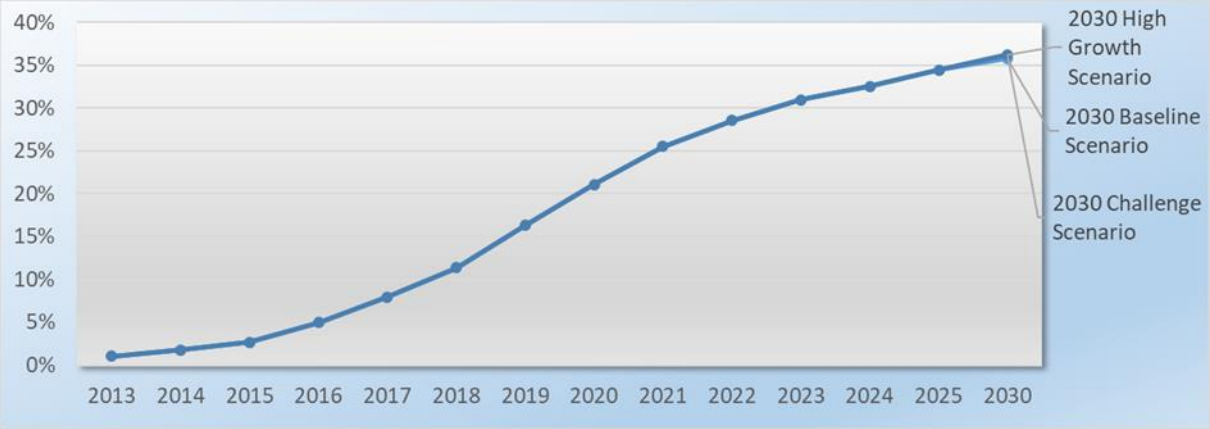
3.5.1 Data Monetisation

The definition of data supplier companies has been extended to accommodate the inclusion of the sale and purchase of data, **data monetisation**: Data monetisation is the revenue that data suppliers get from selling data. In the data economy, we consider data monetisation as an additional direct impact, generated at the level of supplier companies.

Data monetisation is an emerging and somewhat hidden part of the data market, which involves the sale of data between organisations rather than the sale of data software, hardware, or services. Many organisations have a wealth of data and have recently discovered there is a market for this. Typically, this includes location data – giving information about where goods or people are located in space and time, purchase data – what people buy, equipment performance data – information about the how equipment is performing and indication of when equipment is operating out of tolerance.

We estimate data monetisation could account for up to 36% of additional spending by 2030 – approximately €42 billion. Data monetisation is developing slowly as organisations learn what they have and the value of it, together with how to monetise this data. Data monetization dynamics in the EU27 as a share of the data market are shown in the figure below.

Figure 6 – Data Monetisation share of the European Data Market 2013-3030 (Three Scenarios) (%)



3.5.2 Forecasting the Data Market

The forecast for the data market to 2025 and the three scenarios for 2030 is summarised in the table below. The data market in the EU27 will grow slightly over €118 Billion in 2030 (Baseline), representing compound growth rate of 3.3% over the period 2025 to 2030. The EEA countries (Norway, Liechtenstein and Iceland) will be characterised by higher growth (5.7% compound growth rate over the same period) but their market will remain a fraction if compared to the size of the EU27.

Table 11 Data Market Forecast: 2025 (€ '000s), Three 2030 Scenarios (€ '000s), and Compound Growth (%)

	2025	2030 Challenge Scenario	2030 Baseline Scenario	2030 High Growth Scenario	CAGR: 2020–2025	CAGR: 2025–2030, Challenge	CAGR: 2025–2030, Baseline	CAGR: 2025–2030, High Growth
EU27	100,212	103,677	118,112	141,025	10.6%	0.7%	3.3%	7.1%
EEA (NO, LI, IS) + CH	3,708	3,808	4,881	6,477	6.4%	0.5%	5.7%	11.8%
Total, All Countries	139,893	144,615	163,063	192,947	7.3%	0.7%	3.1%	6.6%

Source: European Data Market Monitoring Tool, IDC 2023

In terms of countries, Germany remains the largest data market among the Member States and by 2030 it will represent nearly 25% of the EU27 data market. Germany's industries are data oriented (manufacturing, finance, information and communication) so present strong demand for data, data tools and data technology. However, Germany will grow below the average for EU27 Member States but will still represent almost a quarter of the EU27 data market. The country's earlier adoption of data technologies – because of its data-oriented industries – give less scope for growth as much of the high growth has already taken place in the country.

3.6 Measuring the Data Economy

The **data economy** measures the overall impacts of the data market on the economy as a whole. It involves the generation, collection, storage, processing, distribution, analysis elaboration, delivery, and exploitation of data enabled by digital technologies.

The data economy captures a wider concept than the data market only, as it considers the value and wealth generated in the economy as a whole (not just across businesses) by the exploitation of data.

The data economy includes three sets of impacts on the economy: data companies' revenues in the form of direct impacts on the economy, indirect impacts (backward and forward) on the economy, and the induced impacts of the data market on the economy:

1. The **direct impacts** are the initial and immediate effects generated by the data supplier companies. The quantitative direct impacts is expected then be measured as the revenues from data products and services sold, i.e. the value of the data companies' revenues.
2. The **indirect impacts** are the economic activities generated along a company's supply chain by data supplier companies, considering input providers as well as customers of data supplier companies.
3. **Induced impacts** include the economic activity generated in the whole economy as a secondary effect. Induced additional spending is generated by both new workers, who receive a new wage, and the increased wages of existing jobs. This spending induces new revenue creation in nearly all sectors of the economy. The additional consumption will support economic activity in various industries, such as retail, consumer goods, banks, and entertainment.

The value of the data economy for the EU27 in 2022 reached the threshold of €500 billion, and with an annual growth of 9.3% passed €544 billion in 2023. Indeed, despite the economic turmoil, the market for intelligent analytics and data technologies has been one of the vibrant. Enterprises are increasingly recognizing that business transformation and business benefit is dependent on improved use of data – digital transformation is nothing without data transformation and modernization. Recent economic and political market shocks have not caused long-lasting reduction in data analytics market growth, and indeed the market of data is on the spot. On the one side, data has been recognized being the fuel for a continuous growth, while on the other side there is an increasing recognition of the importance of how the data is used, for example the Artificial Intelligence Act aimed at regulating artificial intelligence development and use in Europe.

Since the beginning of 2021, the global economy faced different events, from new COVID-19 variants, to related lockdowns and closures, up to the diffusion of vaccines and the release of the Next Generation EU (NGEU) funds from the European Union, but especially the Russia-Ukraine war started in February 2022 and the very recent conflict between Israel and Hamas in the Middle East.

At worldwide level economic growth has been resilient so far in 2023 - especially in the US, recession risks have receded but not disappeared. Europe, however, is still vulnerable, looking at GDP growth, and indeed there are still potential delayed impact from interest rate hikes, as inflation proved to be more persistent than expected. Investments are below pre-

pandemic levels, with businesses suffering from rising interest rates and stricter lending conditions and lower fiscal support. Indeed, despite the levels of inflation are lowering everywhere, some European countries faced a recessionary 2023, such as Germany, Finland, Sweden, and Estonia, among a few others, but also the expectations for 2024 are lower than in the US, especially in bigger economies as Italy and Germany, predicted to grow less than 1% in 2024.

From a technology perspective, the ICT market performed well in 2023, in line with expectations, driven by the double-digit growth of software market and the shift to cloud. 2022 has been characterized by the diffusion of Generative-AI solutions and this raised interest among users and providers contributing to a deeper investigation on the use of data, the data regulation and data ethics. As mentioned in the Data Market section, Generative AI had little impact as this evolving market is in its early stages.

Table 12 . Data Economy, 2021–2023: Value (€M), Growth (%), and Impact on GDP (%)

N.		Name	Description	2021	2022	2023	Growth Rate 2022–2023	Impact on GDP, 2021	Impact on GDP, 2022	Impact on GDP, 2023
5.1 5.2	EU27	Value of the data economy and impacts on EU GDP	Value of total impacts on the EU economy and % of EU GDP	455,672	497,806	544,101	9.3%	3.7%	3.9%	4.2%
5.1 5.2	EU27+UK	Value of the data economy and impacts on EU GDP	Value of total impacts on the EU economy and % of EU GDP	593,846	650,418	709,570	9.1%	4.1%	4.3%	4.7%
5.1 5.2	Total, all countries	Value of the data economy and impacts on EU GDP	Value of total impacts on the EU economy and % of EU GDP	645,987	706,512	770,184	9.0%	4.1%	4.24%	4.7%

Source: European Data Market Monitoring Tool, IDC 2023

3.6.1 Forecasting the Data Economy, 2030

In 2030, the data economy for the EU27 is expected to surpass the €851 million threshold under the baseline scenario, with a 5.3% 2025–2030 CAGR. When we consider the UK, the data economy in 2030 is expected to reach to €1.1 trillion value and, with the addition of Switzerland and the EEA (NO, LI, IS) countries, the value will come to slightly more than €1.2 trillion, with a 2025–2030 CAGR of 5.4%.

Table 13 Data Economy Value (€M); 2030 Challenge, Baseline, and High Growth Scenarios (€M); and Impact on GDP (%)

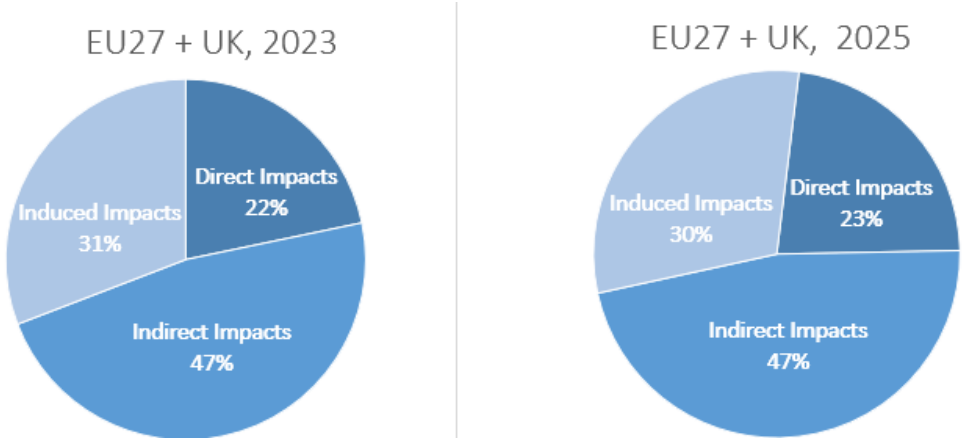
I	Market	Name	Description	2030 Challenge Scenario	2030 Baseline Scenario	2030 High Growth Scenario	25-30 CAGR			Impacts on GDP		
							2030 Challenge Scenario	2030 Baseline Scenario	2030 High Growth Scenario	2030 Challenge Scenario	2030 Baseline Scenario	2030 High Growth Scenario
5.1 5.2	EU27	Value of the data economy and impacts on EU GDP	Value of total impacts on the EU economy and % of EU GDP	723,421	851,490	994,949	1.9%	5.3%	8.6%	5.2%	5.8%	6.5%
5.1 5.2	EU27+UK	Value of the data economy and impacts on EU GDP	Value of total impacts on the EU economy and % of EU GDP	946,614	1,110,978	1,289,462	2.0%	5.3%	8.5%	5.8%	6.5%	7.2%
5.1 5.2	Total, all countries	Value of the data economy and impacts on EU GDP	Value of total impacts on the EU economy and % of EU GDP	1,024,897	1,204,753	1,396,180	2.0%	5.4%	8.5%	5.9%	6.6%	7.3%

Source: European Data Market Monitoring Tool, IDC 2023

The two alternative scenarios will consider a slower growth of the impacts in the overall economy in 2030 for a Challenge scenario, affected by a slower growth of GDP as well, where we could expect lower impacts caused a higher restrictions to data usage, posing barriers to widespread adoption, AI negatively affecting privacy and adoption because of the realization of some concerning behaviour such as low safeguard, malicious data manipulation, unregulated use of data, production of biased results, among other issues.

Our analysis of the data economy also provides an overview of the total effects by type of impact (direct, indirect, and induced). It is worth mentioning how the composition of impacts changes over time, from 2023 to 2025 but especially to 2030 (see next paragraph). Until 2025 direct impact continue to increase slightly, while from 2025 to 2030 both direct and indirect impacts decrease in favour of induced impacts, despite slowly, but thus revealing the effects of data access, data products and services exchange, and data value distribution in the economy.

Figure 7 Data Economy by Impact Type: EU27 + the UK, 2030 (%)



Source: European Data Market Monitoring Tool, IDC 2023

3.7 Measuring the Data Professionals Skills Gap

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

Monitoring the skills gap is critical, since lack of skills is a potential barrier to the development of the data industry, the adoption of data-driven innovation and the transformation of businesses and organisations. Monitoring of the data skills gap is based on a model that balances the main sources of data skills (the education system, retraining, and other contributors) with the estimated demand (from all data companies).

As in the previous rounds of measurement of the European Data Market Monitoring Tool, the data skills gap is provided for the five largest EU countries and the rest of EU 27 aggregated, mainly because of the difficulty in measuring job vacancies for data professionals for each individual Member State. The measurement of this indicator is based on a model that combines the separate estimates and forecasts of the demand for data technical and business professionals and the supply of corresponding data skills by the inflow from the education system and the upskilling and reskilling of the existing workforce. This includes balancing the main sources of data skills (from the education system and retraining to the profession from other careers) with the estimated demand for data skills (from all data companies).

To reach the final estimates on the potential skills gap by country and region, indicators on the supply side such as (but not limited to) immigration inflows/outflows, level of upskilling by industry, retirement of senior workers and level of proficiency of different courses to prepare professionals for data technical roles are all factored in.

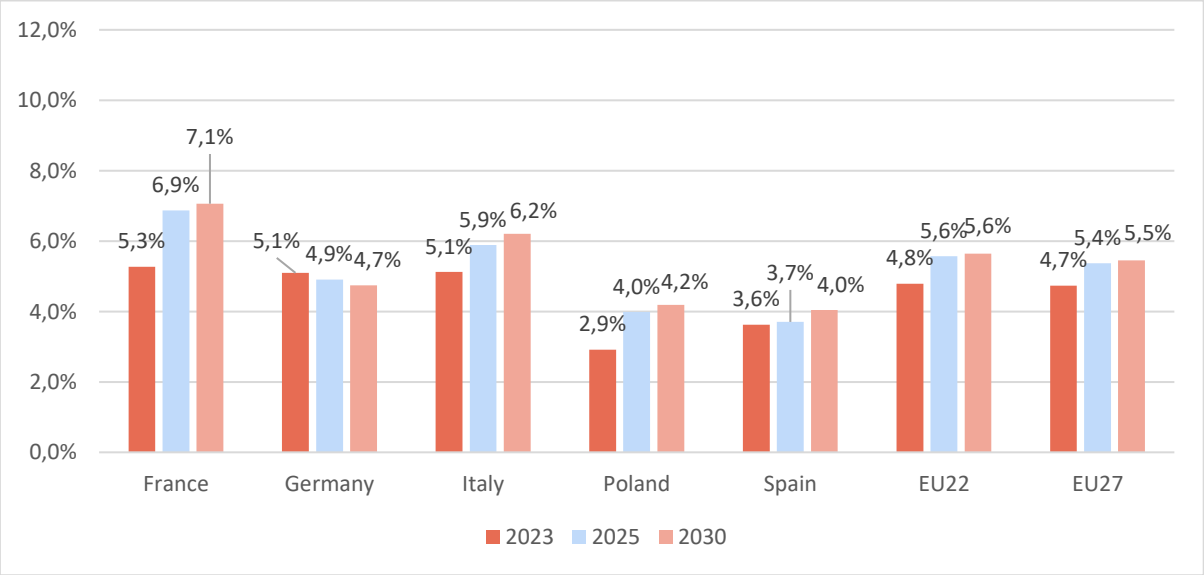
The multi-variable approach enables the model to reach a more accurate mapping of worker flows, which is then compared against the calculated demand for this workforce across key industry sectors in the EU region. Calculations on the demand of data workers are based different indicators, such as (but not limited to) current number of data professionals in activity, level of technology adoption, size of industry by member state and the data sector growth potential in each of these sectors.

The skills gap for data professionals is growing rapidly, and it will expand most significantly in the 2023–2030 period. Demand has already outgrown supply, with significant increases expected between 2023-2030 in any of the scenarios and countries modelled. The following sections provide more details for the European Union and the rest of the European countries.

The table below shows the skills gap for the EU27 in 2023 as a base year and in 2030 for the three scenarios. It is clear that in all scenarios, there is expected to be a skills gap:

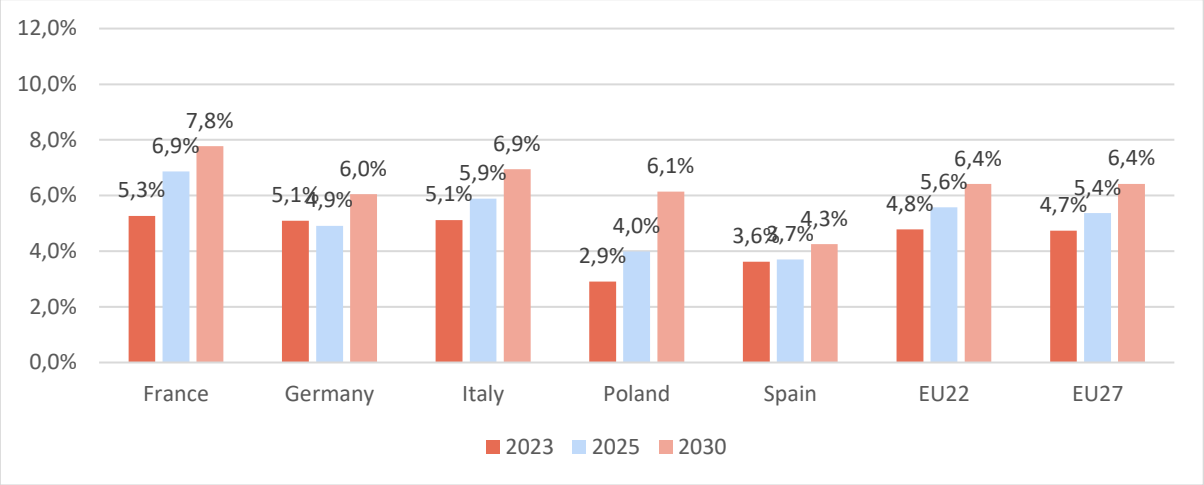
- In 2023, the data professionals' skills gap is estimated at 363,000 across the EU27, growing to 539,000 by 2030 in the Baseline scenario. This means that the gap % between demand and supply will grow from 4.7% in 2023 to 5.5% in 2030.
- For the Challenge scenario, the gap will reach 596,000 in 2030, or 6.4%, as graduates look for alternative careers and there is a lower number of entrants from other careers.
- In the High Growth scenario, the gap will reach 777,000, or 6.7% in 2030 as the education system, reskilling, and upskilling programs will be unable to keep up with accelerating demand.

Figure 8 The Data Professionals Skills Gap for the EU27: 2023, 2025 - Baseline 2030 Scenarios ('000s)



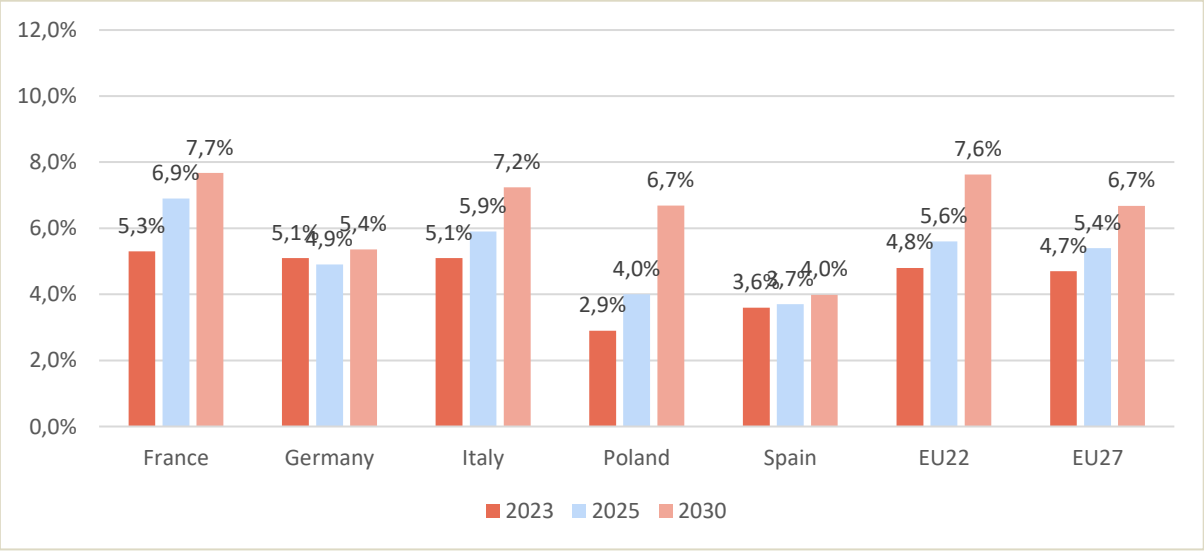
Source: European Data Market Monitoring Tool, IDC 2023

Figure 9 The Data Professionals Skills Gap for the EU27: 2023, 2025 - Challenge 2030 Scenarios ('000s)



Source: European Data Market Monitoring Tool, IDC 2023

Figure 10 The Data Professionals Skills Gap for the EU27: 2023, 2025 - High Growth 2030 Scenarios ('000s)



Source: European Data Market Monitoring Tool, IDC 2023

Table 14 The Data Professionals Skills Demand and Gap for the EU by Member State: 2021–2023, 2025, and Three 2030 Scenarios (Thousands)

Member State		2021	2022	2023	2025	2030 Challenge Scenario	2030 Baseline scenario	2030 High Growth Scenario	CAGR 2025-2030 Challenge	CAGR 2025-2030 Baseline	CAGR 2025-2030 High Growth
France	Numbers	35	52	61	85	144	105	133	6.00%	4.20%	9.20%
	% Gap	3.30%	4.70%	5.3%	6.90%	7.80%	7.10%	7.70%			
Germany	Numbers	84	119	99	105	153	122	166	7.90%	3.10%	9.60%
	% Gap	4.90%	6.50%	5.10%	4.90%	6.00%	4.70%	5.40%			
Italy	Numbers	24	33	38	47	61	58	76	5.50%	4.30%	10.00%
	% Gap	3.50%	4.60%	5.10%	5.90%	6.90%	6.20%	7.20%			
Poland	Numbers	20	19	18	26	40	31	59	9.20%	3.60%	17.70%
	% Gap	3.50%	3.10%	2.90%	4.00%	6.10%	4.20%	6.70%			
Spain	Numbers	13	17	20	22	26	28	32	3.50%	4.90%	7.50%
	% Gap	2.60%	3.20%	3.60%	3.70%	4.30%	4.00%	4.00%			
EU27	**Numbers**	270	360	363	446	596	539	777	5.90%	3.8%	11.70%
	% Gap	3.90%	4.90%	4.7%	5.40%	6.40%	5.50%	6.70%			

Source: European Data Market Monitoring Tool, IDC 2022

3.8 The Data Economy Beyond the EU – US, Brazil, Japan and China

3.8.1 The U.S.

The US remains the strongest of the internationals' data economies in 2022 and out to 2023. The country's strength lies especially in tools and software although hardware is also strong, but much of this is manufactured outside the country. As the world's leading economy, the US has the resources and capabilities to continue to dominate the development of data and the data market.

The outlook though is that the US will bring back onshore a lot of manufacturing, in particular high technology manufacturing such as semiconductor fabrication plants. The Chips and Science Act (or "CHIPS Plus" as it is often dubbed), which was signed into law by President Biden in August 2022, includes approximately $39 billion (more than €36 billion) in subsidies for chip manufacturing on US solid along with 25% investment tax credits for costs of manufacturing equipment. By decreasing reliance on foreign trade partners, particularly China, the US aims to strengthen its strategic position and lessen susceptibility to geopolitical pressures. In a similar vein, the Inflation Reduction Act (IRA), passed by the same administration in the same year, will inject more than $500 billion in new spending and tax break. This will catalyse US investments in domestic manufacturing capacity, encourage procurement of critical supplies domestically or from free-trade partners, and jump-start R&D and commercialization of leading-edge technologies such as carbon capture and storage and clean hydrogen, thus fastening the country's grip of the data market and data economy.

Table 15 US Indicators – Overview 2021-2023

Name	Metrics	2021	2022	2023	Growth 2022-2023
Number of Data professionals	Total Number of Data professionals (Thousands)	16,492	17,064	17,623	3.3%
Data professionals' employment share	% of Data professionals on total employment	12.5%	12.8%	13.4%	4.9%
Number of Data Supplier Companies	Total number of data supplier companies (000s)	324,300	332,003	337,353	1.6%
Value of the Data Market	Estimate of the overall a value of the Data Market (Million €)	242,358	292,378	350,471	19.9%
Value of the Data Economy (Direct Impacts)	Direct Impacts (Million €)	242,358	292,378	350,471	19.9%
Value of the Data Economy (Backward Impacts)	Backward Impacts (Million €)	232,101	276,269	306,540	11.0%
Incidence of the Data Economy on GDP (Only direct impacts)	Ratio between value of the Data Economy and GDP (%)	1.3%	1.4%	1.5%	2.8%

Source: European Data Market Monitoring Tool, IDC 2023

3.8.2 China

The People's Republic of China continues its journey as a significant contributor to the data market through its development of advanced technologies and specifically artificial intelligence and has the capability to be the more dominant supplier of data tools and data to the worldwide data market. China has growing capabilities in AI, 5G telecommunications, and high-performance computing and this could easily present China as a significant competitor to the US within the data field.

Under the presidency of Xi-Jinping, the country has multiplied its efforts towards a solid digital economy notwithstanding the difficulties in coming to terms with the Covid-19 emergency. After years of unabated growth, China's Gross Domestic Product (GDP) grew just 2.8% in 2022 as lockdowns weighed on activity and confidence, according to the median forecasts of 49 economists polled by Reuters[5], slower than a 3.2% rise seen in October's forecast and braking sharply from 8.4% growth in 2021. Nevertheless, the country is now recovering and the outlook for 2023 is a GDP growth of 5.2%. However, China's credit-fuelled growth in recent years was accompanied by widening imbalances and rising vulnerabilities.

Table 16 China Indicators – 2021–2023 Overview

Name	Metrics	2021	2022	2023	Growth 2022-2023
Number of Data professionals	Total Number of Data professionals (Thousands)	10,065	10,408	12,392	19.1%
Data professionals' employment share	% of Data professionals on total employment	1.3%	1.4%	1.6%	19.0%
Number of Data Supplier Companies	Total number of data supplier companies (000s)	887,152	891,006	900,545	1.1%
Value of the Data Market	Estimate of the overall a value of the Data Market (Million €)	31,968	40,061	49,737	24.2%
Value of the Data Economy (Direct Impacts)	Direct Impacts (Million €)	31,968	40,061	49,737	24.2%
Value of the Data Economy (Backward Impacts)	Backward Indirect Impacts (Million €)	42,144	47,494	55,342	16.5%
Incidence of the Data Economy on GDP (Only direct impacts)	Ratio between value of the Data Economy and GDP (%)	0.9%	0.9%	0.9%	2.9%

Source: European Data Market Monitoring Tool, IDC 2023

[5] https://www.reuters.com/markets/asia/china-growth-seen-rebounding-49-2023-more-stimulus-cards-2023-01-12/#:~:text=9%20days%20ago,POLL%20China%20growth%20seen%20rebounding%20to%204.9%25%20in%202023,more%20stimulus%20on%20the%20cards&text=BEIJING%2C%20Jan%2012%20(Reuters),for%20the%20COVID%2Dravaged%20economy

3.8.3 Brazil

Brazil has seen a strong rebound in 2022 after the impact of Covid-19; as expected its GDP returned to growth in 2023, driven by government consumption and household spending. In fact, Brazil's cyclical performance in the current year has been positive[6]. Growth and employment have held up well, core inflation is retreating, trade surpluses are beating all-time records and the real is holding its ground despite a rising dollar. Against this backdrop, the Central Bank eased its monetary policy in August for the first time in a year. These developments coupled with the revival of social policies, have helped spur a rise in Lula's approval ratings. In search of new growth drivers to reduce inequality and accelerate the energy transition, the President unveiled the third act of his Growth Acceleration Pact (Novo PAC). Financing the investment programme, however, poses questions in the face of the recently enacted fiscal framework. To enhance its room to manoeuvre in Congress and help pass reforms (in particular the long-awaited tax reform), the ruling coalition has expanded further to the right.

Table 17 Brazil Indicators – 2021–2023 Overview

Name	Metrics	2021	2022	2023	Growth 2022-2023
Number of Data professionals	Total Number of Data professionals (Thousands)	1,272	1,409	1,400	-0.6%
Data professionals' employment share	% of Data professionals on total employment	2.4%	2.5%	2.6%	5.5%
Number of Data Supplier Companies	Total number of data supplier companies (000s)	41,261	41,751	41,711	-0.1%
Value of the Data Market	Estimate of the overall a value of the Data Market (Million €)	8,865	9,252	9,699	4.8%
Value of the Data Economy (Direct Impacts)	Direct Impacts (Million €)	8,865	9,252	9,699	4.8%
Value of the Data Economy (Backward Impacts)	Backward Impacts (Million €)	10,841	11,018	13,065	18.6%
Incidence of the Data Economy on GDP (Only direct impacts)	Ratio between value of the Data Economy and GDP (%)	0.2%	0.2%	0.2%	0.3%

Source: European Data Market Monitoring Tool, IDC 2023

[6] https://economic-research.bnpparibas.com/html/en-US/Brazil-Defying-expectations-10/16/2023,48998

3.8.4 Japan

Japan's real GDP finally overtook its pre-pandemic peak—as of second quarter 2023—after rising a sizable 1.2% compared to the first quarter[7]. Much of this strength was due to the external sector. A weakening yen supported export growth and helped push imports lower. Meanwhile, domestic demand remained sluggish and is plagued by relatively high inflation. In the near term, economic growth will likely slow down, as external demand wanes and domestic demand struggles to pick up.

The country's data economy remains robust, and its share of GDP is ahead of the EU and comparable with that of the US. However, Covid affected Japan more than several other OECD countries and the country is only now recovering economically with GDP growth expected to be over 1.3% (IMF forecast) in 2023. What is more, Japan has a well-developed digital infrastructure, a highly skilled workforce and is at the leading edge of technologies such as robotics, yet many small firms are lagging behind in adopting digital tools. More investments in tech sector hardware and research, greater efforts to diffuse new technologies throughout business and government, and more firm-based training in digital skills would help further develop the country's data economy and, more importantly, would tackle Japan's long-standing issue of low productivity[8].

Table 18 Japan Indicators – 2021–2023 Overview

Name	Metrics	2021	2022	2023	Growth 2022-2023
Number of Data professionals	Total Number of Data professionals (Thousands)	4,536	4,657	4,818	3.5%
Data professionals' employment share	% of Data professionals on total employment	8.2%	8.7%	8.8%	1.4%
Number of Data Supplier Companies	Total number of data supplier companies (000s)	106,994	108,348	109,049	0.6%
Value of the Data Market	Estimate of the overall a value of the Data Market (Million €)	39,570	45,551	53,136	16.7%
Value of the Data Economy (Direct Impacts)	Direct Impacts (Million €)	39,570	45,551	53,136	16.7%
Value of the Data Economy (Backward Impacts)	Backward Indirect Impacts (Million €)	40,145	45,197	47,970	6.1%
Incidence of the Data Economy on GDP (Only direct impacts)	Ratio between value of the Data Economy and GDP (%)	1.3%	1.4%	1.4%	2.2%

Source: European Data Market Monitoring Tool, IDC 2023

[7] https://www2.deloitte.com/us/en/insights/economy/asia-pacific/japan-economic-outlook.html
[8]https://japannews.yomiuri.co.jp/business/economy/20221220-78590/#:~:text=OECD%20data%20on%20labor%20productivity,was%20first%20compiled%20in%201970.

3.8.5 Comparing the Internationals to the EU27

The relevant EU27 indicators are re-posted in the below table to give a reference for comparison with the other international countries covered in this chapter.

After having dealt successfully with the challenges of the pandemic and the energy price shock triggered by Russia's war in Ukraine, the EU faces the difficult task of restoring price stability while securing strong and green growth over the longer term. Global shifts from geoeconomic fragmentation and the current impact of climate change have introduced new economic challenges that add to long-standing growth problems and could stall convergence. Some deceleration of inflationary pressures is providing relief to households and firms. Easing commodity prices and supply constraints have been mainly responsible, but persistent core inflation has proved more difficult to tackle. Central banks across Europe have tightened their monetary policies substantially, and governments are scaling back fiscal support. The lingering effects of last year's energy price shocks and tighter policies are also contributing to a growth slowdown in 2023. Countries with larger manufacturing or energy-intensive sectors are slowing more than those that depend on services and tourism. Overall, the growth forecast is shaped by the opposing forces of tighter macroeconomic policies and the recovery in real incomes, as inflation falls and wages rise.

The outlook for the EU is for a soft landing[9], with inflation declining gradually. Growth in the region overall slowed down to 1.3 % in 2023 from 2.7 % last year and improve to 1.5 % in 2024. Within advanced European economies, service-oriented economies will recover faster than those with relatively larger manufacturing sectors, which face low external demand and are more exposed to high energy prices. Similarly, European emerging market economies will experience a mild recovery in 2024, but the extent will vary across countries depending on the energy intensity of production, service sector orientation, and, especially for the easternmost countries, disruption of trade relationships with Russia.

All in all, the EU27 confirms its second place in terms of size and strength of the data market and data economy if compared against the present international background. European firms lag behind the US in the adoption of digital technologies, and this is reflected in the size of the data market as measured by our indicators – in 2023 the data market in the EU27 is less than a quarter of the one measured in the US. Slow recovery from Covid-19 in 2022 is possibly one explanation but other reasons such as the small size of companies in Europe vis-à-vis other regions of the world and, in particular, the US should be included. Structural barriers to investment in digitalisation, policy fragmentation, lack of awareness of the potential digital upsides and an insufficient number of digitally skilled workforce are other very well-known reasons that may account for the EU's current gap vis-à-vis the US.

[9] file:///C:/Users/gmicheletti/Downloads/text.pdf

Table 19 EU27 indicators 2021-2023 Overview

Name	Metrics	2021	2022	2023	Growth 2022-2023
Number of Data professionals	Total Number of Data professionals (Thousands)	6,957	7,319	7,660	4.7%
Data professionals' employment share	% of Data professionals on total employment	4.0%	4.1%	4.2%	3.5%
Number of Data Supplier Companies	Total number of data supplier companies (000s)	190,796	218,340	238,325	9.2%
Value of the Data Market	Estimate of the overall a value of the Data Market (Million €)	64,820	73,754	81,940	11.1%
Value of the Data Economy (Direct Impacts)	Direct Impacts (Million €)	75,287	83,992	90,536	7.8%
Value of the Data Economy (Backward Impacts)	Backward Indirect Impacts (Million €)	115,738	126,727	135,290	6.8%
Incidence of the Data Economy on GDP (Only direct impacts)	Ratio between value of the Data Economy and GDP (%)	0.6%	0.6%	0.7%	5.3%

Source: European Data Market Monitoring Tool, IDC 2023

4. DESCRIBING THE DATA MARKET – THE STORIES

The quantified stories were the result of a mixed effort entailing both secondary and primary research activities and were aimed to add quantitative and qualitative evidence to the indicators measured through the European Data Market Monitoring Tool. The main goal of the stories was therefore to ensure both complementarity and support to the study activities while making sure to capture all the relevant aspects that are characterizing the existing data market and the building of data spaces in Europe today and in the years to come. Twelve quali-quantitative descriptive stories were produced throughout the duration of the European Data Market Study. The stories focused on the following topics: Data Sharing in Construction; Data for Green Deal; Data for Skills; Digital Sovereignty; Data for Energy; on Data for mobility; Data4Food; Data for Healthcare and Predictive Data Driven Policymaking.

4.1 Story 1 – Data Sharing in Construction

The research conducted by the study team[10] presented a report which developed an in-depth understanding of data sharing practices in the construction sector and the challenges ahead. More specifically, the report provided an overview of general trends in the sector; a description of the emerging data ecosystem; drivers and barriers that the sector is experiencing in sharing data and information across stakeholders; implications for micro-SMEs; and policy recommendations.

The study was based on the secondary analysis of current reports and data available about the state of the art of data use and data sharing in the sector combined with semi-structured interviews with experts, and an in-depth analysis of a collaborative emerging platform and architectural framework (Digiplace) that is currently being designed to facilitate data sharing within the sector.

The general trends showed that construction lags in the productivity gains compared to other industries these trends reflect a worrying situation for the industry. One of the reasons for the non-uniform productivity performance of global construction is because large-scale players are engaged in large construction. The relative lag in productivity can be partly explained by the fact that the sector is significantly behind when it comes to ICT adoption. There are still significant differences in the level of digitalisation of the construction sector, when compared to other industries, and this is justified by a set of challenges related to digitalisation that need to be still address.

One of the promising digitalization strategies with high hopes for the industry players is the adoption Building Information Modelling (BIM), which refers to intelligent 3D model-based process based on the generation of vast amounts of data that gives architecture, engineering, and construction (AEC) professionals the insight and tools to more efficiently plan, design, construct, and manage buildings and infrastructure. The goal of BIM is to create a collaborative design and building process that is capable of visualizing the physical and functional aspects of a building

[10] D3.1 “Data Sharing in Construction”, April 2021 (Update of the European Data Market study, SMART VIGIE 2020-0655);D3_1_Data_Sharing_Construction_v20_PE2zqumvKjRZHDjCztz1UE1xMc_76225.pdf (europa.eu)

The analysis revealed what are the key drivers and barriers of data sharing in construction. Among the key drivers are efficiency gains and reduction of duplications costs. Data sharing is seen as a playing a central role for better understanding the ecosystem and optimizing processes and the use of machinery. The study also found that a major goal for big and small players in the industry is to enable scalability by facilitating data reuse across heterogeneous projects. However, according to a survey done by Digiplace specialized and business-oriented collaboration tools are less employed comparing to easily accessible systems like chats. Other drivers such as safety and sustainability, pressure from competition were identified. Additional drivers towards data sharing are the implied shifts in business models: As experts point out, sharing data implies changes in the responsibilities of players and remuneration models. It is expected that more time will be needed in the design phase of the construction process

The analysis of the different data sources examined highlighted three types of barriers that ecosystem players need to overcome in order to enable and accelerate data sharing in the industry.

- **Technical barriers** refer to obstacles that companies need to overcome from a technological point of view to achieve the desired interoperability and seamless data re-use.
- **Economic and business barriers** integrate the impediments for companies related to managerial transformations from a business perspective that would be required to be put in place to accelerate data re-use across industry players.
- **Legal barriers** describe the current challenges related to data ownership, scalability of contract agreements across players to allow data re-use, and other legal considerations that make harder to share data across companies.

The report also touched up on the emerging mechanisms to overcome the barriers of data sharing. At present, there are not yet platforms or common infrastructures that increase accessibility of data and tools, but software packages that perform integration, modelling, and analysis of data. There is current competition between US and European providers of main software packages that are trying to position themselves in a strategic place to provide ‘the platform’ to the sector. Strong standards are necessary, and interoperability is key in their implementation. The industry is already heavily standardized when it comes to their processes due to safety and regulatory requirements. What some experts envisage is that machine-readable schema definition would allow software generators to create interfaces to databases that others could learn about the details of APIs and schema. Standards would provide what has been labelled as ‘neutral representation’ (or vendor neutral way) that public authorities could ask for procurement processes. Skilling programs for the workforce is high on the agenda. Due to the growing need of working with data processes. organizations in every segment of the construction sector are aware that would need to acquire digital skills

Finally, the combination of the study insights provided a set of policy conclusions that can be summarized as follows:

- Policy implication 1: The need for an in-depth analysis and implications of open versus proprietary platforms for data sharing in the construction sector.
- Policy implication 2: Explore BIM adoption and supporting required activities enabling data sharing.
- Policy implication 3: Upskilling activities across the construction ecosystem.

- Policy implication 4: Favour cross-learning of blueprint legal frameworks for industrial data-sharing across related sectors.

4.2 Story 2 – Data4Green: Why Data- Driven Innovation is Key to Delivering the EU Green Deal

The second story[11] investigated what are the bottlenecks to scaling up the solutions at a level required to achieving the goals of the European Green Deal. The study underpinning this data story shows that data analytics is present across all the priority areas of the European Green Deal. The range of impacts is wide. It can help with mitigation, for instance by reducing carbon emissions through precision agriculture. Also, it can help with adaptation, for instance by better predicting floods.

There is scattered quantitative evidence about the size of this opportunity. At the macro level, estimates of the impacts of 82 climate solutions by 2050 are available through Project Drawdown. Data plays a key role in almost all the areas identified and notably in tracking such reduction. The data story also reviewed available quantitative evidence at the micro-level. For instance, a case of precision fertilizer use shows a 10% carbon footprint reduction as a result. A 20% increase in wind energy value is achieved by using predictive technologies in wind energy production. A predictive energy control system for heating, ventilation and air conditioning in buildings demonstrates 20% energy savings.

Leveraging data in climate solutions also provides an economic opportunity. In all areas with quantifiable financial costs and savings, the return on investment is largely positive. That is why there is a wide variety of start-ups emerging in Europe to take this opportunity.

After identifying 63 start-ups that provide data-driven services in the area of the European Green Deal, this story examined in more details three cases.

1. **Plan A**, a fast-growing Berlin-based carbon reduction and environmental, social and governance performance start-up, shows how greater access to carbon footprint data can help companies to achieve net-zero transition.
2. **The Norwegian Knowledge Bank** containing loss data held by insurance companies has helped local Norwegian governments better plan for urban flooding and other climate-related risks;
3. **Elering**, the pioneering Estonian energy grid operator, uses data portability to empower consumers to achieve energy efficiency.

The cases showed a wide range of opportunities and challenges. The Plan A case study demonstrates that besides the environmental benefit of reducing companies' carbon footprint, the application of data-driven insights may also help companies save money and reputational damage. For instance, Plan A helped Atos to determine that 50% of its carbon footprint comes from computers, leading to the development of a green awareness app and carbon offsetting programs. The Norwegian case shows that insurance loss data are of high utility value to municipalities, as they foster a better understanding of the risks linked to natural disasters and surface-water flooding, in turn facilitating well-informed choices on what areas to prioritise in implementing preventive measures. The case of Elering shows

[11] D3.2 "Data4Green: Why Data-Driven Innovation is Key to Delivering the EU Green Deal " The European Data Market, VIGIE 2020-0566 https://ec.europa.eu/newsroom/dae/redirection/document/79186

the opportunity of better access to energy metering points data and how to scale it up to the European energy market. Such data access can help create new and innovative energy products and services that save energy and money, develop and provide personalised energy services based on real metering data history and save money by realising one integration instead of many. The estimated benefit of implementing an energy data exchange platform across the European Union amounts to 218 million euro per year by 2023. Moreover, through a more granular Guarantee of Origin labelling, energy consumers will be able to make a meaningful choice for 100% green energy.

Our analysis revealed that the above-mentioned examples all converge around one common issue: better access to high quality data. Across different contexts and applications, data sharing remains a permanent bottleneck. In this sense, current policy measures such as the Data Governance Act and the Green Deal Data Space can play a fundamental role.

4.3 Story 3 –Skills for Data: How to Overcome Skills Gaps and Develop Competent Data Professionals

The third story[12] investigated the long-time ongoing question of closing the digital skills gap in Europe. As the latest European Data Market study (SMART 2016/0063)[13] demonstrated that the demand for data professionals is expected to grow with 8.7% in the next five years, while in 2019 there were an estimated six million data professionals in the EU27. However, still as a result of a shortage of skills, digital transformation initiatives in Europe are often delayed by 8.1 months on average, and for every second company, the skills gap has had a substantial impact on both revenue creation and the ability to deliver products and services to the market. According to the latest IDC research, the overall lack of skill will result in an annual loss of €188 billion for European organisations as a whole[14].

In response to the digital skills gap, many companies already started to take action by implementing training programmes, upskilling or reskilling employees, and developing strategies to link the required skills with a data management transformation.

This Story demonstrated through five case studies, each of which offers a unique and cross-sectoral perspective from the private sector, examples on how to develop data-driven professionals and thus enable European business success.

1. The **Ernst & Young** example shows that data management skills are no longer a matter for data professionals only. For a firm that relies on the ability to understand employees, markets, and customers, data management skills will be required in all segments of the business.

2. The case of a **mid-size company** demonstrates the benefits of adopting a strategy that offers real career path for graduates and young talents. For instance, a 15-week training course provided the EU market with over 7000 data analysts.

3. A **global life science company** created a digital and data academy to assist the firm's digital transformation and offer workers with the skills they need to engage

[12]**Skills for Data: How to Overcome Skills Gaps and Develop Competent Data Professionals** https://ec.europa.eu/newsroom/dae/redirection/document/81425

[13] The European data market study update, July 2021, Link: https://digital-strategy.ec.europa.eu/en/library/european-data-market-study-update

[14] Does Lack of Skills Directly Impact Business Imperatives? https://www.idc.com/getdoc.jsp?containerId=EUR147736621, May 2021

successfully in the change to grow into a data-driven organisation. This example also highlights the challenge of implementing right data governance and to provide learnings in local languages of the employees over the world.

4. The **Orange group** has set up a goal to train 20,000 employees with data management skills and invest €1.5 billion in digital literacy programs. Despite all the efforts this example illustrates the ongoing challenge of talent recruitment in Europe and suggests further collaborations between academia and the private sector.

5. The case study of the **European Data Science Academy (EDSA)** describes a research project funded by the Horizon 2020 whose objective was to deliver the necessary learning tools to close the skills gap in data science in Europe.

Bridging Europe's digital skills gap and developing competent data professionals will become imperative for many organisations. As with most larger changes in enterprise and society, the first investment phase of the data driven economy contained a number of new initiatives, proof-of-concepts and pilot cases. In the second phase organisations are now learning from their peers and a consensus appears on how investments towards a data driven organisation is best done.

The five case studies demonstrated how digital literacy is critical in achieving digital transformation in Europe. The aspects and approaches that the examples bring forward are different and diverse; they reflect the complexity of building the appropriate skills when "the business as usual" is no longer an option. Despite the rapid pace of digital innovation and technological development, the digital skills gap remains a challenge for European businesses. Only last year, there were 341.000 unfilled jobs for data professionals in Europe[15] , and it is estimated that the demand for data management professionals will grow with 8.7% in the EU in the next five years. Given the attrition from retirement, more than 300,000 new data professionals will be required in the same period.

4.4 Story 4 – Digital Sovereignty in the EU: A convoluted Journey

The fourth story explores the concept of digital sovereignty and its impact on the European Data Market and Economy. For this study the research team have interviewed five key stakeholders to better understand this new European narrative, from diverse perspectives coming from the private and public sector.

Over the past two years, the notion of digital sovereignty has become more widespread among EU policy makers and governments and has been given additional tangible strength with the establishment of GAIA-X, whose goal is to create the next generation of data infrastructure for Europe as the EU embarks upon its digital journey. The concept has further been made more concrete through a number of legislative proposals such as the Digital Services Act, the Data Market Act, the Data Governance Act and the Data Act. In the same vein, with the Chips Act, the EU is asserting its determination to regain a leading role in the semi-conductor sector and avert shortages in the future. Finally, the outbreak of the Covid-19 crisis has shed light on the EU's economic vulnerability and interdependency. Its impact thus has reinforced the sense of urgency and relevancy around the general notion of digital sovereignty.

[15] Final Study Report: The European Data Market Monitoring Tool Key Facts & Figures, First Policy Conclusions, Data Landscape and Quantified Stories, D2.9_EDM_Final_study_report_16.06.2020_IDC_pdf.pdf (datalandscape.eu)

4.5 Story 5- 6 Data4Energy: How Energy Data Can Accelerate the Green Transition

The data story provides an overview of data start-ups active in the energy area, and three deep dive case studies. To showcase the variety of applications, the cases cover the micro level (Opower, on smart meters and customers empowerment), the meso level (EDA, on data sharing in distributed grid management) and the macro level (LEAP4SME/OECD, using energy data to track the green transition). The start-ups analysis show that data analytics is taking a prominent role across the energy value chain. The start-up landscape is burgeoning and growing. The climate-tech sector is the fastest growing startup vertical sector and energy start-ups are more than 5% of EU data start-ups tracked in the EU data landscape and investment is growing fast. Frontier technologies such as deep tech and artificial intelligence are those most prominently used, suggesting that growth is likely to accelerate over the years.

4.6 Story 7-8 – Data for Mobility

This study investigates the market trends affecting changes in mobility, by looking at the evolution of three main attributes of people and goods mobility. For each attribute, the study provides a comprehensive analysis, encompassing demand-side trends, supply-side contributors, and illuminating case studies. Its insights and findings are designed to empower decision-makers to make strategic choices regarding the future of mobility customer experiences, operations, and ecosystem collaboration.

Key Findings:

- **Customer Experiences**: Mobility-as-a-Service (MaaS) is redefining how customers experience mobility. We uncover the demand for personalized and convenient services, highlight leading MaaS developers, and present case studies that showcase practical solutions and valuable lessons.
- **Traffic and Transportation Operations:** Operations are evolving into cooperative and intelligent systems. The study identifies the need for increased efficiency, safety, and sustainability, spotlights innovators in the field, and provides case studies that offer replicable strategies and insights.
- **Ecosystem Collaboration**: Collaboration within the mobility ecosystem – including but not limited to transportation operators, governments, OEMs, insurance companies - , coupled with innovative data monetization models, is driving revenue growth, cost efficiency, safety enhancements, and environmental sustainability. We explore collaboration trends and showcase companies at the forefront through case studies.

In conclusion, by gaining insights into the evolving landscape of mobility experiences, operations, and collaboration, stakeholders can make informed and strategic decisions that align with the ever-changing future of mobility.

4.7 Story 9-10 – Data4Food

The data story provides an overview of data start-ups active in the agri-food area, and four deep dive case studies. The first case study analyses how data intermediaries (DjustConnect data exchange platform) can make the agri-food sector thrive using the data in a legal, ethical and fair data exchange process. The second provides relevant information on how the use of smart trays improves the food supply chain and contributes to reducing food waste. The third illustrates (AgriFood Data Space Finland) how data-sharing activities between the stakeholders of agriculture and food systems can concretely help the agri-food

industry in Finland. The fourth case (DIH AGRI-FOOD Data Space, Slovenia), a federally organised data-sharing platform, provides an example of how any interested data owner, data provider or any stakeholder from the agri-food sector can share or use data through the platform, using pre-known policies and rules defined by the data governance model.

The start-ups' analysis shows that data analytics is taking a prominent role across the agri-food value chain. The start-up landscape is burgeoning and growing. The agri-tech sector is a fast-growing start-up vertical sector and, in 2022, 4% of EU data start-ups tracked in the EU data landscape were active in agri-food sectors. Frontier technologies such as deep tech and artificial intelligence are used most prominently in the agri-food sectors, suggesting that growth is likely to accelerate over the years.

Challenges remain, especially in terms of the availability of standardised, real-time and granular data across member states. Access to different kinds of agricultural-related data both inside and outside member states continues to be difficult, especially due to the lack of trust of data holders (e.g., farmers). As the DjustConnect platform shows, providing a clear solution, simple to use that offers the farmers the right to decide with whom they share the data can significantly help accelerating data-sharing processes.

4.8 Story 11 – Data for Healthcare

The European Health Data Space EHDS stands as a transformative force, providing essential elements that promote a safe and compliant exchange of health data. By establishing rules, common standards, infrastructure, and a governance framework for both primary and secondary use, EHDS holds the potential to unlock the inherent value of health data. As the trilogue negotiations for the approval of the definitive version of EHDS regulation continue, this story delves into the European healthcare context in which EHDS will function, while assessing the current status of the EHDS2 Pilot advancements.

The pilot project is designed to support five distinct use cases, each aimed at demonstrating the potential of EHDS in facilitating the cross-country reuse of health data including research, innovation, policy-making, regulatory activities, and potentially personalized medicine. The project's use cases focus on specific cross-border research or public policy projects, necessitating data access from multiple countries. They encompass a wide range of research topics, like: Infectious disease surveillance (AMR), Thrombosis in COVID-19 patients, Covid-19 testing, vaccination and hospitalisation, Cardiometabolic diseases and Colorectal cancer.

Nevertheless, the ongoing developments in the EHDS2 Pilot and its use cases reveal challenges and offer initial lessons learned. These insights highlight areas that require attention to ensure the ultimate success of the European Health Data Space. The fragmented legal environment is leading to significant variations among use cases and nodes in processing data access requests within the EHDS2 Pilot. Addressing regulatory harmonization challenge early on will establish a transparent context for a trustworthy EHDS ecosystem, driving acceptance and adoption across healthcare ecosystems. Additionally, it is essential to establish a system of rules, requirements, and incentives to effectively collaborate that recognizes both the benefits and constraints of data holders. Another key factor in enabling the EHDS is a comprehensive approach to semantic interoperability as part of the broader data quality framework. This helps ensuring comparability across data sources, within and across data holders, ultimately leading to the generation of reliable and accurate outputs.

4.9 Story 12 – Predictive Data Driven Policymaking

The data story provides an overview of public sector initiatives based on emerging technologies (e.g., artificial intelligence and blockchain), and three deep-dive case studies. One of the showcases (Preventing Medicare Fraud) provides some insights into how predictive analytics technologies help identify and prevent the payment of fraudulent claims in the Medicare Fee-For-Services Program in the United States. The second case (Spotlight: Fighting Human Trafficking) provides relevant information on how data analytics helps investigators visualise the complexity of a juvenile's trafficking situation and helps them fight underage human trafficking victims. The third showcase (MITOS: Digitising Administrative Procedures and Services in Greek Public Service) offers an overview of the Greek National Registry of Administrative Procedures, a state-of-the-art information system (IS) that aims to host and manage all administrative procedures related to Greek Public Administrations (PAs).

The landscape analysis shows that data-driven analytics has a prominent role across the EU public sector. The emerging technologies initiatives are numerous and with various applicability (e.g., improvement of public service, administrative efficiency, more responsive, efficient and cost-effective public services, increase the quality of processes and systems, provide public (citizen) centric services, etc.), covering all the functions of the government (e.g., general public services, economic affairs, public order and safety, health, social protection, etc.). They consider all three types of interaction of the government – government-to-citizens, government-to-government and government-to-businesses. To a limited extent, the analysis provides information about cross-border and cross-sector initiatives at the EU level.

The challenges remain, in terms of the availability of standardised, real-time and granular data across member states. Getting access to data remains an issue across EU member states, either due to the lack of trust of data holders or to low digitalisation of the public sector organisation.

5. MAPPING THE DATA MARKET – DATA LANDSCAPE

5.1 Overview of the background and the methodology

The data landscape database provides a solid mapping of the key players in the data economy. It uses objective and well-defined criteria to select the most promising big data companies in Europe with a special focus on the “key data companies" category. This category includes companies that a) are active in the area of big data; b) have their headquarters (or R&D department) in one of the European Union (EU) member states; and c) have a valuation of at least €100 million.

The EU data landscape mapping is realised using the Dealroom database as the source, similar to the previous two years. This also aims to build a time series of data that will provide relevant information about the data start-ups and scale-ups environment in the 27 EU member states.

The EU Data Market study has identified start-ups and scale-ups to be a focus area to be closely monitored. To better align the mapping of data companies with this objective, new categories mapping the landscape of accelerators, incubators and digital innovation hubs supporting start-ups have been added. These new additions include:

- Business angels;
- Business angels’ networks;
- Federations of business angels’ networks;
- Early stage venture capital funds;
- Business accelerators;
- Business incubators;
- Associates/other early stage market players;
- Universities and scientific parks.

The final EU data landscape is comparable with the previous versions developed throughout the study duration. Thanks to the partnership with Dealroom, the consortium had access to more granular and rich data about data companies and the two years of data collection also allow for the comparison between the two years’ results. The threshold used to determine key companies remained the valuation above 100 million euros of a company, as it was used in the previous report.

5.2 Overview of the Data Landscape

The third run of the query in the Dealroom database returned 4,091 data start-ups and scale-ups entries matching the selection criteria, distributed across the 27 EU member states. In 2023, the selection volume of data companies increased by 18% compared to 2022 and by 31% compared to 2021, having an overall compound annual growth rate of 14% for the period 2021-2023. Compared to 2022, there are 814 new companies in the EU27, while 92 previously selected companies have dropped from the list. Therefore, the current analysis will focus on the selection of 4,091 data start-ups and scale-ups. The main parameters used in the selection of data companies remained unchanged compared to the previous year: the company is operational, focuses on big data technologies and has headquarters in a country within the EU.

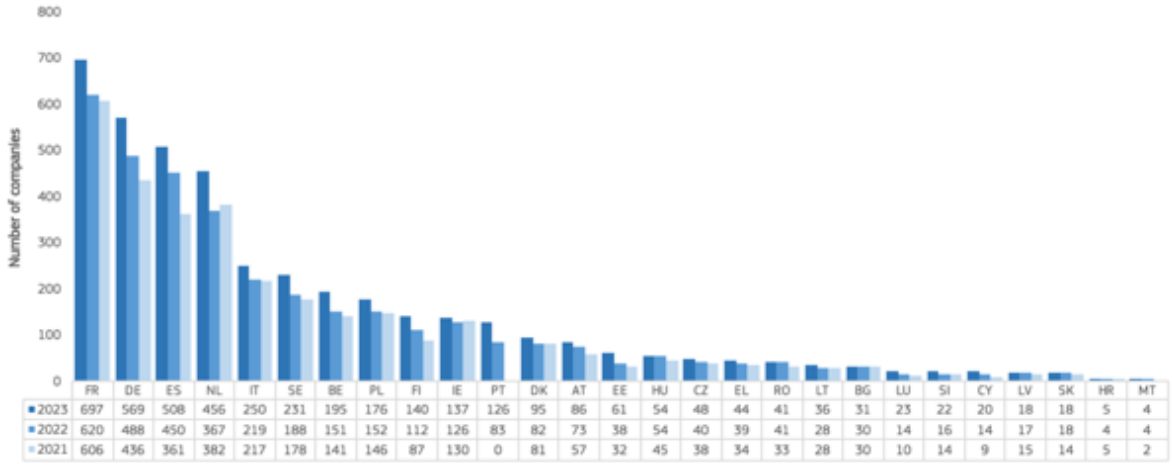
The data gathering maintained the company’s characteristics selected previously: the size and age of the company, the employment growth, the development stage, the financial aspects (i.e., last round founding, total funding, the revenue and the valuation of the

company), the number of employees, the headquarters coordinates (i.e., country, city), the type of market (i.e., industries and sub-industries where the company is active) and the technologies used.

In relation to company age, the database includes a similarly wide range of companies, from very young data companies (less than a year old) to well-established firms with decades of experience (over 30 years old companies). In 2023, the database includes 180 data companies with over €50 million valuation (a 22% increase since 2022), of which 95 have a valuation of over €100 million (a 22% increase compared to the previous year). Over the period 2021-2023, the compound annual growth rate of

When it comes to geographical distribution, the east-west distribution remains unchanged: 86% of companies have the headquarters in the Western Europe and only 14% in Central and Eastern Europe.[16]

Figure 11 Geographic distribution of the start-ups and scale-ups across EU member states, 2021 - 2023.



	FR	DE	ES	NL	IT	SE	BE	PL	FI	IE	PT	DK	AT	EE	HU	CZ	EL	RO	LT	BG	LU	SI	CY	LV	SK	HR	MT
2023	697	569	508	456	250	231	195	176	140	137	126	95	86	61	54	48	44	41	36	31	23	22	20	18	18	5	4
2022	620	488	450	367	219	188	151	152	112	126	83	82	73	38	54	40	39	41	28	30	14	16	14	17	18	4	4
2021	606	436	361	382	217	178	141	146	87	130	0	81	57	32	45	38	34	33	28	30	10	14	9	15	14	5	2

Source: Analysis by the authors based on Dealroom's database of startups and scale-ups

The database covers 31 industries and 19 types of technologies. In 2023, 129 companies have no information about the market covered within the database (6.7% of the total number of companies selected, up by 0.5% compared to 2022). On average, the number of industries a company is active in remains similar to the previous year at 1.3, with values varying across countries from 1.00 (Malta) to 1.53 (Lithuania).[17]

There are no significant changes in the top 15 industries covered by the database in 2023 compared to the previous year. The top positions remain stable, with 34.6% of the companies active in the enterprise software industry (0.2% increase), 13.6% in health (0.8% decline since 2022) and 13.2% in marketing (0.5% decline).

[16] The division was set from wide geographical perspective. The Western Europe includes Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Spain, Sweden. Eastern Europe includes Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia

[17] The average values include the companies that have no information about their specific industries. In the database, there are 276 data start-ups and scale-ups without information about the industries where they are active..

The database covers 19 technologies, with a particular focus on big data (31.6%), artificial intelligence (14.4%), deep tech (13.4%) and machine learning (10.7%). The database coverage of the full spectrum of technologies used is presented in **Error! Reference source not found.**. The data shows that, on average, 3.2 technologies are identified per company, ranging from 2.26 (in Estonia) to 3.78 technologies (in Slovakia). Also, the number of technologies used by companies varies significantly and it goes up to 19 technologies (two companies: one in Spain and another one in the Netherlands).

Similar to the previous years, the database includes a wide range of data company types, considering the development stage, the company size (in terms of employment), launch year and funding level (when this information is available):

- 81% are small enterprises (having between one and 50 employees). Moreover, almost half of the data companies included in the database (49.7%) have less than ten employees. Compared to the previous year, the number of companies with less than 10 employees remained stable (approximately 50%), while the companies with 11 to 50 slightly declined (about 2.6%). The medium enterprises (with 51 to 500 employees) represent 12.2% of the companies (up by 1.2%), while the large companies are 1.6% (up 0.7% compared to 2022).
- 50.5% of the data companies in the database are in the seed stage (down by 0.7% compared to 2022), while another 31.4% are in the early growth stage (down 3% compared to 2022). Late growth companies increased by 1%, accounting for 14% of data companies in the selection. In addition, 2.6% of the data companies included are at a mature level of development. Moreover, like in the previous edition, the Western Europe hosts over 85% of seed stage companies, 86% of early growth stage companies and 87% of late growth stage ones. In addition, 92% of the mature companies included in the database selection are also hosted by Western countries.[18]
- 39% of data companies are five to ten years old, while 23% are three to five years old. On average, the age of companies included in the database is 9.7 years old (a 25.5% increase in the age of data start-ups and scale-ups included in the selection). At the country level, the companies' ages vary between 6.1 years old, in Estonia, to 15 years old, in Croatia. In 2023, 2.8% of companies (116 companies) do not include this information.
- several types of financial information are available for 3,008 companies (74% up 17% compared to 2022): 1,248 companies provide information about their valuation (down 4% compared to 2022), 1,506 provide information about the last founding round (down 4%), 1,560 have information regarding the total funding (down 3%) and for 2612 information about revenue is available (up 39%), with 1674 having information for 2023. Some of the companies have provided more than one type of financial information, and 865 of them (21% of the companies in the database, up 12% from 2022) have all the four types of information about their financial status available.

[18] The division was set from wide geographical perspective. The *Western Europe* includes Austria, Belgium, Denmark, Finland, France, Germany, Ireland, Italy, Luxembourg, Malta, Netherlands, Portugal, Spain, Sweden. *Eastern Europe* includes Bulgaria, Croatia, Cyprus, Czech Republic, Estonia, Greece, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia.

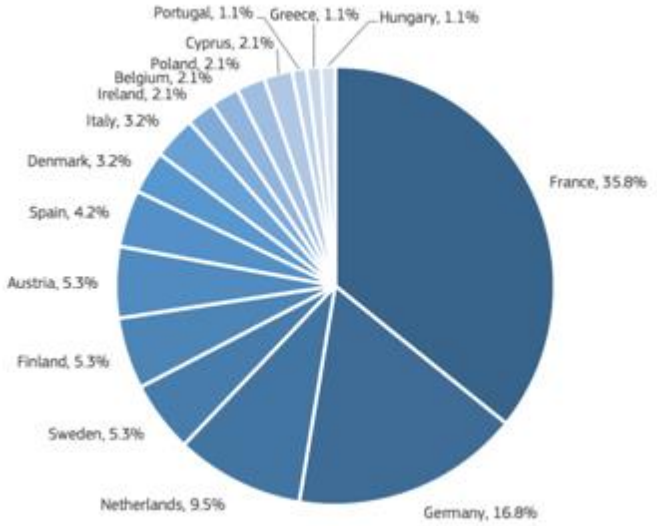
- 46.8% (1916 companies) of the data start-ups and scale-ups included on the database have only one owner, while 22.8% (933 companies) have multiple owners. For 25.6% (1,049 companies) of the data, the ownership is not specified and for the rest of 4.7% (193 companies), the owner is mentioned as “not known.”
- when it comes to single ownership, 43% of data start-ups and scale-ups are bootstrapped, venture capital is the owner in 32% of data companies and accelerators own 13% of the companies.

5.3 Key Data Landscape companies:

Within the 4,091 data companies included in the database, 95 data companies have been identified as key companies, a 17% increase compared to the previous period. In 2023, 28 new key companies joined the list, while 14 of the previous ones are no longer included. The companies included in the list have an average valuation of at least €100 million.

- In 2023, 93.7% of the companies are located in Western Europe (up by 18%), while Eastern Europe still hosts only six data companies (two companies in Poland and Cyprus and one in Hungary and Greece).[19]

Figure 12 Distribution of key data companies across the EU member states, 2023



Source: Analysis by the authors based on Dealroom’s database of startups and scale-ups

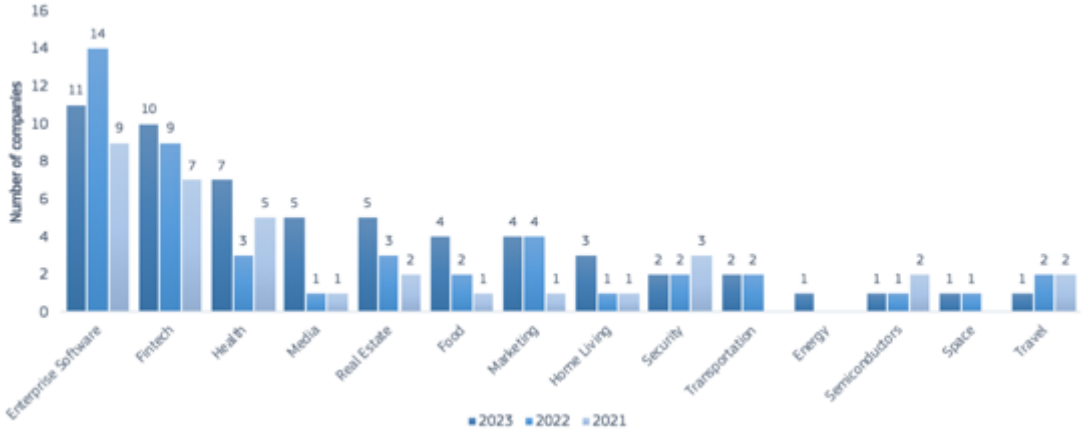
- France (34 companies, up by 26% compared to 2022) and Germany (16 companies) remain the countries where more than half of the key data companies are located (50 out of 95 companies). Over the period 2021-2023, the number of French companies increased by 30% (from 20 to 34, currently), while German companies show a 6% decline (from 18 down to 16 companies).
- On average, the companies included in the database use 3.4 different technologies. At the same time, the number of technologies varies across the data companies from one (in 15 companies, up by 7% compared to 2022) to seven (in two

[19] Ibidem.

companies). Moreover, the number of companies using only one technology shows a 46% growth rate during the period 2021-2023.

- In addition to big data (which was the main selection criteria), the most frequent technology used in 2023 remains artificial intelligence (AI), with 55 of the key companies using it (up by 12% compared to 2022). It is followed by machine learning, with 45 companies (up by 2% compared to 2022) and deep tech, with 44 companies (down by 8% since last year). Since 2021, the number of key data companies using artificial intelligence increased annually by 41%. Similarly, the key companies using machine learning algorithms grew annually by 40.6%. When it comes to deep tech the annual growth is much smaller – only 4.8%.
- 60% of the key data companies are active in one industry, with the top four most frequent industries being enterprise software, fintech, health and media.

Figure 13 Distribution of industries for company active in only one industry, 2021 -2023



Source: Analysis by the authors based on Dealroom's database of startups and scale-ups

Note: The data refers only to companies that are active in one industry only (57 companies out of the 95 identified).

Overall, the EU data landscape provides a wide range of information concerning the startups and scale-ups environment, with a good data granularity that allows better analysis of the companies' profiles and provides additional information about stakeholders and their main characteristics.

6. ACTING UPON THE DATA MARKET – THE ROLE OF POLICY

The sizing and forecasting exercise carried out by the European Data Market Monitoring Tool, together with the additional analysis obtained through the quantified stories, were complemented by the Final Report on Policy Conclusions (D2.8), which investigated the role of policies in shaping the present and future trends of the European Data Market and Data Economy.

6.1 Three Scenarios for the European Data Economy

The European Data Strategy presented in 2020 describes Europe's vision to become a global leader in the data-agile economy and a leading role model for a society empowered by data to make better decisions in industry and government. The European Data Market study projects the current reality of the European data market and economy to the year 2030, developing three alternative scenarios exploring the different mix of factors and policy choices which may lead to achieving the EU's ambitious objectives or, on the contrary, lead to a setback.

Building on the baseline measurements of the data market for the current period, the scenarios provide storylines, contextual framework, and key assumptions used to model and forecast the EDM Monitoring Tool indicators, with a particular emphasis on the role of policies. Important to note that the scenarios are not predictions but rather potential future developments.

The ultimate objective of the scenarios is to analyse which combination of framework conditions and policy actions may maximise the growth potential of the European data market and economy and, by feeding into the quantitative models, estimate the actual size and depth of their potential benefits. In this way, the scenarios provide a realistic approach to the forecast estimates, since we project a range of values (not a single estimate, which may be widely off the mark). The scenarios added value consists in highlighting the potential consequences of various market trajectories, thus providing a guide to action, particularly for policymakers.

The methodology framework of the scenarios is the same successfully implemented in the three editions of the EDM study. The indicators are projected from 2023 (current actual measurement) to 2025 (short term forecasting with a low level of uncertainty). From 2025 to 2030 we project the three alternative development paths of the indicators, providing measurements for the year 2030.

The main storylines of the scenarios have been updated to consider recent disruptive events, specifically the potential consequences of the Russia-Ukraine war, the Middle East conflicts, the tight financial conditions and the uncertainties about macroeconomic, as follows:

Baseline scenario: the main assumptions are based on the continuation of current growth trends and framework conditions. High interest rates and trade tensions are expected to dampen growth in Europe, with low GDP growth rates until 2025 and a moderate take-up again after 2025. Thanks to the resilience of the data market, though, the dynamics of diffusion of data innovation is still relevant. This scenario is characterised by a modest concentration of power in the hands of dominant data owners, a data governance

mechanism that protects individual data rights, and unequal but relatively broad distribution of data innovation benefits across countries and society.

High Growth scenario: The data market enters a faster growth trajectory, thanks to more favourable framework conditions. This would require an improvement of geopolitical conditions, thanks to contained war escalation threats in the Middle East, some kind of cease-fire agreements between Israel and Gaza, Ukraine and Russia, no aggressive actions by China against Taiwan and an American Presidency managing a stable foreign policy. This would lighten international trade tensions and inflation pressures on energy and commodities prices. If also core inflation would go back under control by 2025, as some analysts are cautiously hoping, a more relaxed monetary policy from that year onwards could drive a faster economic growth cycle in the second half of this decade. Better economic conditions would enable a faster adoption of data innovation than in the baseline scenario, in a context of data sharing supported by a globally recognised data governance framework and successful industrial policies in Europe. In this scenario, a positive spillover effect is foreseen as a result of various investments in cybersecurity, data spaces, digital skills, AI, cloud, etc., enabled by EU funding including the Digital Europe Programme and Horizon Europe.

Challenge scenario: this scenario could easily result from negative outcomes of at least some of the current geopolitical crises, in the Middle East, in Ukraine, or in Asia. Worsening international trade conditions would increase pressure on energy prices as well as commodities, perhaps even slowing down the green transition by reducing the exports of the necessary materials, which Europe does not control, for example for batteries or solar or wind plants. This could result in a stagflation scenario substantially reducing Europe's economic growth perspectives in the next years. At the same time, increased defense /military spending could result in higher investments and revenues by military and manufacturing industries, particularly in the countries with a strong military tradition. Data-driven innovation would still happen in this scenario but with an uneven diffusion, focused on government and defense markets rather than business and consumer services. As a result, countries with solid economies would fare better than weaker ones. This scenario is also characterised by fragmented data flows and a low level of digital innovation by SMEs.

Based on these assumptions, the following **table** shows the cumulative growth rates for the period 2025-2030 for the three scenarios. These growth rates have been updated in November 2023. Thanks to the surprising resilience of European economies, the current estimates foresee only a mild decrease of the data market growth rates up to 2030, compared to more optimistic estimates before Russia's invasion of Ukraine. Concerning the data economy, while the baseline scenario is only slightly affected, the High Growth scenario to 2030 is less optimistic than the forecast presented in November 2022, due to the cumulative effect of the continuing difficult macroeconomic conditions in the period 2022-2024. On the contrary, the potential of negative developments is worse than before, so the Challenge scenario sees a slight decline of growth rates even compared to October 2022 estimates.

	CAGR 2025/2030 Challenge	CAGR 2025/2030 Baseline	CAGR 2025/2030 High Growth	CAGR 2020-2025
November 2023				
EU 27 Data Economy	1.9%	5.3%	8.6%	8.7%
EU27 Data Market	0.7%	3.3%	7.1%	10.6%

A detailed description of the three scenarios storylines is presented in the following paragraphs, after a summary of the main assumptions underlining the differentiation between the 3 alternative development paths.

6.2 Policy and the Baseline Scenario

EU27 macroeconomic conditions in the Baseline scenario foresee moderate GDP cumulative growth average in the period 2025-2030 (+1.6 %) and **ICT spending** growth of **4.4%,** compared to an almost completely flat growth in the Challenge scenario. The Baseline scenario envisions a healthy European data industry, continuous improvement in the provision of data products and services, and gradual growth in demand, particularly among the most advanced, competitive, and inventive firms, large and small. In aggregate, the economic impact of legislative initiatives such as the Digital Governance Act, the Data Act and the Digital Markets Act, creates a globally recognised data governance framework facilitating competition and data sharing, protecting individual data rights without excessive concentration of power over data assets by few leading stakeholders.

As a result, the **EU27 data market** will reach **€118 billion by 2030** with a CAGR of **3.3%.** In this scenario, we expect the gradual emergence of a healthy data ecosystem based on multiple vertical/horizontal industrial and personal data platforms, providing secure data sharing and trading environments. This will be supported by the at least partially successful development of the European Data Spaces in EU27 providing these platforms for secure data sharing and trading in the main industries. In this context the European data industry will grow fast, with the number of **data supplier companies** reaching approximately **316,889 in 2030** with a cumulative growth rate of **3.4%,** slightly faster than the data market. By 2030 we expect **data supplier companies** to represent **2.6%** of total companies in the ICT and professional services sectors, up from 2% in 2022.

The number of data user companies will also grow, driven by the fast adoption by large companies and innovative SMEs of AI and data-driven business models. The EU27 **data user companies** will reach **910 thousand by 2030**, with a 6.8% cumulative growth rate for the period 2025-2030. The **data users share** of the total universe of EU enterprises will reach **3.2%** in 2030, from 2.2% in 2022, a remarkable increase.

This development of the data market will be supported by strong government stimulus for the Green and Digital transition. With Next-Generation EU, the Commission deployed a €750 billion temporary extraordinary recovery mechanism to assist governments in repairing the social and economic damage caused by the epidemic. In this scenario, we expect that a great proportion – between 20 per cent and 35 per cent, depending on the

country – of national recovery and resilience plans will be spent on ICT by 2025[20]. Robust investments and collaboration amongst Member States can effectively support Europe in developing autonomous data infrastructures and digital resources, shaping global digital governance regulations in accordance with EU principles is envisioned in this Baseline scenario. Europe achieves technical sovereignty, as predicted by the digital and data agendas. The planned EU Chips act should also generate investments in microprocessors factories, while the increased investments in cybersecurity by the DEP and national collaboration (see the new Cyber Solidarity Act proposal) will generate trust and the safe use of data intensive products and services.

Europe's ambitious Horizon Europe and the Digital Europe Programme will provide substantial investments supporting research and innovation, complementing private investments. Finally, this scenario will be enabled by the deployment and take-up of Very High-Capacity Networks (VHCNS) across Europe, even with somewhat uneven coverage by geographical area, accelerated by proposed measures such as the new Gigabit Infrastructures Act. Additionally, the Baseline scenario assumes that the EU's digital ambitions for 2030, as outlined in the Digital Compass, will most likely be slightly revised and updated, with some delay in the achievement of some targets, because of the difficulty to implement the close collaboration between all Member States.

In this scenario, the **data economy** will grow to **€851 billion** by 2030, representing **5.8%** of EU27 GDP, thanks to a **5.3%** cumulative growth rate from 2025. This means that in this scenario Europe's contribution to the global Data Economy will be on track to match its economic weight by 2030, owing to a thriving data single market.

Digital technologies are being used more and more by governments and organisations as a way to make the economy and society more sustainable. In this scenario, technology users and IT vendors play a big role by building and implementing digital assets, processes, and operations to help organisations become more sustainable and move toward a circular economy. A significant success will be achieved on the EU's sustainability goals for a green ICT to eliminate the environmental footprint of data centres by 2030. Cloud providers would install new, more sustainable data centres that are energy-efficient by using renewable energy sources, reusing waste heat, and implementing circular measures for recycling and reusing decommissioned servers. Moreover, European investments in workspace digital initiatives are growing fast. The shift to a hybrid work environment will require offices ensuring a collaboration environment that drives a flexible working culture and enhances creativity while continuing to maintain productivity.

Finally, even considering the difficulty to source high level technical skills in Europe, in this scenario we expect the **number of data professionals** to reach **9.9 million by 2030** in the EU27. This represents a strong contribution to the EU labour market, as well as progress towards the EU's overall goal of employing at least 20 million ICT specialists by 2030.

6.3 Policy and the High Growth Scenario

In the High Growth scenario, Europe's economy will grow faster than in the Baseline scenario (with a CAGR of **2.6 %** between 2025 and 2030), with a stronger emphasis on digital innovation and higher growth of overall ICT investments (+6.9% in the same period). Faster than expected resolution of international conflicts leads to improved economic

[20] Recovery Plans in Europe and Investments in Traditional and Emerging Technologies: An IDC Overview

conditions already by 2024-25 with faster growth than the baseline from 2025 onwards. This scenario remains characterised by advanced data innovation and digital transformation across Europe and a globally recognised data framework. This is also characterised by global supply chains more integrated than previously between Europe, the US, South Korea and Japan and a reduced dependency from China manufacturing by 2030. In this scenario, a positive spillover effect is foreseen as the outcome of larger investment targeted to rebuild Europe strengths in the areas of the Important Projects of Common European Interest (IPCEI) such as semiconductors, hydrogen and the batteries. Also, the positive impact of European Digital and Data Strategy policies is maximised by effective implementation across Europe generating important benefits for growth.

In this scenario, the **EU27 data market** is estimated to reach **€141 billion** by 2030, with a cumulative growth rate from 2025 of **7.1%,** twice as fast as the baseline scenario. The **EU27 data economy** is forecast to reach **€995 billion** in the same year, representing 6.5% of EU27 GDP, with a cumulative average growth rate of **8.6%.** The economy will transform into an emerging digital-first marketplace, with more than half of the GDP driven by products and services from digitally transformed enterprises.

The data market will accelerate its expansion, and data technology will extend beyond a small group of pioneers to a larger audience of mainstream users. We foresee that the goal set up in the Data Strategy will be fulfilled, meaning that, by 2030, an attractive policy environment will be created whereby the EU's share of the data economy corresponds to its economic weight. The supply-demand dynamics will shift from technology-driven to demand-driven, with a fully formed ecosystem creating positive feedback loops between data firms and users. This is a common virtuous cycle process that might occur if data technology adoption accelerates sufficiently to build momentum. A rapid diffusion, a characteristic of ICTs, doubles the advantages to users in their interactions and makes it simpler to consolidate standards and interoperability, further lowering adoption barriers.

To enable this scenario, we must presume a set of favourable framework conditions. First, the implementation of the Data Governance Act enables the re-use of the data held by the public sector Second, the Data Act by clarifying data ownership and data portability rights helps developing new digital services and increases the number of new actors in the data economy. Third, with the Digital Markets Act in place, the dominance of the Big Tech companies is somewhat lowered with emerging European players on the horizon.

If all policies and regulations are implemented, and the Commission succeeds in reaching its Digital Decade 2030 targets, we can expect an ideal pace of digital transformation and diffusion of technologies such as IoT, cloud, 5G, 6G, etc.

The development of the European Data Spaces and the adoption of big data technologies spreads beyond pioneers to mainstream users. A fully developed data ecosystem powers a positive demand-supply growth cycle, boosted by the EU's funding programme Digital Europe.

We also consider that by 2030, the EU will make great progress towards meeting its commitment to sustainability and reaching its goal of improving the energy efficiency and the circular economy performance of cloud computing and data centres. Through technology innovation and the intelligent use of data to govern newly remodelled supply chains, organizations develop, implement, and achieve ambitious sustainability KPIs. The investments in green digital solutions for the biggest Challenges of climate change result in lower greenhouse gas emissions rates.

The established policy measures and legislations will enhance the increase of the number of **data supplier companies** to **334 thousand**, with a **4.5%** compound average growth rate for the period 2025- 2030. The **data industry revenues** will reach **€172 billion**, with a **8.3%** CAGR for the same period. On the demand side, in this positive scenario more and more organisations will leverage digital solutions and digital business models to generate revenues that will lead to an increasing share of wealth. Therefore we forecast EU27 data users to pass the 1 billion threshold (1,098 thousand companies) with an 11% compound average growth rate. The number of **data professionals will reach 11.6 million** by 2030 (compared to 9.9 million in the previous scenario).

6.4 Policy and the Challenge Scenario

The Challenge scenario envisions a negative self-reinforcing spiral, in which less promising worldwide economic conditions discourage investment and weaken global demand, consequently limiting European growth. It is a combination of a less favourable macroeconomic environment than in the Baseline scenario, less favourable framework conditions, and a slower spread of digital innovation, resulting in a low-growth path for the data market. This context results in strong disparities between countries with rich economies (US, leading EU countries such as Germany and France) continuing to invest in digital technologies and data innovation, and countries with weaker economies less able to keep up with the new technologies race. This scenario is also characterised by fragmented data flows and low level of digital innovation by SMEs, with an incomplete internal digital single market unable to compensate for countries disparities. Because demand-pull will be minimal, the supply-demand dynamics will be dominated by the technology push. As a result, this scenario examines the possible risks and implications of failing to remove impediments to the growth of Europe's data economy.

In this scenario, the EU27 GDP compound annual growth rate in the period 2025-2030 is 0.8%, dramatically lower than the 1.6% growth rate of the Baseline. This slower pace of global economic growth could be caused by relevant geo-political shocks in critical regions as it is the current case with the Russia-Ukraine war. Other possible reasons for these slowdowns can be caused by trade wars fostered by new protectionist policies; or else a new financial crisis, foreshadowed by the ongoing rise of inflation and the energy prices. 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.

Persisting high inflation is a threat because it decreases people’s purchasing power, as real wages increase fail to compensate the increase of prices. In this scenario, both supply-side and demand-side measures will have a smaller impact and will be implemented more slowly. Policy measures for the digital economy will be less effective, with public R&D investments failing to compensate effectively for lower private investments. The insufficient development of data ecosystems in Europe will limit the diffusion of data sharing platforms. The lack of unified standards and insufficient levels of automation act as barriers preventing a harmonised Digital Single Market.

As a result, the value of the data market and data economy will be significantly lower in 2030 than in the Baseline scenario. The EU27 **data market** is estimated to reach almost **€104 billion** by 2030, expanding at a compound annual growth rate of **0.7 per cent** (versus 3.3% in the Baseline). The **data economy** is projected to achieve a value of **€723 billion** in the EU27 by 2030, corresponding to **5.2 per cent** share of EU GDP.

Slower digital innovation hinders the economy of the potential economic boost generated by data-driven products and services, while small and medium-size businesses struggle to keep up with the international competition. Governments have limited capability to spend in sustainability transformation incentives. In this environment, European firms find it difficult to maintain high levels of digital investments and tend to prioritise survival over pushing digital transformation towards sustainability. In this scenario, the EU is not able to fulfil its sustainability goals related to the green cloud. The transition to a more energy-efficient and circular economy is slower and uneven across Europe.

Under the Challenge scenario, the increase of both data supplier and data user companies will be much weaker than in the other scenarios. The number of **data suppliers** is estimated at **302 thousand** in 2030 and that of **data users** at **765 thousand (+3.2%** CAGR from 2025), versus 334 thousand data supplier companies and more than 1 million data user companies in the High Growth scenario. As shown by the indicators, the demand side of the data market is more affected by the negative conditions of the Challenge scenario than the supply side, with the resilience of the data industry helped also by export capabilities outside of Europe. In this context, the number of **data professionals** in the EU27 will reach **9.3 million by 2030,** versus 9.9 million in the Baseline and 11.6 million in the High Growth. But the data skills gap will be higher than in the Baseline scenario, reaching an estimated number of more than **596 thousand** unfilled positions in the EU27 by 2030. The unequal spread of data innovation across the European Union will result in a mismatch between data skills demand and supply, while lower investments in data skilling will depress supply.

6.5 The European Data Policy Framework

The digital strategy of Europe, highlighted as one of the top six priorities by the present Commission, saw substantial progress between 2021 and 2023. This period was marked by the enactment of several important legislative initiatives and the approval of corresponding implementation actions, especially in the realm of data governance.

Concerning the first pillar, the new regulatory framework for data is taking shape with the implementation of the **Data Governance Act (DGA**[21]), which entered into force on 23 June 2022 and is applicable since September 2023. The Data Governance Act aims to strengthen mechanisms that increase data availability (both personal and non-personal data) thus enabling companies and start-ups to develop new products and services. It also aims to allow the safe reuse of specific categories of public-sector data that are subject to the rights of others. In a way, it complements the *Open Data Directive* from 2019, which does not cover the categories of data that DGA aims to address. It contains the first steps toward the limitation of the transfer of non-personal data. It supports the development of common European data spaces in strategic sectors such as health, environment, energy, mobility and finance. The DGA regulates activities of “Data intermediaries”. According to the EC the “Data intermediaries will function as neutral third parties that connect individuals and companies with data users". The concept behind data intermediation services is to facilitate secure data sharing among companies, mitigating concerns related to the potential loss of competitive advantage or the risk of data misuse. The

An important step towards completing the European regulatory framework on data sharing was taken with the formal adoption of the **Data Act**. The Parliament formally endorsed the new legislation during its November 2023 Plenary session. The text has been then

[21] EUR-Lex - 52020PC0767 - EN - EUR-Lex (europa.eu)

published in the Official Journal on 13th December 2023 and is expected to become applicable in 20 months, i.e. in September 2025. The main focus of the Data Act is removing barriers to the access to industrial and high-quality data (currently 80% of that data is not used) particularly in the industrial context, enabling faster and better B2B and B2C data sharing without removing data protection guarantees.

The **DMA (Digital Markets Act**) entered into force on 1 November 2022 and it is applicable since 2 May 2023. The DMA applies to online platforms designated as 'gatekeepers', defined as large digital platforms acting as important gateways between business users and consumers, on the basis of quantitative parameters including for example a market capitalization of more than €75 billion. The DMA applies to online platforms designated as 'gatekeepers', defined as large digital platforms acting as important gateways between business users and consumers (Amazon, Apple, Alphabet, etc). The main goal of this legislation is to recognize the power held by major platforms on the online market (the "gatekeeper" role) and to make sure that it is exercised fairly, enabling all other companies to access the market and compete on a balanced, even field.

The **Digital Services Act (DSA)**[22] was presented as a complementary measure to the DMA, covering online content moderation, clarifying responsibilities and obligations of online intermediary services, hosting services and (very large) online platforms such as META or Twitter. The DSA aims at increasing democratic control and transparency of online content, particularly harmful content. All the DSA requirements and obligations are applicable from July 2023 for very large platforms and from January 2024 for everybody else. An essential part of this compliance is to put in place a risk management system to identify and mitigate potential risks for society, like harmful content.

In March 2021, as a consolidation of the EU's digital strategy, the "**2030 Digital Compass: the European way for the Digital Decade"**[23] was released. The compass sets out concrete 10-year targets for the EU's digital ambitions and priorities. Four areas of focus are outlined in the Compass: 1. digitally skilled citizens and highly skilled professionals, 2. secure, performant, and sustainable digital infrastructures, 3. the digital transformation of businesses, 4. the digitalisation of public services. To implement the Compass, the EC proposed the policy programme "**Path to the Digital Decade**"[24] which aims to set up a governance framework and funding to help achieve the 2030 digital decade targets, including multi-country projects and cooperation mechanisms between the Commission and Member States. In September 2023 the Commission published the first State of the Digital Decade Report[25] which looks at the key progresses made towards the 2030 Digital Decade Targets.

[22] The Digital Services Act: ensuring a safe and accountable online environment (europa.eu)
[23] 2030 Digital Compass: the European way for the Digital Decade, https://eur-lex.europa.eu/legal-content/en/TXT/?uri=CELEXper cent3A52021DC0118
[24] Proposal for a Decision establishing the 2030 Policy Programme "Path to the Digital Decade", EUR-Lex - 52021PC0574 - EN - EUR-Lex (europa.eu)
[25] 2023 Report on the state of the Digital Decade | Shaping Europe's digital future (europa.eu)

Table 20 EU Data Regulation Overview

		Regulation	Goal	Data covered	Scope /Target group
Shaping Europe's digital future	**EU Data Strategy**	Data Governance Act	**Foster data availability for use** by increasing trust in data intermediaries and strengthening data-sharing mechanisms across the EU.	Personal Non-Personal data	Horizontal Public sector bodies
		Data Act	***Maximise the value of data*** in the economy by ensuring stakeholders gain control over their data	Private-sector data Personal data Non-Personal data	Horizontal Private companies, Public sector Cloud and data processing service providers
		Open Data Directive (Revised PSI Directive)	Overcome the barriers still preventing the full re-use of public sector information	Public sector data	Public sector bodies
	The Digital Services Act package	Digital Services Act	Legislate against the spread of illegal content and ensure the protection of the fundamental rights of the EU citizens.	-	Intermediary services, hosting services, online platforms
		Digital Markets Acts	Ensure fair competition in the EU digital market by limiting the ***market power*** of big online platforms, the so-called "gatekeepers."	Personal data Private-sector data	Cloud and data processing service providers, digital platforms

6.6 Navigating the Data-Driven transformation of the Economy

The resilience of the data market and the data economy are based on the pervasive innovation implemented in multiple use cases in multiple industries, where data-driven value added demonstrates its benefits to businesses and consumers. To provide a better understanding of the dynamics of data-driven innovation adoption, this chapter highlights two sectors where data technologies play an important role: mobility and energy.

Data-driven innovation for sustainable mobility is a dynamic field with a multiplication of use cases and concrete experiences across Europe: it is definitely out of the phase of experimentation and piloting and into the phase of implementation and scale-up. However, there is much to do to enable an acceleration of take-up and the reaping of benefits, as foreseen in the High Growth Data scenario. The first necessary condition is the availability and accessibility of good quality data from private and public sources. Second is the

implementation of interoperability standards and solutions, without losing flexibility. Third is the availability of funding and skills, particularly for the local governments where most of the action of sustainable mobility will occur. To overcome non-technical barriers to data sharing, business and governance model sandboxes would be extremely useful, letting stakeholders design and test new business and governance models that enable trusted data sharing and profit making for private actors. The EU Mobility data space has exactly this type of goals and can play a relevant role in promoting the implementation of smart and sustainable mobility.

Data-Driven Innovation in the Energy sector encompasses use cases aiming energy efficiency and green energy, essential to the transition to the net zero emissions targets by 2050. Recent EU policies recognize the important role of energy digitization, mandating increased data transparency and sharing. The evidence presented on the use cases outlines a vision of the energy data of the future as a virtuous cycle, where energy consumption data become available in very granular form and real time, service providers (often fast growing startups) are able to provide EU-wide innovative services to increase energy efficiency and support the green transition, and consumers enjoy the benefit from these services and are willing to provide the necessary data. For green energy transition to succeed, Europe needs data and “climate tech” start-ups to grow and sell their services beyond their national borders.

6.7 The EU Data Policy and the International Dimension

The EU27 maintains its second-place ranking in the size and robustness of its data market and economy when viewed against the current global landscape. In 2023, the value of the data market in the EU27 was nearly €82 billion, trailing only the United States, which boasted a market value of over €350 billion, and comfortably leading Japan (€53 billion) and China (€49.7 billion). However, China's data market saw a significant increase of 25.3 percent in 2023 compared to the prior year, surpassing the growth rates of the US at 20.6 percent and the EU27 at 13.8 percent. The EU's slower digital technology adoption rate compared to the US, coupled with structural investment barriers in digitalization, fragmented policy approaches, a lack of recognition of digital benefits, and a continuing digital skills gap, are among the primary factors contributing to Europe's significant delay behind the US in data market development.

With a data economy of almost €226 billion (in terms of direct[26] and backward indirect impacts only[27]), the EU27 exhibits the second-largest data economy worldwide after the United States in 2023. With €105 billion in the same year, China does reach the third position in terms of data economy size (direct and backward impacts only) as it outsizes Japan for the first time – Japan’s data economy in terms of direct and backward impacts only is estimated at slightly more than €101 billion in 2023. Brazil, as in the previous

[26] Direct impacts are the initial and immediate effects generated by data supplier companies on the economy as a whole. Direct impacts correspond to the data suppliers’ revenues from data products and services sold. They are therefore measured as data suppliers companies' revenues

[27] The indirect impacts are the economic activities generated along a company's supply chain by data supplier companies, considering input providers as well as customers of data supplier companies. There are two different types of indirect impact: backward indirect impacts and forward indirect impacts. 1. Backward indirect impacts represent the revenues resulting from changes in sales from input providers to the data suppliers. In order to produce and deliver data products and services, data suppliers need inputs from other stakeholders. 2. The forward indirect impacts include the economic growth generated through the use of data products and services by the downstream industries, i.e. the data users.

measurement of the international Monitoring Tool's indicators, continues to display the smallest data economy with nearly €23 billion in the same year.

In terms of the data economy incidence on GDP the situation is somewhat different. As in the previous version of the Monitoring Tool, our international indicators measure the effects of the data economy on GDP limited to the direct impact components. In this respect, the U.S. and Japan exhibit the highest impact of the data economy on GDP with an incidence rate in 2023 of 1.46 and 1.42 per cent respectively. China, the second-largest economy worldwide, fares better than the EU27, with an incidence of the data economy (direct impact only) on GDP of 0.94 per cent versus a scanty 0.68 per cent shown by the EU27 in 2022. In line with the results obtained in the previous wave of measurements, we continue to observe that China's data economy, while still relatively underdeveloped in absolute terms, does exert a growing impact on its overall economy (China's incidence in 2022 was estimated at 0.92 per cent) and that this impact, in relative terms, is greater than in the EU27.

The United States maintain their leadership also in the realm of data professionals with more than 17 million in 2023. China, which, with 12.4 million, marks a year-on-year increase in data professionals of only 0.4 percent but continues to present a relative low number in units if compared to its size of population. As a result, the employment share of data professionals remains considerably high in the U.S. (13.4 per cent in 2023) and significantly low in China (1.4 per cent in the same year) – a clear sign of a still developing data economy. In contrast, the proportion of data professionals within the workforce in the EU remains robust at 4.2 percent, trailing only behind the United States and Japan, which stand at 8.8 percent, and significantly surpassing Brazil's figure of 2.6 percent.

Regarding data provider companies, China significantly outnumbers both the U.S. and the EU27. In 2023, China is home to over 900 thousand data provider companies, compared to the U.S. with more than 337 thousand and the EU27 with about 238 thousand. However, despite the large number of data supplier firms, their contribution to China's data economy is relatively minor due to the smaller scale of China's data market compared to other leading global entities. This indicates that China's data economy has considerable ground to cover to match the levels seen in Western countries. Yet, given China's superior growth rates across nearly all metrics, it might only be a matter of a few years before China closes this gap, surpassing the performance of other global competitors.

7. CONCLUSIONS

In 2023 in its Autumn Forecast, the European Commission has adjusted its earlier EU GDP growth forecasts downwards, reflecting a European economy that has experienced stagnation. This economic slowdown has been attributed to rising living costs, diminishing foreign demand, and the impact of tighter monetary policy. Despite these challenges, there is an anticipation of a gradual resurgence in economic activity. Furthermore, inflation within the eurozone has seen a decrease to its lowest in two years as of October and is anticipated to remain subdued throughout the remainder of the forecasting period.

The third round of measurement of the European Data Market Monitoring Tool estimates the overall data market in the EU27 to be at almost € 82 billion in 2023 (a year-on-year increase of more than 11%) and at more than € 118 billion in 2030 according to the baseline scenario. A similar trend is visible for the data economy which, in the EU27 is measured at €544 billion in 2023 (with a considerable growth of 9,3% from 2022) and at more than € 851 billion in 2030 under the baseline scenario.

The main results are summarised in the following paragraphs, while full data is available online.

7.1 Data Professionals

Data professionals were redefined for this edition of the EDM Monitoring tool, distinguishing between data technical professionals (focused on managing data) and data business professionals (focused on analytics, including data scientists). By the end of 2023 the EU27 Member States counted 7.6 million data professionals, with an increase of 4.7% on 2022. The share of data professionals on the EU27 workforce also increased from 3.3% in 2019 to 4.3% in 2023. This confirms the continuing penetration of data skills in the labour market, notwithstanding the persistent difficulty of sourcing such skills claimed by most enterprises.

According to the scenarios, the number of data professionals is expected to increase substantially by 2030, ranging between 9.9 million (Baseline scenario) and 11.6 million (High Growth scenario). Even if negative conditions prevailed under the Challenge scenario, the number would be only marginally lower at 9.3 million in 2030, given the hunger for data skills by the economy. This represents a strong contribution to the EU labour market, as well as progress towards the EU's overall goal of employing at least 20 million ICT specialists by 2030.

This trend will increase the pressure on the education and training system to train and/or upskill or reskill workers to learn data skills applied to a wide range of industry sectors and typologies of data intelligence. Actually, according to the data skills gap indicator the supply-demand asymmetry of data workers in Europe is expected to worsen. In the Baseline scenario, the gap for EU27 is estimated at 4.7 % of the total number of data professionals in 2023, growing to 5.4% in 2025 and reaching 5.5% in 2030. But the data skills gap could be as high as 6.7% in the High Growth scenario, or 6.4% in the Challenge scenario.

7.2 Data Companies

The number of both data supplier and data user companies saw a healthy rise in 2023, with even stronger growth foreseen by 2030.

On the supply side, the number of European data suppliers reached 238,325 in 2023, a jump of 9.2% on the previous year. By 2030, their number could range from 302 thousand in the Challenge scenario, to 317 thousand in the Baseline scenario, up to 334 thousand in the High Growth scenario. By 2030, we expect data supplier companies to represent 2.6% of total companies in the ICT and professional services sectors in the High-Growth scenario.

The revenues of the data industry are also growing fast, reaching nearly €93 billion among Member States by 2023, nearly €127 billion across the European countries measured in the EDM Tool. By 2030 we expect data supplier revenues to reach €139 billion in the Baseline scenario, or even increase to €172 billion in the High Growth one. This is mostly due to the increased revenue associated with artificial intelligence systems, which is growing faster than expected in the prior forecast. The mix of AI revenues changed, with more focus on machine learning and the tools associated with AI machine learning.

On the demand side, the number of data user companies in the EU27 reached more than 604 thousands companies in 2023, a growth over 2022 of 3.5%. By 2025, data user companies will account for slightly more than 653 thousands. This is about the same as the growth in the number of all companies. By 2030 (Baseline scenario forecast) data user companies will account for approximately 910 thousands companies, growing at an annual rate of 6.8% between 2025 and 2030. Baseline.

The services industries are those which are more likely to be data intensive, and hence have a higher number of data user companies. These service industries are Professional Services, Retail and Wholesale, and Information and Communication, but Manufacturing also has a high intensity of data use. However, Growth out to 2030 (Baseline) is evenly balanced across the industries, so the dominance seen by the services industries in terms of data user companies is unlikely to change over the period of this forecast. The top four industries account for nearly 70% of the growth between 2025 and 2030 (Baseline).

7.3 Data Market

The value of the data market in EU27 grew by 11.1% in 2023 to a value of €81.9 billion, up from €73.8 billion in 2022. Data adoption accelerated in 2023 although the greatly hyped Generative AI had little impact as this evolving market is in its early stages. Revenues and spending associated with Generative AI are low as most technology only began to appear in late 2022, and many services are provided free.

In 2023, Germany held the largest portion of the Data Market within the EU, with its size being nearly 60% greater than that of France, which has the second-largest share. The growth from 2022 to 2023 for the five leading Member States—Germany, France, Italy, the Netherlands, and Spain—has been marginally below the EU average, except in France and Spain. Collectively, these five Member States contribute to over two-thirds of the Data Market among the EU27. This is partly due to the larger scale of their respective economies, and also because these countries have a strong foundation in key data-driven industries, which cements their leading positions. Most other countries in the EU are projected to achieve growth rates around the average in 2023, as the region continues to navigate its recovery from the economic repercussions of the Covid pandemic.

In 2023 Data Monetisation grew by 20.6% in 2023 over 2022, we can constant a slower growth pace comparing to the 28.3% in 2022 over 2021. This is expected to reach €42.3 billion by 2030 (Baseline) at a compound rate of 4.1% per year from 2025. We estimate the value of data monetisation at €25.4 billion in 2023, rising to € 34.5 billion in 2025 across the Member States

7.4 Data Economy

In 2023, the EU27 data economy passed the threshold of €500 billion, with an annual growth of 9.3% on 2022. By 2025 the data economy is projected to grow to €659 billion, with a share on GDP of 4.9%. The positive growth paths continue to 2030, with the EU27 data economy forecast to range between €85 billion (Baseline, 5.8% of EU27 GDP) and the just under the €1 trillion threshold (High Growth scenario,6.5% of EU27 GDP). Even in the pessimistic Challenge scenario, estimates foresee the EU27 data economy at 723 euro billion, with a compound average annual growth rate of 1.9%.

The composition of impacts changes over time, from 2023 to 2030, with a growing share taken by so-called induced impacts, the secondary effects on the economy, that is the benefits taken by all industries and workers thanks to data access and the use of data products and services (for example additional spending thanks to increased market share or revenues). This reflects the increasing penetration of data-driven innovation in the socio-economic system.

The highest share of the data economy's value is generated in the finance sector, where great focus is placed on open banking, security solutions, digital payments, and biometrics. The second largest share is represented by the manufacturing and mining industry, with a focus on automation, remote collaboration, and agility needs. Public administration is the third largest industry, investing in modernisation of digital services, digital connectivity, cybersecurity, and digital identity. The top three fastest growing markets in terms of impacts are utilities, public administration and professional services, followed by health and transport.

7.5 Concluding remarks

In a complex international environment, full of contradictory trends and swept by ever growing geo-political tensions, the data economy and the data market appear as resilient as ever. While torn by internal pressures and threatened externally by countries with different economic systems and political values, the European Union continues to benefit from the positive development of its data economy. The indicators put forward by the third and last round of measurement of the European Data Market Monitoring Tool confirm a historical trend that, since 2013, has seen the value of the data market and the data economy on a constant increase. As an example, the data market in the EU27 has almost doubled in value since the first release of the study and the total of the data economy has passed from €203 billion approximately (excluding the UK) to over €544 billion over the same period. Even more interestingly, Europe’s expenditure on ICT and digital related technologies has been growing at much higher rates than GDP – for the period 2025-2023 we expect ICT spending to increase at a Compound Annual Growth Rate (CAGR) of 6.9% versus a GDP growth of 2.8% in the EU27.

The digital economy is likely to continue its expanding path in 2024 and beyond. Its strength can be attributed, in part, to the rapid advancement in technology innovation and digital transformation. Investments in digital technology by businesses are projected to increase at a rate seven times faster than the overall economy in 2024, as market pressures push companies towards the development of digital business models and the enhancement of digital capabilities. A significant portion of these investments is expected to be channelled into artificial intelligence: by 2025, it is anticipated that organizations within the Global 2000 (G2000) will dedicate more than 40% of their primary IT spending to AI-driven endeavours,

resulting in a substantial increase in the pace of innovation in products and processes. The EU activism in the field of AI regulatory policies is therefore very well justified. As part of its digital strategy, the EU has – first among its international partners and competitors – come forward with a proposal to regulate AI to ensure better conditions for the development and use of this innovative technology. The EU AI Act, provisionally agreed by the Council and the Parliament in December 2023, has the ambition to provide a coherent set of rules, ensuring that AI systems placed on the European market and used in the EU are safe and respect fundamental rights and EU values, without suffocating innovation. The EU is aiming at a leadership role in global AI policy making, as it did in the data protection field. A daunting challenge all the more desirable to be pursued in the coming years.

In a similar vein, the EU is achieving remarkable progress in promoting further data availability and data sharing within its borders. The implementation of the Data Governance Act (applicable since September 2023) and the formal adoption of the Data Act in November of the same year are both testimony of a successful effort aimed at the removal of barriers against the use and re-use of data by companies and European organisations and the creation of reliable mechanisms to ease access to industrial and high-quality data, without endangering the existing data protection legislation. Both measures, if appropriately implemented, will foster innovation across Europe by encouraging the creation of new services that utilize Europe's vast data resources. Additionally, they will ensure equity by defining the rights and responsibilities of all economic participants involved in data sharing, especially those dealing with Internet of Things (IoT) products. This, in turn, is likely to increment the number of data professionals in the EU, strengthen the existing base of data companies and foster the creation of new ones, thus consolidating the overall data market and data economy.

The geo-political interests of the European Union on the international scene have also been advanced by the recent wave of EU digital policy measures. The Digital Market Act, applicable from May 2023, has designated for the first time the official six digital platforms that qualify as "gatekeepers" and that, as a result, are subject to the obligations and restrictions provisioned by the DMA to ensure a fair and balanced access to the EU online market by all companies (including many European ones), and not just by the usual (mainly US American) suspects. This additional example of the so-called "Brussels Effect" is of paramount importance as it demonstrates the depth and breadth of EU policy-making action within and beyond its borders. It further reasserts the role of the EU in the digital domain on the international scene where, as pointed out by the European Data Market Monitoring Tool, the EU's second position is increasingly undermined by the rising digital power of China. The EU digital policy is therefore key to navigating Europe's ambitions through the troubled waters of the established rivalry between the U.S. and China. At a time when, broadly speaking, the EU relies on U.S. software and East Asian hardware, the exploitation of technological dependencies for the purposes of power politics could constrain the EU's ability to act with full sovereignty and autonomy. Central to this process will be to properly understand and re-define its own role in relation to the U.S. and China. With the former, the task has proven to be at times difficult and could become even more painful by a possible change in the U.S. administration following the elections of November 2024. However, the solidity of the transatlantic relationship and the positive developments of the U.S.-EU Trade and Technology Council (TTC) bode well for a mutual collaboration of the two blocs in the field of the digital economy. Unlike the U.S., though, China is not a security ally of the EU. Moreover, the development of the policies that structure the digital technology ecosystems of the EU and China are shaped by fundamentally different economic and political systems.

China's presence in digital technology overlaps with European priorities, interests and concerns in a myriad of ways. Notwithstanding all these concerns, technological decoupling and ceasing all cooperation with China on digital technologies is neither desirable nor feasible. Even without considering the spillover effects that such a move would have on other areas of the EU-China relationship, an all-out confrontation with China would have severe impacts on European consumers, businesses and research institutions to say the least. China remains a complex actor for the EU policy-making that needs to be apprehended in its multiple role of partner, competitor and systemic rival[28]. A 'derisking' approach has therefore already been adopted by the EU vis-à-vis China but also other, more proactive and collaborative measures need to be taken into consideration. Both the EU and China are committed to a comprehensive strategic partnership where they pledge to work together to tackle global and regional challenges while remaining committed to engagement. Whether this is enough to protect the EU's strategic interests (including the data economy) remains to be seen.

[28] https://www.clingendael.org/publication/chinas-digital-power-assessing-implications-eu

8. METHODOLOGICAL ANNEX

The study required a complex mix of quali-quantitative methodologies allowing to reach the interlocked objectives. While quantitative methodologies represent the most relevant part of the study, qualitative methodologies are indispensable to balance the statistical approach and provide the market and social intelligence needed to lead to policy insights and the development of sound scenarios.

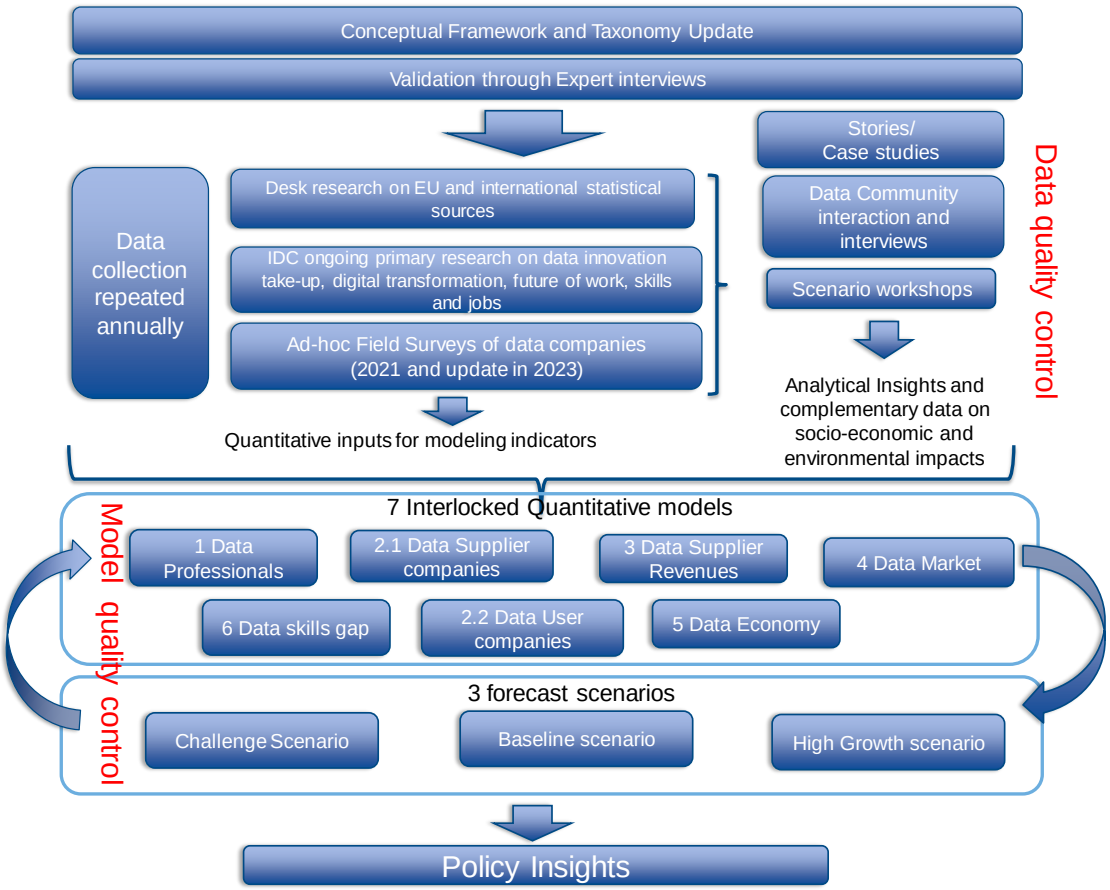
In order to guarantee the continuity of the study, the methodological approach is similar to the previous releases of the EDM Monitoring Tool with the following improvements:

- Updated and revisions of the main indicators' definitions aligned with the maturing of the market and the Data Economy
- Strengthening of the quali-quantitative analysis of socio-economic and environmental impacts
- Additional data collection on data skills and jobs
- Stronger focus on start-ups, thanks to access to data from Dealroom, leading data and intelligence provider on start-ups and scaleups in Europe, and partner of EuropeanStartups.co

The main steps of the methodology did include:

- Revision and update of the Conceptual framework and taxonomy, focusing on:
    - Update of definitions of data professionals, data user companies, Data Market including data monetisation value
    - Definition and management of data sharing and data interoperability issues, including the role of Common European data spaces and the concept of data sovereignty
    - Assessment of social and environmental impacts of data-driven innovation
- Validation of the revision/update through the expert interviews.
- Organisation and implementation of data collection (including desk research and field research) which will be repeated annually to feed into the measurement of indicators.
- The outputs of data collection and qualitative analysis of the 7 interlocked quantitative models used to measure the main indicators (the data companies indicator has 2 models, one for user companies and one for supplier companies).
- In parallel with the calculation of indicators, the scenario forecasting methodology is implemented developing the main assumptions driving the 3 alternative scenarios to 2030 and the forecast of all indicators.
- The quantitative models and the scenarios methodology interact closely and provide reciprocal feedback.
- Quality control accompanied each step of the process, with a focus on data quality control in the data collection phase and on model quality control in the phase of measurement of indicators and development of scenarios. Quality control of deliverables is under project management.

Figure 14 EDM Monitoring Tool



8.1 Desk Research

As in the previous editions of the European Data Market study, the study team revised the list of relevant and available public sources, integrated it if necessary and collected the data that are necessary for the indicators' update.

- Concerning the indicators on data market, data companies, data companies' revenues, and the data economy the main sources are:
    - Eurostat business demography statistics in the European Union, treating aspects such as the total number of active enterprises in the business economy, their birth rates, death rates, and the survival rate (last update: March 2020)[29];
    - Eurostat annual structural business statistics with a breakdown by size-class are the main source of data for an analysis of SMEs (latest update: March 2020)[30];

29 https://ec.europa.eu/eurostat/statistics-explained/index.php/Business_demography_statistics

30 https://ec.europa.eu/eurostat/web/structural-business-statistics/overview

- IDC Worldwide Black Book Live Edition, monthly updates form the years 2019 through 2024[31]. The Black Book represents IDC's live analysis of the status and projected growth of the worldwide ICT industry in 89 countries.
- IDC's spending guides[32]. Spending Guides are multi-dimensional, all-in-one data products that present technology forecast data segmented by any or all of the following views: region, country, industry, company size, line of business or use case:
  - IDC Worldwide ICT Spending Guide Industry and Company Size, semi-annual updates for IT Hardware, Software, IT, business and telecom Services from 2019 to 2024 by 20 Industries and 5 size-classes in 53 countries;
  - IDC Worldwide Big Data and Analytics Spending Guide, semi-annual updates for Big Data and Analytics spending from 2019 to 2024 by 20 Industries and 5 size-classes in 53 countries;
  - IDC Worldwide Digital Transformation Spending Guide, semi-annual updates for Digital Transformation spending from 2019 to 2024 by 20 Industries and 278 use cases in 9 regions;
  - IDC Worldwide Artificial Intelligence Spending Guide, semi-annual updates for Artificial Intelligence spending from 2019 to 2024 by 20 Industries and 194 use cases in 9 regions and 32 countries.
- IDC European Tech and Industry Pulse Survey 2019 2020[33].
- IDC Big Data and Analytics in the COVID-19 Era: Adoption and Spending Trends Across Vertical in Europe, Jun 2020, IDC # EUR145280920.
- IDC FutureScape: Worldwide Data and Analytics 2021 Predictions, October 2020, IDC #US46920420
- IMF World Economic Outlook (WEO) Database, April 2020.
- Consensus Forecasts, Consensus Economics, monthly updates to July 2020.
- Review of data on social networks about new and emerging companies through a thorough research of annual reports of the most relevant companies, where available.

- For the data professionals we will use in addition the following sources:
- OECD publications about the digital economy[34]. As an example, “A roadmap toward a common framework for measuring the Digital Economy”, OECD 2020 and “Going digital: Making the transformation work for growth and well-being: Measuring the Digital Transformation. A Roadmap for the Future” OECD 2020.
- ILOSTAT (International Labour Organization) Statistics and Databases (2020)
- EUROSTAT Educational attainment statistics (Last update: 2019)[35].
- European Data Science Academy (EDSA) project deliverables and publications (2018).

31 https://www.idc.com/getdoc.jsp?containerId=IDC_P336

32 As an example: Worldwide ICT Spending Guide: Industry and Company Size, IDC 2020, Worldwide ICT Spending Guide: Industry and Company Size, IDC 2020 https://www.idc.com/getdoc.jsp?containerId=IDC_P33207

33 https://www.idc.com/getdoc.jsp?containerId=EUR145717319

34 https://www.oecd.org/sti/ieconomy/

35 https://ec.europa.eu/eurostat/statistics-explained/index.php/Educational_attainment_statistics

- IDC's Technology Employment Impact Guide – updated on a semi-annual basis with forecast of employment across 40 technology job roles, including eight data management and analytics roles (Last update December 2020)
- Cedefop – Skills-OVATE data for vacancy estimations (Most recent data collected between July 2018 and September 2020)
- Cedefop – Skills Index and Skills forecast (Last update 2019)[36]

Other sources from which relevant data for the indicators' measurement and for the three updates of the indicators during the study duration will be:

The Digital Economy and Society Index (DESI), Human Capital Dimension, (2a Basic Skills and Usage; 2b Advanced skills and Development), last update, 2018.
IDC Worldwide Augmented and Virtual Reality Spending Guide.
IDC Quarterly Wearable Device Tracker.
IDC FutureScape: Worldwide Future of Work 2021 Predictions, Oct 2020, IDC #US46248920.
Practices to Make AR and VR a Reality for Enterprises, Jun 2020. IDC #EUR146541720.

In addition, IDC has established a LinkedIn community for European start-ups and scale-ups, which we will be able to poll for specific insights on the topics above. As of March 2021, the community counts 251 members.

8.1.1 Scenarios Desk Research

We used a combination of external sources and IDC sources from its ongoing research. The most relevant sources were the following:

- IDC's European IT spending forecast and key digital trends across European industries and Worldwide Economic and Industry Assumptions. The most recent versions are dated September/October 2020)[37]. These documents are updated quarterly to feed into IDC's ongoing forecasting.
- IDC's FutureScape predictions by technology and industry are delivered once a year: IDC analysts deliver 10 main predictions for the next 2 to 5 years for each vertical market (for example, government or retail) and main technology area (for example Digital transformation). The predictions are developed in a global interactive process between analysts and then are specialised by world region (of which one is Europe). These predictions have proven very useful for the development of scenarios assumptions and storylines.
- The most recent research on Big Data and Analytics, Digital Transformation and Innovation accelerators and emerging technologies.[38]
- The 2025 emerging technologies landscape developed for the ATI (Advanced Technology for Industry) study for EASME-COSME by a consortium led by IDC with Technopolis Group, IDEA, Fraunhofer, Capgemini Consulting, NESTA[39].
- The most recent public studies about digital markets and big data forecasts and trends, by well renowned international bodies and organisations such as Accenture, OECD, Mc Kinsey[40].

36 https://ec.europa.eu/eurostat/statistics-explained/index.php/Educational_attainment_statistics

37 As an example: European IT Spending Forecast, 2019–2023: Key Digital Trends Across European Industries, IDC, Nov. 2019, https://www.idc.com/getdoc.jsp?containerId=EUR145632419; IDC Worldwide BlackBook, 2020 https://www.idc.com/getdoc.jsp?containerId=IDC_P336

38 IDC FutureScape: Worldwide IT Industry 2020 Predictions, IDC, Nov. 2019, https://www.idc.com/getdoc.jsp?containerId=US45599219

39 https://ati.ec.europa.eu/

40 A roadmap toward a common framework for measuring the Digital Economy, OECD, 2020 http://www.oecd.org/sti/roadmap-toward-a-common-framework-for-measuring-the-digital-economy.pdf

- Updated forecasts to 2030 of EU GDP and ICT spending, under 3 alternative scenarios, leveraging the market insights and forecasts of the Economist Intelligence Unit (EIU[41]), the International Monetary Fund, and the OECD.
- Collection and review of all useful data from IDC's extensive databases to estimate the future value of the data market, including for example size and forecast of data stored, size and forecast of data analytics and Big data software, primary research on companies' plans of adoption for data analytics and data-driven applications and services, etc.
- Historical trends emerging from the EDM Monitoring Tool indicators in the period 2019–2025 as per the European Data Market study update (SMART 2016/0063).

8.2 Measuring Data Professionals

8.2.1 Definition and Scope

Data professionals *are workers who collect, store, manage, and/or analyse, interpret, and visualise data as their primary or as a relevant part of their activity. Data professionals must be proficient with the use of structured and unstructured data, should be able to work with a huge amount of data and be familiar with emerging database technologies. For 2021–2023 the definition of data professionals was refined to differentiate the roles played by different data users: these are Data Technical Professionals, Data Business Professionals, and Data Consumers. The measure of data professionals includes data technical professionals and data business professionals only.*

Table 21 Indicator 1- Data Professionals

Indicator 1 – Data Professionals				
N.	**Name**	**Description**	**Type and Time**	**Segmentation**
1.1	Number of data professionals	Total number of data professionals in the EU	Number, 2019–20–21 Forecast 2025. Forecast 2030, 3 Scenarios	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK
				By Industry: 12 industry sectors NACE rev.2
				By size: not applicable
1.2	Employment share	Total number as a share of total employment in the EU	% of total employment, 2019–20–21	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK
				By Industry: 12 industry sectors NACE rev.2
				By Size: not applicable
1.3	Intensity share	Average number of data professionals per company (only for private sector)	Number, 2019–20–21	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK

41 https://store.eiu.com/product/market-indicators-and-forecasts

Indicator 1 – Data Professionals				
N.	Name	Description	Type and Time	Segmentation
				By Industry: 12 industry sectors NACE rev.2
				By Size: not applicable

8.2.2 Methodology Approach:

The methodology approach is based on an iterative process and on a calibration process of the final estimates.

Statistical Identification

Data professionals are not classified as such in any of the labour and occupation statistics. In order to define them statistically, we adopted the International Standard Classification of Occupations (ISCO-08), selecting categories where data professionals may be included. The criteria adopted for the selection of the ISCO-08 codes are the following:

- We have selected the occupations where data professionals can be involved either as data providers or as data users;
- We have selected the occupations from 1 to 4-digit disaggregation;
- The occupation codes selected are those where the presence of data professionals can be detected because they fit into the definitions above:
- Data Technical Professional are a smaller subset of Data Professionals as a result of their increased expertise and focus. Out of the four digit ISCO codes only 10 categories are included in the definition of Data Technical Professionals.
- Data Business Professionals are identified as one of the 40 4-digit ISCO categories based on their management responsibilities or lower technical experience or expertise.
- The selected codes relate to the roles and responsibilities highlighted for the Data Technical Professionals and the Data Business Professionals in the preceding paragraphs and are where a significant part of the workers in these categories perform specific responsibilities relating to these roles.
- We excluded all the data professionals which are not included into the knowledge economy perimeter because their occupation is a low skilled one, i.e. with high routine level (as an example, call centre workers are in theory data professionals but since their activity is a routine one and as such excluded from the knowledge economy, they are not considered data professionals).
- Table below shows the detail of the number of codes included in each of the definitions for the 1,2-,3-, and 4-digit categories.

Table 22 ISCO-08 Structure and Data Professionals

ISCO-08 Structure and Data Professionals	ISCO-08 structured Classification			
	Major Groups (1 digit)	Subgroups (2 digits)	Minor Groups (3 digits)	Units (4 digits)
Number of codes ISCO-08 structure	10	43	131	436

ISCO-08 Structure and Data Professionals	ISCO-08 structured Classification			
	Major Groups (1 digit)	Subgroups (2 digits)	Minor Groups (3 digits)	Units (4 digits)
Number of selected codes including data professionals	8	23	52	245
Of which data business professionals	4	7	12	41
Of which data technical professionals	2	3	4	8
Of which data consumers	8	23	51	121
Share of data professionals' codes in the ISCO-08 structure	80%	53%	39%	28%

Calculation of the Quantitative Perimeter

The quantitative perimeter of employment where data professionals are trackable is based on the selected ISCO codes crossed with the NACE classification of economic activities, for each one of the 27 Member States, Switzerland, the EEA countries, the UK and the EU as a whole and has been updated based on the source's updates.

Estimate and Calibration of the Penetration of Data Professionals

The next step is to estimate the percentage of data professionals within the perimeter of data professional candidates. The sets of assumptions will be revised and updated for each release of the study and applied to the model to calculate the share of data professionals by Member State and by industry. The survey of data professional companies and data user companies includes a question relating to the share of workers in each of the categories, and this is one of the prime components of the share estimate.

8.2.3 Forecasting Data Professionals

The same model was applied to forecast data professionals to 2030, by developing specific assumptions by scenario, even though the level of uncertainty is higher, and the reliability of the forecasts is lower.

8.3 Measuring Data Companies

8.3.1 Definition and Scope

Data companies *are organisations that are directly involved in the production, delivery and/or usage of data in the form of digital products, services and technologies. They can be both data suppliers' and data users' organisations:*

- ***Data suppliers*** *have as their main activity the production and delivery of digital data-related products, services, and technologies. They represent the supply side of the Data Market.*
- ***Data users*** *are organisations that generate, exploit collect and analyse digital data intensively and use what they learn to improve their business. They represent the demand side of the Data Market.*

Table 23 Indicator 2 Data Companies

Indicator 2 – Description				
N.	**Name**	**Description**	**Type and Time**	**Segmentation**
2.1	Number of data supplier companies	Total number of data supplier companies in the EU & EEA & UK, measured as legal entities based in one country	Number, 2019–20–21 Forecast 2025. Forecast 2030 (3 Scenarios)	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK
				By Industry: Sectors A, C, D, E, G, H, J, K, M, P, Q
				By company size: below 250 employees above 250 employees
2.2	Share of data supplier companies	Total data supplier companies on total companies in industry sectors A, C, D, E, G, H, J, K, M, P, Q	%, 2019–20–21 Forecast 2025, Forecast 2030 (3 Scenarios)	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK
				By Industry: Sectors A, C, D, E, G, H, J, K, M, P, Q
2.3	Number of data user companies	Total number of data user companies in the EU, measured as legal entities based in one country	Number, 2019–20–21 Forecast 2025, Forecast 2030 (3 Scenarios)	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK
				By Industry: 12 industry sectors NACE rev.2
				By company size: below 250 employees above 250 employees
2.4	Share of data user companies	Total data user companies as share of total private companies	%, 2019–20–21 Forecast 2025, Forecast 2030 (3 Scenarios)	By Industry: 12 industry sectors NACE rev.2
2.5	Share of data user and data supplier companies that offer data for re-use.	Percentage of data companies that offer data reuse as a percentage of total data supplier and data user companies	2020, 2021	By industry: 12 industry sectors NACE rev. 2 By company size band: Below 250 employees Above 250 employees

8.3.2 Methodology ***Approach***

The indicators on Data Supplier Companies and Data User Companies is measured by updating the same model used in the previous EDM study which leverages both IDC and public sources.

8.4 Measuring the Revenues of Data Companies

8.4.1 Definition and Scope

Data companies' revenues *correspond to the aggregated value of all the data-related products and services generated by Europe-based data suppliers, including exports outside the EU. This indicator measures the revenues of the data suppliers identified and classified*

by Indicator 2, for the products and services specified in our definition of the data market. Data companies' revenues do not include data monetisation as part of the data market.

Table 24 Indicator 3 Revenues of Data Companies

Indicator 3 – Description				
N.	**Name**	**Description**	**Type and Time**	**Segmentation**
3.1	Total revenues of Data Supplier Companies	Total data supplier companies' revenues	Billion €, 2019–20–21	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK
				By company size: below 250 employees above 250 employees
3.2	Share of Data Supplier companies' revenues	Ratio between data supplier companies' revenues and total companies revenues in the sectors J and M	% of revenues on total, 2019–20–21	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK

8.4.2 Methodology Approach

The indicator is measured by applying the same model used in the previous EDM study, which calculated the revenues by feeding on:

Table 25 EDM Data Sources

Data Source	Used in
Data Supplier Companies (Indicator 2)	Data Company Revenues
IDC Core IT Spending guide	Data Company Revenues
IT Big Data and Analytics spending Guide	Data Company Revenues
IDC Worldwide Black Book (standard edition)	Data Company Revenues
IMF World Economic Outlook	Data Company Revenues

8.5 Measuring the Data Market

8.5.1 Definition and Scope

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

Table 26 Indicator 4 Data Market

Indicator 4 – Description				
N.	**Name**	**Description**	**Type and Time**	**Segmentation**
4	Value of the data market	Estimate of the overall value of the data market (including data monetisation)	Billion €, 2019–20–21 Forecast 2025 – Baseline scenario, Forecast 2030 (3 Scenarios)	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK

				By Industry: 12 industry sectors NACE rev.2
4.1	Data monetisation	Sub-indicator Estimate of the value of data monetisation	Billion €, 2019–20–21 Forecast 2025 – Baseline scenario, Forecast 2030 (3 Scenarios)	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK By Industry: 12 industry sectors NACE rev.2

8.5.2 *Methodology Approach*

The data market indicator is updated every year for the duration of the study. The model is built on data from IDC databases concerning the components of hardware, software, and services, spending which fall in the definition of the data market. The value of data monetisation is added to this and is estimated from desk research and the results of the ad-hoc data companies survey. The IDC data is already segmented by country and by industry and this is mapped to the industry segments used in this study using already established mapping tables build from detailed matches of NACE II segments. The respective shares for the software, hardware, services, and data monetisation spending are derived from IDC surveys covering Big Data, IT spending patterns and intentions in the European market, and a survey of data supplier companies and data user companies in key Member States, together with analyst expertise and alignment with IDC's European and worldwide forecasts for the business analytics and Big Data market.

This model updates the data market value shares by MS and by industry and uses the following data sources:

Table 27 Data Sources- Data Market

Data Source	Used in
New ad-hoc survey	Data Market
Data Companies' revenues (Indicator 3)	Data Market
Eurostat Business Demographic Statistics	Data Market
Eurostat annual Structural Business Statistics	Data Market
Eurostat chain linked Volumes (GDP)	Data Market
IDC Core IT Spending guide	Data Market
IT Big Data and Analytics spending Guide	Data Market
IDC Worldwide Black Book (standard edition)	Data Market
IMF World Economic Outlook	Data Market
Consensus Forecasts – Consensus economics	Data Market

8.6 Measuring the Data Economy

8.6.1 ***Definition*** and Scope

The **Data Economy** measures the overall impacts of the Data Market on the economy as a whole. It involves the generation, collection, storage, processing, distribution, analysis elaboration, delivery, and exploitation of data enabled by digital technologies.

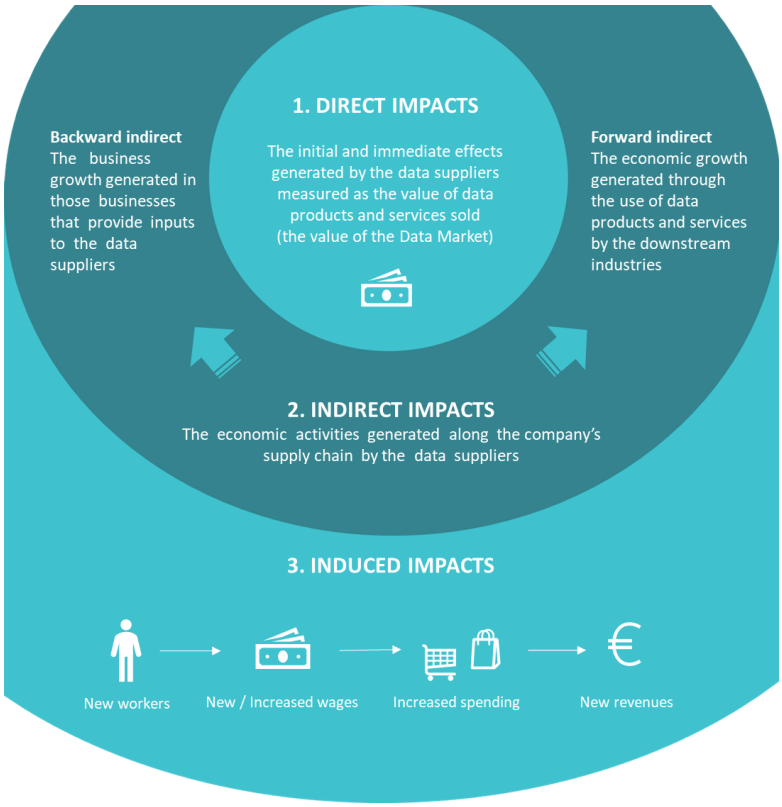
The Data Economy captures a wider concept than the Data Market only, as it considers the value and wealth generated in the economy as a whole (not just across businesses) by the exploitation of data.

The Data Economy includes three sets of impacts in the economy: the Data Companies Revenues in the form of direct impacts on the economy, the indirect impacts (as backward and forward) and the induced impacts effects of the Data Market on the economy.

- The **direct impacts** are the initial and immediate effects generated by the data supplier companies; they represent the activity potentially engendered by all businesses active in the data production. The quantitative direct impacts will then be measured as the revenues from data products and services sold, i.e. the value of the Data Market. We consider the Data Market value as a good proxy of the direct impacts. Therefore, for the sake of simplicity, direct impacts will coincide with the value of the Data Market.
- The **indirect impacts** are the economic activities generated along the company's supply chain by the data supplier companies, considering input providers and customers of data supplier companies. Indeed, there are two different types of indirect impacts, the backward indirect impacts and the forward indirect impacts (Richardson, 1985):
    - the **backward indirect impacts**: such impacts represent the business growth resulting from changes in sales from suppliers to the data industry. In order to produce and deliver data products and services, the data suppliers need inputs from other stakeholders. Revenues generated among the providers side from those sales to data suppliers companies are the backward indirect impacts.
    - the **forward indirect impacts**: such impacts include the economic growth generated through the use of data products and services by the downstream industries, i.e. the data user companies as a selected number of industries. For the user companies, data is a relevant factor of production; the adoption of data products and services by the downstream industries provides different types of competitive advantage and productivity gains to the user industries. Data users are engaged in digital transformation, able to make a strategic use of data and reap its benefits. The main benefits that the exploitation of data can provide to downstream industries are (OECD, 2013, Mc Kinsey, 2011):
        - Optimising production and delivery processes: data-driven processes (data-driven production);
        - Improving marketing by providing targeted advertisements and personalised marketing practices (data-driven marketing);
        - Improving existing organisation and management practices (data-driven organisation).
- The **induced impacts** include the economic activity generated in the whole economy as a secondary effect. Induced additional spending is generated both by new workers, who receive a new wage, and by the increased wage of existing jobs. This spending induces

new revenues creation in nearly all sectors of the economy. The additional consumption will support economic activity in various industries such as retail, consumer goods, banks, entertainment, etc.

Figure 15 Data Economy: Direct, Indirect, and Induced Impacts



Source: European Data Market Monitoring Tool, IDC 2021

This indicator is measured according to the scope detailed in the following table.

Table 28 Indicator 5 Value of the Data Economy

Indicator 5 – Value of the Data Economy				
N.	**Name**	**Description**	**Type and Time**	**Segmentation**
5	Value of the data economy	Value of the direct, indirect and induced impacts of data-driven innovation on the EU economy	Billion €, 2019, 2020, 2021 Forecast to 2025. Forecast to 2030, 3 Scenarios	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK
5.1	Impact of the data economy on GDP	Ratio between value of the data economy and EU GDP	Billion €, 2019, 2020, 2021 Forecast to 2025. Forecast to 2030, 3 Scenarios	By Geography: EU27 MS (by country and total) EEA (NO, LI, IS) Switzerland UK

Our Data Economy estimation does not include the user benefits and social impacts of data-driven innovation such as changes in quality of life (health, safety, recreation, air quality). Although these benefits may be evaluated in economic (monetary) terms, they are not economic impacts as defined above as they do not induce an increase in the business activities and a consequent growth in GDP.

The Value of Data

The value creation process based on data rests on the elaboration of information and knowledge (OECD 2016), although the boundaries between data, information, and knowledge are sometimes fuzzy. The huge volume of data is a global phenomenon which is sometimes view with suspicion by citizens, consumers and businesses because data flows are seen as an intrusion of the privacy.

Nevertheless, it is now commonly agreed that data analysis can provide benefits to both businesses and consumers. Moreover, the introduction of GDPR (General Data Protection Regulation) in May 2018 helped in managing the usage of information, giving rules to data users as well as providing control over personal data to data owners.

We should remind that the economic theory holds that information encourages competition between businesses for the benefit of consumers. Data do not provide value and benefits as such; data need to be collected, stored, aggregated, combined and analysed in order to be appropriately used for decision making processes. **To create value, data need to be processed (OECD, 2016):**

Extracting information from structured and unstructured data: data analytics techniques are today able to analyse both structured and unstructured data. We should remind here that most data stored by businesses are unstructured. Technologies such as optical character recognition, natural language processing, face recognition algorithms and machine learning algorithms are empowering the use of all data.

- **Real-time monitoring and tracking**: analysis of data in real time is often mentioned as one of the most powerful factors since it supports organisations to make real-time decisions, which, in a fast changing world, is a well-known competitive advantage.
- **Inference and prediction**: until now, prediction was based exclusively on prior information and data series. Data analytics can now enable the creation of information even without prior information. Such information can be created through patterns and correlations of data. Personal information, for example, can be deduced from anonymous or non-personal data. Businesses and organisations demand real time insights rather than historical and periodical information, and for advanced specialised data analytic services. Algorithms allow machine and statistical learning based on non-specific data; businesses can learn and predict a lot about their customers even if they do not have specific data and time series about the issue they are interested in. Machine learning has, as an example, applications in health care where data collected on patients are recorded by imaging, or it supports production processes to increase the quality of production

The diffusion of technology supporting production and analysis of data induces organisations and businesses to base their decisions on data much more than they were used to do. As pointed out by OECD in its recent report, the process to take decisions is also changing. Decision makers do not necessarily need to understand the phenomenon before they act on it. A store can change the product placement based on data analysis without the need to know the reason why such a change should improve the sales. There is therefore a decision automation process: “first comes the analytical factor, then the action, and last, if at all, the understanding” (OECD, 2015).

The impacts of such a new approach to decision making and to the use of data in all the enterprises and organisations’ functions are many and varied, so that we believe, such impacts will be object of studies and analysis in the upcoming years. It is, at this point, difficult to classify them and to suggest a taxonomy of such impacts.

Such impacts have been observed through some empirical studies and case analysis. The most relevant ways the benefits appear are the following:

- **Creating more information, knowledge and transparency**: technology is making data more accessible and exploitable to all kind of stakeholders, including SMEs. This increases transparency and decisions are made on a rational process.
- **Improving performance**: having access to a wide information and to a high number of data is changing the way of making decisions. An increasing number of organisations are going to become data-driven organisations, which means that they make decisions based on empirical results. As an example, retailers can adjust prices and promotions, more precisely than they were used to and in real time. This may improve competitiveness. McKinsey underlines that the health sector is achieving a lot of benefits from the new making decisions process: studies on clinical data allow to identify and understand the sources of variability in treatment, to identify the best treatment protocols and to create guidelines for the optimisation of treatment decisions. This does not only increase the effectiveness of treatments, but it also produces saves.

- **Improving customisation of actions for better decisions**: data technology is definitely improving the segmentation of customers and the analysis of their preferences in real time. This allow companies to supply products and services targeted to specific groups of individuals who have specific needs and preferences. Such a segmentation is also useful when supplying public services. Such a segmentation helps define the price precisely and offering exactly what is needed which means a better quality and also companies avoid offering products and services the consumers are not willing to pay.
- **Innovating products and services as well as business models**: the more information and understanding businesses have about their customers, the better they can serve them. It is important to say that although consumers may fear their privacy is injured, this can also provide them unexpected surplus: real time price comparison services do not only provide better transparency but also allow buying the best product at the most convenient price (for example when buying online airline tickets or when booking hotels). Companies can in fact produce and create new products and services to better satisfy their customers' needs. This is true also for the public sector and specifically for the health care system where preventing care programs can be created.
- **Ecosystem effects**: there are some areas in which there are great opportunities deriving from the use and the exchange of data, and that will be also driving examples for the near future, such as parts provenance and the origin track of food and materials in manufacturing, but also tracking the conditions at which materials and goods are shipped, know your customers and digital identity (for the financial and the public sector), tracking of medical devices and appliances as well as managing data sources of medical information in healthcare.

These effects are reflected in an increase in revenues due to higher market share from the increase in competitiveness or due to a reduction in costs. All these effects are included in the forward indirect impacts; these impacts are delivered on the user industry, and because of the above reasons, these are the impacts we consider new on the overall economic system.

8.6.2 ***Methodology*** Approach

Measuring the data economy, broadly speaking, depends on:

- the macroeconomic context
- the availability and diffusion of tools that help companies in their data elaboration and usage;
- the industry and country maturity;
- the integration processes the companies are implementing.

Therefore, the data economy model is based on a set of assumptions on all these factors, including choices about proxy indicators where actual data is missing.

The data economy model is a highly sophisticated model articulated by country and industry which has successfully delivered the current and forecast estimates of economic impacts for the last cycles of the EDM Monitoring Tool measurement. The model is sufficiently flexible that it was possible at the start of 2020 to run a simplified version to provide a rough post-COVID data economy estimate for 2020 and forecast to 2025 for the Baseline scenario.

For the next round of the study, we will revise and update the structure and key assumptions of the model.

The main steps are similar to the other indicator models and the following:

- annual round of desk research and data collection.
- Revision and update of the assumptions driving the model and the measurement of each category of impacts.
- Measurement of each type of impacts as follows:
    - Direct impacts: they correspond to the value of the data market (indicator 4)
    - Backward indirect impacts: they correspond to the increase of revenues by data supplier companies and are based on indicator 3 – data supplier companies' revenues.
    - Forward indirect impacts: this is the most difficult type of impact since is based on the estimates of the economic benefits by industry generated by the adoption of data-driven innovation, through the calculation of multipliers.
    - Induced impacts measure the secondary effect of the other categories of impacts together on the overall economy and are calculated through the use of specific indicators and the estimate of appropriate multipliers.
- The impacts measured are then aggregated and their value and growth trend will be cross-checked again for coherence with other indicators. This is the value of the data economy and will be calculated in the first measurement for 2019, 2020 and 2021 (estimate). (for the EU27, separately and in total, the rest of the EEA, the UK and Switzerland).
- Separately, the study team will provide estimates of GDP value for each of the country covered and will calculate the impact of the aggregated data economy on GDP (for the EU27, separately and in total, the rest of the EEA, the UK and Switzerland).

The forecasting to 2030 will be carried out as follows:

For the forecasting scenarios the study team will:

- Review the qualitative assumptions developed for each scenario for the year 2025 (only Baseline) and 2030 (3 scenarios).
- For direct and backward indirect impacts, the forecast will be calculated separately by the data market model and the data supplier companies' revenues model and the results will be included in the data economy model (through a round of cross-check and validation of coherence, robustness and quality of all the results).
- For forward indirect impacts and induced impacts, we will derive assumptions in order to calculate the forecast multipliers under the 3 alternative scenarios to the year 2030.
- The value of all impacts will be aggregated calculating the value of the data economy.
- Estimates of GDP value in 2030 for the countries measured will be generated for the 3 alternative scenarios.
- Finally, we will calculate the impact of the data economy on GDP.
- The results will be again cross-checked for mistakes or lack of coherence by different members of the study team.

It should be noticed that the IDC study team includes 4 different analysts in charge of the indicators models. They are the same analysts who have developed and calculated these models in the past years. This will help the quality control since they will collaborate in the reciprocal cross-check and validation of their models.

Data sources

Each year the study team will carry out ad-hoc desk research to update the data economy model assumptions, particularly the value of multipliers, leveraging other similar studies about the economic impacts of data innovation and other emerging technologies (sources such as McKinsey, Accenture, Deloitte, Everis). The results of the data collection for this study will be used, specifically the measurement of business impacts of data innovation. IDC's annually and bi-annually updated research will be used, including (but not limited to) the following studies:

- IDC Worldwide Semiannual IT Spending Guide Industry and Company Size
- IDC Worldwide Public Cloud Services Spending Guide
- IDC Worldwide Big Data and Analytics Spending Guide
- IDC Worldwide Internet of Things Spending Guide
- IDC Worldwide Artificial Intelligence Spending Guide

IDC spending guides estimate the demand side spending in technologies by industry, country and use case for a period of 5 years (previous year, current year and 3 years forecast). The spending guides are high quality data products, cross-checked for coherence both by geography and by industry. These spending guides will feed into the estimate of the level of take-up and value of data spending by industry as well as into the historical series.

The data on business impacts sourced from the ad-hoc field survey will also be leveraged to improve the estimate of indirect impacts. In order to measure the impact of the diffusion and use of data services and products, we will estimate each component (as defined in the above paragraph) of the impacts separately.

Estimate of Forward Indirect Impacts

As highlighted by OECD, 2013, McKinsey 2011 the impacts provided by the exploitation of data over the economic system include:

- optimising production and delivery processes (data-driven processes)
- optimising marketing by providing targeted advertisement
- enhancing research and development and developing new products and services
- improved decisions making, launch of innovations, creation of new businesses,
- innovating business models
- creating transparency and diffusion of information

While impacts from the data supply-side are immediate and measurable, the impacts on the demand-side are more difficult to catch, especially in the early stage of an emerging industry.

The estimate of the value of the data economy will be based on estimates of the multipliers of the data products and services on the whole economy which depend on (but not only):

- The multiplier effect of data products and services on innovation in the whole economy;
- The multiplier effect of increased revenues by users.

IDC will cluster the industries which may be affected by a high, medium, and low multiplier effect in order to estimate the overall effect on the EU economy. Finance, retail, manufacturing, energy for example are industries where the impact of an intensive use of data is likely to be high. Direct and indirect impacts and the possible multiplier effects are not going to occur within a year, but they may require at least a couple of years.

IDC will develop a detailed model based on other models calculating the economic impacts of IT pervasive innovations. Impacts on economy will clearly depend on the diffusion rate, which in turn depends also on the general economic conditions of next years.

8.7 Measuring Data Professionals Skills Gap

8.7.1 *Definition* and Scope

The **Data Professionals Skills Gap** indicator captures the potential gap between demand and supply of data professionals in Europe.

Monitoring the skills gap is of paramount importance since the lack of skills may become a barrier to the development of the data industry and the rapid adoption of data-driven innovation. It is based on a model balancing the main sources of data skills (from the education system and re-training and other carriers) with the estimated demand (by all data companies).

For the data skills gap the data is provided as always for the 5 largest EU countries and the rest of EU 27 in an aggregated way, mainly because of the difficulty to measure data skills job vacancies for each individual Member State.

Table 29 Indicator 6 Data Professionals Skills Gap

Indicator 6 – Description				
N.	**Name**	**Description**	**Type and Time**	**Segmentation**
6	Data Professionals Skills Gap	Gap between demand for and supply of data technical and data business professionals (not segmented)	Absolute number and % on total demand, 2019–20–21 Forecast to 2025 (Baseline scenario) Forecast to 2030, 3 scenarios	By Geography: 5 EU MS: DE, ES, FR, IT, PL Rest of EU27 Total EU 27 UK Switzerland EEA (NO, LI, IS)

8.7.2 *Methodology* Approach

The measurement of this indicator is based on a model combining the separate estimates and forecasts for the demand for data technical and business professionals and the supply of corresponding data skills by the inflow from the education system and upskilling and reskilling of the existing workforce (Figure 8.1). This includes balancing the main sources of data skills (from the education system and re-training to the provision from other careers) with the estimated demand for data skills (by all data companies).

More specifically, we use the following definitions:

- **The supply of data professionals** is equal to the data skills supply stock (the sum of employed data professionals and the unemployed ones).
- **The demand for data professionals** is the sum of existing and open positions for data technical professionals and data business professionals, that is the number of currently employed data professionals (indicator 1 in this study) plus the unfilled vacancies.
- **The indicator measures the difference between total demand and supply**; if demand is higher than supply there is a data skills gap (excess demand). If supply is higher than demand, there is over supply and potentially unemployment.

Data Sources

As for the other indicators, the study team will carry out annually ad-hoc desk research on data skills supply and demand dynamics. The main sources which will be considered are (but not limited to):

- ILOSTAT (International Labour Organization) Statistics and Databases (2020)
- EUROSTAT Educational enrolment statistics (Last update: 2021).
- IDC's Technology Employment Impact Guide – updated on a semi-annual basis with forecast of employment across 40 technology job roles, including seven data management and analytics roles (Last update: June 2021)
- Cedefop – Skills-OVATE data for vacancy estimations (Most recent data collected between July 2018 and September 2020)
- Cedefop – Skills Index and Skills forecast (Last update 2020)

Measuring Demand

The total demand for data technical and business professionals is calculated for the years 2019, 2020 and 2021 in the first cycle and will move forward one year for each measurement cycle. For the current year of the indicator (in the first measurement it will be 2021) we have added to the number of data professionals sourced from Indicator 1 an estimate of existing unfilled positions (vacancies). The labour market is a dynamic environment characterised by inflows and outflows of human resources, and at any given moment present there are companies looking to hire as well as unemployed looking for a job. Our model includes estimates of these inflows and outflows due to retirements, sickness, deaths, graduations, career changes between companies, industries and job roles, and people entering or exiting the market for training or education activities.

To estimate the current vacancies, we have carried out additional data collection on job search portals such as LinkedIn, Indeed and others to calculate the level of demand for data skills jobs, defined on the basis of the desks research and analysis calculated for Indicator 1 on data professionals. IDC's ongoing research on the demand for advanced ICT and data skills has been leveraged to support the forecasts. In addition, the survey has provided data about companies' difficulty in filling specific data professional positions. This has helped to model the demand forecast and to understand the level of the potential data skills gap.

The forecasted demand for data professionals to 2025 (Baseline scenario) and 2030 under the 3 scenarios calculated by Indicator 1 is considered as the total potential demand (as it incorporates future potential vacancies).

Measuring Supply

Supply has been estimated by aggregating the number of graduates in the relevant disciplines corresponding to the data skills identified in Indicator 1 and the level of inflows from other careers or upskilling. The model considers the inflows and outflows in the data skills market such as retirements, and unemployment.

Since we have changed the definition of data professionals compared to previous years, in this first phase of the study we have also updated the type of data skills to be monitored and the type of fields of study providing them. To do so we have leveraged desk research but also expert interviews.

The relationship between skills demand and supply and the resulting skills gap or over-supply is illustrated in the figure below.

Figure 16 The Data Skills Demand-Supply Balance Model

Source: European Data Market Monitoring Tool, IDC 2021

9. ESSENTIAL GLOSSARY – THE KEY INDICATORS

Data professionals[42] are workers who collect, store, manage, and/or analyse, interpret, and visualise data as their primary activity or as a relevant part of their activity. Data professionals must be proficient with the use of structured and unstructured data, should be able to work with a huge amount of data, and should be familiar with emerging database technologies. For 2021–2023, the definition of data professionals was refined to differentiate the roles played by different data users: These are Data Technical Professionals, Data Business Professionals, and Data Consumers.

Data technical professionals are specialists in the collection, storage, management, modelling, and quality assurance of data, as well as the integration of various data sources, to ensure consistency, accuracy, and quality of data. A data technical professional can, given the question that needs to be answered, ensure that the data supply chain is provided and that it is accurate.

Data business professionals have as a primary or significant focus the task of performing predictive analysis, qualitative analysis, data modelling, data extraction, and data summaries with the purpose of creating new insights and knowledge from available data. They have thorough industry and/or process understanding and can put data analysis into context and relate to existing trends within the industry or line of business they are in. They typically leave collection, management, and quality of data to the data technical professional but, using analysis tools such as Excel, Tableau, and Power BI, are able to summarise large amounts of data and to visualise and present trends and insights to a wider audience of key stakeholders in the business in order to drive the strategic decision-making process in the organisation. Data scientists predominantly reside within the data business professional group.

Data consumers are product, process, human-resource, asset, or department employees and managers responsible for driving change or maintaining a position whereby decision making is heavily reliant on the supply of data and insights based on large amounts of data. They work directly with data only part of the time. They are decision makers or stakeholders in a decision process whereby the data and insights provided determine the quality of the decisions made. A data consumer guides the business based on the data and insights provided through the data supply chain.

Data companies are organisations that are directly involved in the production, delivery, and/or usage of data in the form of digital products, services, and technologies. They can be both data suppliers' and data users' organisations:

- **Data suppliers** have as their main activity the production and delivery of digital data-related products, services, and technologies. They represent the supply side of the data market.

[42] The European Data Market Study (SMART 2013/0063) included an indicator measuring "Data Workers", which was based on a similar, but slightly more restrictive, definition. In the subsequent European Data Market Study Update (SMART2016/0063) we measured "Data Professionals" – that is, workers with a wider range of data-related roles. In this context, data professionals are not only data technicians, but also users who, based on sophisticated tools, take decisions about their business or activities after having analysed and interpreted the available data.

- **Data users** are organisations that generate, exploit, collect, and analyse digital data intensively and use what they learn to improve the business. They represent the demand side of the data market.

Data companies' revenues correspond to the aggregated value of all the data-related products and services generated by Europe-based data suppliers, including exports outside the EU. This indicator measures the revenues of the data suppliers identified and classified by Indicator 2 (see the products and services specified in our definition of the data market). Data companies' revenues do not include data monetisation as part of the data market.

The **data market** is the marketplace where digital data is exchanged as "products" or "services" as a result of the elaboration of raw data. The data market captures the aggregate value of the demand of digital data without measuring the direct, indirect, or induced impacts of data in the economy as a whole. The value of the data market is not exactly equal to the aggregated revenues of European data companies because it includes imports (data products and services bought on the global digital market from suppliers not based in Europe) and excludes the exports of the European data companies. In this report, we add to the data market an estimate for the value of data monetisation.

The **data economy** measures the overall impacts of the data market on the economy as a whole. It involves the generation, collection, storage, processing, distribution, analysis elaboration, delivery, and exploitation of data enabled by digital technologies. The data economy captures a wider concept than the data market only, as it considers the value and wealth generated in the economy as a whole (not just across businesses) by the exploitation of data.

The Data Economy includes three sets of impacts in the economy: the Data Companies Revenues in the form of direct impacts on the economy, the indirect impacts (as backward and forward) and the induced impacts effects of the data market on the economy.

- The **direct impacts** are the initial and immediate effects generated by the data supplier companies; they represent the activity potentially engendered by all businesses active in the data production. The quantitative direct impacts will then be measured as the revenues from data products and services sold, i.e. the value of the data market. We consider the data market value as a good proxy of the direct impacts. Therefore, for the sake of simplicity, direct impacts will coincide with the value of the data market.
- The **indirect impacts** are the economic activities generated along the company's supply chain by the data supplier companies, considering input providers and customers of data supplier companies.
- The **induced impacts** include the economic activity generated in the whole economy as a secondary effect. Induced additional spending is generated both by new workers, who receive a new wage, and by the increased wage of existing jobs. This spending induces new revenues creation in nearly all sectors of the economy. The additional consumption will support economic activity in various industries such as retail, consumer goods, banks, entertainment, etc.

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