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

Update of the European Data Market Study 2021-2023
VIGIE 2020-0655

November, 2021

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|---|---|
| Deliverable | D3.3 Quarterly Stories (Story 3) |
| Date of delivery | 5th November 2021 |
| Version | 2.0 |
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| Contract ref. | LC-01568518 |

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# EXECUTIVE SUMMARY

The latest European Data Market study (SMART 2016/0063)[1] demonstrates that the demand for data professionals is expected to grow with 8.7% in the next 5 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[2].

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 is the result of the research done on the great divide between the digital skills and the data workforce in the EU. It demonstrates 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 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. Following a brief overview of the case studies, each chapter delves into their main business benefits, challenges, and future data skills development considerations. The various examples also show how businesses from various industries are approaching the ongoing challenge of responding to the rapid pace of digital transformation while ensuring that employees have the necessary skills.

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[1] The European data market study update, July 2021, Link: https://digital-strategy.ec.europa.eu/en/library/european-data-market-study-update
[2] Does Lack of Skills Directly Impact Business Imperatives? https://www.idc.com/getdoc.jsp?containerId=EUR147736621, May 2021

# 1 INTRODUCTION

## 1.1 Background

The digital transformation of European organisations has accelerated over the past few years. Much of the transformation is centred around how organisations can improve processes and efficiencies based on data and analysis, how they can create new products and services on the basis of data aggregation and analysis, how they can better serve their customers based on greater analysis and insight into customer behaviours and preferences – and fundamentally - how they can make better decisions based on data. At the same time, the amount of data that are flowing into the organisation is expanding rapidly, creating a growing request for data professionals that can harness, curate and create deep insights from the data – but also an increasing demand on the workforce in the wider organisation to be able to make decisions based on data. Consequently, we are seeing new data professional job role specifications emerge, where the individual may not have the depth of understanding of how to work with data as a sheer **data scientist** but must possess sufficient knowledge of data to elaborate appropriate information and create dashboards for decision making, such as **data analysts**; or indeed master a deep understanding of business processes and sufficient knowledge of how to interpret data to make the relevant decisions, such as **business analysts** (or data users).

As part of this research, we will therefore seek out real-life examples that underline best practices of how to create a "fit for purpose" data workforce in order to overcome the skills gap. According to the second edition of the European Data Market Study Update (SMART 2016/0063)[3], in 2019 there were an estimated six million data professionals in the EU27 alone. Demand for data professionals is expected to grow significantly for the next 5 to 10 years as companies become increasingly data-driven – for decision making but also for the development of new products and services.

As mentioned above, data analysis and data management are typically key ingredients in the larger digital transformation of organisations and society. However, the speed at which the transformation can be carried out depends on the skills available, and organisations across Europe have experienced a significant shortage of skills with serious impacts on their journey to digital transformation. On average, digital transformation projects in Europe are delayed by 8.1 months due to lack of skills, and for more than 50% of companies the skills gap has had a significant impact on both revenue generation and ability to provide products and services to the market[4]

Organisations are becoming aware of the strong link between data management success and the skills required both by data professionals and data consumers. The strategies for linking transformation programmes to skills development programmes are still immature in many organisations, and examples where this has been carried out are important to describe and formulate potential development paths that can serve as best practices or inspiring examples for other organisations. European organisations and policy makers should be able to learn from the companies that have spearheaded a continuous skill development and how that has enabled successful data management transformation.

## 1.2 Methodology

The case studies presented in this paper have been identified through desk research on publicly available sources including publications from the OECD, the World Economic Forum, and the ILO, as an example, as well as using IDC insights into companies that have established significant data skills development programmes.

The desk research was accompanied by an additional effort of primary research in the form of in-depth interviews with companies and organisations that are implementing strategies to tackle the shortage of digital skills and data-related competences. The interviews set out to address the following questions amongst others:

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

- *What strategies have been applied by the organisation to overcome the hurdle of skills availability in your data management transformation programme?*
- *What learnings and recommendations can be extracted from these examples that can benefit the larger community of European organisations that are embarking on data management transformation programmes?*

This research process resulted in the identification of five case studies, each bringing a unique perspective and offering a cross-sectoral view to this story:

- **Ernst & Young (EY).** This global professional services firm – one of the Big Four accounting firms – has embarked on large-scale skilling of its workforce in data and analytics. The company decided that, as business was ever-increasingly data-driven, it had to ensure that it had the data professionals it needed to serve its customers in all aspects of its business. The firm also considered that developing deep data experts as well as highly proficient data users across its business could serve as a competitive differentiator. Especially as data professionals were scarce in the market. A key outcome for EY has been to embed analytics end-to-end from strategy to implementation in every part of the business. This has happened internally but also in the solutions that the firm takes to its clients.
- **A mid-sized data consulting and training company**. This Netherlands-based training and consultancy company has taken a very different approach to addressing the data skills challenge. The company is dedicated to training young talents into professionals in data analysis, AI and cloud technologies. The company does this by offering graduates and young talents a 15-week training course, followed by employment for two years, where they work on customer engagements. Unlike other train-and-hire offerings, the company's approach is to provide a career after the initial employment with the SME at one of its customers or collaboration partners.
- **A global life sciences company.** This global, European headquartered life sciences company has been on a transformation journey since 2016, with a focus on bringing the digital tools into the business and into healthcare. Taking pharmaceutical drugs to the market involves not only clinical testing; the process is increasingly becoming dependent on collection and management of massive amounts of data. In order to meet these new demands, the company embarked on a digital transformation journey that has seen it create an extensive data skills development programme, including establishing a digital and data academy for its employees. The results of this transformation and focus on skills development can already be seen in the company's key performance indicators.
- **Orange.** This European telecommunications company headquartered in France has initiated a digital transformation that involves both the internal infrastructure of systems and data, as well as the ability to innovate and renew its products and services. At the heart of this transformation is the data that the company manages – vital information about the network and the customer is spread in so many different silos that it has become difficult to serve the customers efficiently, and to be able to innovate and create new products and services. The data management transformation is not only an implementation of technology; it goes hand in hand with creating the ability to manage, understand and visualize the available data. This skills development programme has been ongoing for three years and aims at reaching 70% of Orange's 146,000 employees.
- **EDSA.** This European research project set up a goal to create a curriculum and other training materials to help overcome the data science skills gap in Europe. Throughout the project the members have developed a real time analysis dashboard on the job openings in the EU, created a curriculum and an online courses platform where users can explore a variety of courses related to data science. Initially, the aim of the project was to have more than 50,000 learners participating in online training that was overachieved by having around 120,000 students registered on e-Learning or MOOCs courses.

The case-study analysis will be followed by a set of concluding remarks where the key messages from the interviews and case studies will be summarised, contrasted and compared and some essential policy considerations outlined.

A summary of the data sources employed for the analysis of the present data story is described in Table 1.

**TABLE 1:** *Data sources*

| Data Sources | Description |
|---|---|
| Secondary data sources | ▶ Academic publications and policy reports<br>▶ Websites (i.e McKinsey, CIO Magazine, Harvard Business Review and websites related to the case studies and the long list of cases of data-driven initiatives[5]) |
| Semi- structured interviews (Duration average 30-60 min) | ▶ The global data and AI leader and the global leader for learning and digital engagement services, EY<br>▶ The CTO for the Data and AI Division, Orange<br>▶ The founder of DataCorner<br>▶ The leader of business transformation at the life sciences company<br>▶ The founder of the mid-sized data consulting and training company<br>▶ The coordinator of the EDSA Project |

## 1.3  Data Story Structure

This case study is divided into four sections: Following the introduction and the description of the research methodology used for this report, Section 2 describes the current state of the data skills gap in Europe and emphasizes the need for more people with digital literacy skills to achieve digital transformation. It also illustrates possible long-term solutions to the shortage of qualified professionals.

Section 3 is at the core of this study with four different scale scenarios from the private sector. In this section, the reader will find a description of each case study examining also main business benefits, challenges, and considerations of further developments. It analyses the methods and accomplishments of the following enterprises: large-scale firms EY and the Orange Group, a medium-sized European Data Consulting and Training Company and a European Headquartered Life Science Company.

The last section discusses the findings, lessons learned, and policy implications related to the overarching issue of developing skills in critical business functions.

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[5] A few selected examples of secondary data sources are listed below:
What Would It Take to Reskill Entire Industries? (hbr.org)
Data Science in the New Economy: A new race for talent in the Fourth Industrial Revolution | World Economic Forum (weforum.org)
OECD Skills Outlook 2021: Learning for Life | en | OECD
The future is now: Closing the European skills gap | McKinsey
How companies are reskilling to address skill gaps | McKinsey
Upskilling for shared prosperity: WEF & PwC report
The Future of Jobs, World Economic Forum, October 2020

# 2 SKILLS FOR DATA: HOW TO BRIDGE THE DATA SKILLS GAP

## 2.1 The Challenge

For a long time, when organisations embarked on large-scale technology projects where wide-ranging training of employees was rarely part of the plan. Training was typically funded through centrally monitored yearly coaching budgets, and it was often seen as an extra cost that could be avoided and replaced with less expensive on-the-job training or "learning-by-doing" programmes. In particular, after the financial crisis in 2008-2009, training budgets were cut in many organisations since it was a quick win on the bottom line.

However, with digital transformation now a prerequisite for organisations across sectors and countries, and the rapid technological development, the lack of people with the necessary skills – including data analytics, data science and data literacy skills – has become a critical shortage across the European industry and markets. The fact that skills are not easily available to projects and initiatives is affecting organisations across a number of measurements including revenue growth, time to market of new products, and customer satisfaction. IDC has estimated that by 2025, the overall lack of skills will result in an annual loss of €188 billion for European organisations as a whole[6].

The scope and impact of the skills gap has brought the issue of talent development, talent acquisition and talent retention firmly on the board level agenda. The case studies presented below from a European life sciences company, a multinational telecommunications corporation, and multinational professional services firm illustrates how skills are now a strategic priority – together with the development of data professionals and data literacy amongst users, as digital transformation more often than not hinges on the fact that organisations are becoming increasingly data-driven.

## 2.2 The Solution

The situation described above has led to massive investments in learning and development as can also be seen from the case studies. With data skills amongst some of the most critical skills needed, there are indeed companies that are now starting to find new ways of bringing data talent into the market. The case study example from a medium-sized data consulting company below illustrates this. But there are other examples, such as the Portuguese DataCorner[7], a signatory of the Pact for Skills - the European Commission initiative to form a shared engagement model for skills development in Europe. In August 2021, DataCorner launched what it calls a Data Talent Discovery campaign in Portugal with the aim to take 100 unemployed people with the right talent and provide them with analytics skills deliver by DataCorner's Analytics Academy to become data scientists, data engineers or data analysts. These kinds of initiatives are important. With 23% of unemployed in the European Union having tertiary degrees in 2020 according to Eurostat (Labour Force Survey)[8], there is an unexploited potential that could be channeled towards technological careers, including the ones relating to data.

However, the case studies presented below also show that longer-term data analytics and data literacy skills should be considered as a foundational ability that is to be developed and integrated in the education system. Some European universities are already moving in that direction. The Polytechnic Institute of Setubal (Portugal), together with the aforementioned Analytics Academy, has developed what it terms a Sustainable Upskilling Platform in Data Analytics (SUPinDA)[9]. While the platform is commercially available, it has also been highlighted as a potential project for funding by the E3UDRES2 group of universities (Austria, Belgium, Hungary, Latvia, Portugal, and Romania) to offer all students – no matter the faculty – the ability to assess their potential in data analytics, take the necessary training and ultimately find careers with partner employers. While this project is not live yet, this would be an example of how to develop both data professionals and proficient data users across all careers and job functions.

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[6] Does Lack of Skills Directly Impact Business Imperatives?
https://www.idc.com/getdoc.jsp?containerId=EUR147736621, May 2021
[7] https://data-corner.com/AboutUs
[8] https://ec.europa.eu/eurostat/web/lfs
[9] https://eudres.eu/ideas-and-concepts

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# 3   OVERCOMING THE SKILLS GAP: THE CASE STUDIES

## 3.1 Ernst & Young – Infusing Data Professional Skills and Data Literacy Across the Organisation

This case study details Ernst & Young's large-scale internal transformation to a data-driven professional services firm, including training employees in data analytics and data proficiency. The company is also bringing this data expertise into its customer engagements.

## Case Study Description

Ernst & Young (EY), founded in 1989, is a multinational professional services firm with more than 312,000 employees in over 150 countries including most EU member states. It is considered one of the Big Four accounting firms and in 2021, it reported revenues of $40 billion of which about a third was from advisory services and strategy consulting.

Four years ago, EY embarked on large-scale skilling of its workforce in data and analytics. The company decided that, as the market was becoming increasingly data-driven, it had to ensure to have proficient data professionals to serve its customers in all aspects of the business. The firm also considered that developing deep data experts, as well as highly skilled data users across its business, could serve as a competitive differentiator since data professionals were scarce in the market. The philosophy has been that everyone should have data skills and be data literate. Data should be part of the "business language". On top of this foundational knowledge, EY then set out to develop around 10% of its employees to be data specialists. The firm created an online, virtual Academy[10] in 2018 with very broad data learning content. It realized that the content and the courses had to be relevant to the functional areas in which the employees work. For example, what a professional in Risk needs to understand about data – as a user – how analytics is applied and the context, is likely very different to the demands of a professional in Supply Chain.

Consequently, the Academy has different learning paths with different entry points, depending on the learner. The paths are based on either domain (e.g., Risk or Supply Chain) or sector (e.g., Oil & Gas or Retail). Apart from learning content on data and analytics, the Academy also includes artificial intelligence and automation, as these are closely related subjects. The learner receives badges after successful completion of courses. EY has defined four levels of badges- bronze, silver, gold and platinum. At this point, the firm has issued 54,000 badges in analytics alone. The pandemic accelerated the uptake of learning and has helped create a stronger culture of learning.

However, EY is not stopping there. Later this autumn, it will announce, in collaboration with Hult International Business School, for a M.Sc. in Business Analytics. EY and Hult are already collaborating on the EY Tech MBA, with the first group graduating in February 2021. The M.Sc. in Business Analytics – aimed at data specialists - is structured as a mix of badges and practical application. In fact, EY puts a strong emphasis on practical application and real-world insights as illustrated by its Better Working World Data Challenge.

## The Better Working World Data Challenge

EY's Better Working World Data Challenge is aimed at students and early career data scientists (EY employees as well as external young professionals). The challenge is for them to use their data science skills to make a real-world impact, rather than being a theoretical exercise.

In 2021 over 8,700 students from 1,100 universities, as well as young professionals from more than 115 countries, took part in the Challenge to develop an automated fire-edge detection and prediction model and help firefighters make more timely and informed decisions, and ultimately helping to save lives, property and biodiversity from the effects of wildfires. EY will take the result of the Challenge to COP26 and to other large events, such as Extreme E.

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[10] https://eyvirtualacademy.com/

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EY is creating similar challenges internally but where everyone can participate – not only the deep data science experts. The firm is eager to create a culture around data, where employees can see that they can contribute to have real impact.

# Neurodiverse Centres of Excellence

In 2016 EY started establishing Neuro-Diverse Centres of Excellence in the US, which it has since expanded to six as well as centres in Canada and India. In 2021, it opened CoEs in London and Madrid and it's planning to open in Sydney, Hong Kong and South America. These centres are designed to apply the talents of neurodivergent individuals to meet clients' business needs. The employees in these centres are individuals with cognitive differences such as dyslexia, ADHD, autism, and Asperger syndrome. The firm recognized the untapped potential of neurodivergent individuals, who make up approximately 20% of the global population and excel in data analytics and software management that supports emerging technologies, including artificial intelligence, automation, blockchain, cyber and more. However, it's estimated that up to 85% of autistic adults are unemployed or underemployed, according to the Centers for Disease Control and Prevention. EY plans to hire around 5,000 employees into these centres over the next three years. In addition, many of its clients are seeking the firm's assistance to also open centres, employing neurodiverse individuals.

## Main Business Benefits

One of the key outcomes for EY has been to embed analytics end-to-end from strategy to implementation in every part of the business. This has happened internally but also in the solutions that the firm takes to its clients. A critical element for EY as a professional services firm is to be able to deliver client outcomes. EY estimates that around 85% of engagements now have data, analytics and AI as significant components. The firm believes this has made it better able to influence client outcomes and it says it is getting better client feedback from the work that it does. This in turn has led to increased revenue growth and improved margins. Another positive outcome has that the Better Working World Data Challenge has helped out building a pipeline of 10,000 new data science talent interested in joining the firm globally. Internally, EY has seen a huge people impact around motivation, engagement, retention, and the EY employee value proposition. This is helping staff retention.

## Main Challenges

A key challenge, which EY is also recognizing with its clients, is the need for cultural change and awareness of the reasons why major learning programmes around data is important. This is especially the case for employees, who are getting on with their day jobs but where there is suddenly a demand on them to train in data literacy and be able to understand the value of data and how the training will help them in their careers. Part of this is to position the relevance of the training. EY has found that rather than talking data analytics, it has to be in the right context of the employee – or when addressing external clients, their industry or functional area. So, for example, it is better to frame a discussion around the factory of the future and digital fluency, and then the relevance of data and analytics mindsets. It is important to understand that technologies generate huge amounts of information and data and that the key is how to analyze those data to help the business in being more efficient, reducing waste, improving time to market, and increase profitability.  For EY it has been critical that data and analytics were seen as a strategic priority, which is also what the firm is trying to instill with customers. If it is not elevated to that level, it becomes more difficult to align all parts of the business behind the efforts and forge the necessary cultural change.

## Considerations on Data Skills Development

For EY the data analytics skilling journey has not so much been about creating the data specialist, as it has been about infusing this capability across the whole firm. This provided the company with a better ability to redeploy people across multiple engagements in different roles and doing different jobs. As a result, the upskilling and reskilling of the workforce has endowed EY with greater flexibility and resilience while creating career opportunities for people to take on evolving roles or new roles where they're moving horizontally across the organisation.

EY already has 44,000 technologists across the world and 22,000 data scientists globally. In 2020, the company invested $450 million (approximately € 387 million) globally in training, which translates 16 million learning hours or an average of 54 hours per employee – much of which was for training in new technologies and data insight.

In its external engagements, EY says that in the past few years it has seen the skills development conversation – including data skills, which are in short supply – elevated to the top executive level ("CxO level") – an absolute novelty considering that this type of concern did not reach beyond the Human Resources department until a few

years ago. This has especially been the case in Banking, where CEOs of several major banks are now calling out reskilling as one of their top strategic priorities with considerable increase in funding for training and coaching, including setting off time for employees to learn.

## 3.2 A Medium Sized European Data Consulting and Training Company – Developing Data Management Capability for the Enterprise Community

This case study analyses the methods and achievements by a Dutch mid-sized data consulting and training company dedicated to educating and preparing data professionals.

### Case Study Description

The Netherlands-based training and consultancy company is dedicated to coaching young talents into professionals in data analysis, AI and cloud technologies. The company does this by offering graduates and young talents a 15-week training course, followed by employment for two years. Unlike other train-and-hire offerings, the company's approach is to provide a career after the initial employment with one of its customers or collaboration partners. The purpose of the approach is to promote the career of the individual and to serve the customers and partners with which it collaborates. The company is specialized in data engineering, data analysis, data science, data governance, machine learning and cloud technologies.

The approach is based on rigorous selection of candidates and a conscious aim for increasing diversity. The company says it accepts only 1% of the applications it receives and that has achieved three times higher female participation than average in the data analysis market. Within data analysis, the training programme then aims at a certification as Data Engineer, Data Analyst, Data Scientist or Data Governance Specialist.

The process used by the SME includes the main steps of data analysis:

- data sourcing
- data staging
- data profiling
- cleansing and processing of data
- data modelling
- testing, hypothesis build and iteration
- data analysis
- data presentation and visualization

Recruitment is not only from STEM graduates; the company emphasizes that data analysis requires broader recruitment and needs talent from various backgrounds and wider education settings. Not only knowledge and "hard" skills are the basis for recruitment, but also softer skills of problem solving, stakeholder management, presentation and client management.

### Main Business Benefits

The company's approach is different from other train-and-hire offerings. The benefit for the individual is that the programme gives a career path in data analysis and data science, not just in the form of training, but as a combination of training and assignments. The two years of consulting following the training period provide the opportunity to implement the new knowledge and add experience and real use cases to the mix. To the individual this gives a credibility beyond the mere certification.

To the customers and partners of the company, the approach ensures a low-risk ability to fill the skill gaps in the organisation. By utilizing this approach employees can be recruited where the initial selection, training and experience gathering is finalized. Within data analysis and data science, the combination of business and technology is vital, and the blend of diverse backgrounds, technology training and business experience this programme provides may prove to be key for success. To the company, the niche of train-hire-release has proven successful. It has provided the European market with more than 700 data analysts and data scientists, and it has grown rapidly serving more than 70 companies across different industries, including Shell, Santander, Schroders, MS Amlin and Total.

### Main Challenges

The company has a focus on talent hiring, trying to find abilities to develop and acquire knowledge in its applicants rather than looking at the existing skills and capabilities. Especially during the pandemic, finding and evaluating

these talents was difficult, particularly without the abilities of evaluation that a physical interview can provide. Also, after the pandemic, virtual recruitment and onboarding will be a part of the process, and virtual groups will have to be formed also during the intense training period.

The company also points out the disconnect its partners have experienced between the data analysis teams and the business and the need for skills on both the technical side and on the commercial side.

## Considerations on Data Skills Development

The demand for data analysts and data scientists in Europe is growing rapidly. Given that the current data professionals are of all ages, and a portion of data professionals will retire in the next 5-year period, the supply of professionals from the data analysis-oriented university programmes will not be nearly enough to fill the demand. IDC estimates that the demand for data management professionals will grow with 8.7% in the EU in the next 5 years. Given the attrition from retirement, more than 300,000 new data professionals will be required in the same period[11].

Independent programmes dedicated to fill the data professional skills gap in Europe will be an important ingredient. It will continue to be difficult for each individual organisation to start training programmes on their own, as data science technology is rapidly evolving, and as the efficiency in both training and capability development will need constant evolution. The use cases for data analysis and data science are expanding and will penetrate most parts and processes within the business.

## 3.3 Europe-HQed Life Sciences Company – Enabling Data-Driven Innovation in Science and Personalised Health Care

This case study provides insight into how a life sciences company established a digital and data academy to support the organisation's digital transformation process and provide its employees with the skills needed to successfully participate in the transformation to a data-driven organisation.

### Case Study Description

The life sciences company, head-quartered in Europe with operations across the globe including 24 countries within the EU, has like most companies in the sector been on a digital transformation journey over the past three years. The company has set a strategic path: delivering personalized healthcare, driven and informed by science and data, and aimed at substantially improving the outcomes for patients and healthcare systems worldwide. The company focuses on discovery, development and commercialisation of prescription medicine in biopharmaceuticals and oncology.

Enabling intelligence and the ability to learn from multisource data are emerging as key competitive factors in the life sciences industry. Life sciences companies are generating and have access to more data than ever before, and the quantity is expected to grow exponentially. However, according to IDC survey data, only 29% of European life sciences organisations had in 2020 adopted Big Data Analytics and artificial intelligence solutions, while 26% were planning to adopt and 23% were evaluating adoption[12].

This life sciences company's digital transformation journey is aimed at enhancing customer and patient experience, improving R&D productivity, and optimizing operations, underpinned by advanced use of data and advanced analytics.

## Enhancing Customer and Patient Experience

Technology innovation is allowing people to monitor their own health and become active participants in managing their healthcare. For example, Internet of Things (IoT) applications and technologies are influencing patient engagement strategies and improving patient interactions with healthcare systems. Innovation can also be accelerated using large volumes of data from disease biology and genomics, which is driving precision medicine,

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[11] 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)
[12] Digital Transformation in European Life Sciences: Enabling Intelligence and Insights, IDC#EUR146894920, October 2020

while advances in data management and integration can improve the speed and quality of clinical trials. Additionally, a better understanding of disease biology can assist the delivery of new medicines and new approaches to health, including improved methods of prevention.

Examples of how the patient experience can be improved through better insight and analysis of processes is around collecting test and measurements relating to health conditions and the most efficient and convenient approaches to collect these, whether through specific health appointments or collection at home. In-depth analysis of 90 health protocols showed that 70% of data could be collected remotely, thereby easing pressure on the health system and improving convenience for patients.

## Improving R&D Productivity

Access to high quality data is crucial to advancing science in today's world. Through access to connected, analytics-ready data, scientists can uncover new insights with the aim of speeding up the discovery, development and delivery of potential new medicines to patients. Consequently, research teams need to be able to rapidly access and use the data they need, in a responsible way. All of this will add up to driving R&D productivity through clinical trial excellence and the use of artificial intelligence (AI), data science and digital technology, that enable new insights and accelerated processes to improve new product development. Examples of improvements include accelerating studies by a medium of nine months and reducing the cost of Phase 3 trials by 20%.

## Getting Started on the Data-Driven Transformation Journey

To achieve the above objectives, the life sciences company had to undertake a significant cultural change across the organisation. The aim was to empower all employees to combine knowledge and experience with the power of data and technology so to create a "digital" mindset in the company to drive business transformation. This has meant that it had to embark on a massive skills development exercise across virtually the whole of the organisations' departments.

The first step was to create a digital leadership bootcamp. The purpose was to get the top management and the leadership of the business areas to understand how digital technologies would impact the organisation and understand the possibilities this could bring. The next step was to implement new ways of working with design thinking and agile in order not to just take the old processes and make those digital but instead rethink how technology could make the processes smarter and more adaptable, and to apply automation and AI where possible. This aim was also to bring agility and change readiness into the organisation. An element in this step was to create a company specific lexicon to ensure that all employees would use the same language around the technologies.

The company next established an enterprise-wide Digital and Data Academy, with a comprehensive Digital Awareness Hub (hosted in its learning management system) that offers practical, quality education and access to experts. The Hub has three main aims:

- To develop enterprise-wide digital literacy, data and analytics capability
- To showcase the company's digital strategy, case studies and people to help align around the digital innovation happening across the organisation.
- To provide access to digital experts and peer networks for sharing and collaborating on digital activities.

Learning topics in the Digital Awareness Hub content were developed with the help of subject matter experts to cover everything from basic digital ways of working and the role of data science and AI, to design thinking and the value of organisational agility and agile development.

The company has seen a growing network of digital pioneers that are drawing on Digital Awareness Hub resources across initiatives. These resources include regional workshops, learning hackathons, and mapping out employee training needs against learning during/for capability assessments. Many parts of the business have identified digital and data literacy as a key enabler of their strategy and objectives. This is leading to ongoing development of learning resources, exercises and workshops-in-a-box to help them increase skill levels and achieve objectives.

## Main Business Benefits

One of the key objectives for the company was to triple the amount of clinical data available for re-use. This was achieved by also adding chemistry and biological data, imaging, multi-omics and real-world data.

From an employee perspective, the company is making good progress in creating a culture of lifelong learning. In 2020, 84% of employees said this has been achieved – with a steady growth in the rating over the last few years. Part of the reason for the data-driven digital transformation was to improve R&D. In 2020, the company reported a record number of new drugs progressing through the pipeline bringing the number of new drugs in the pipeline up of 63% from the previous year.

Another effect of focusing on constant upskilling and life-long learning has been to be able to fill new positions from within. In 2020, 60% of vacancies across the top three levels in the company were filled internally, which the company says it reflects its long-term commitment to develop high-quality leaders and its rigour of leadership succession planning.

## Main Challenges

Some of the key challenges was to get data in the right shape, embed the right governance, implement the right analytics tools, and, most importantly, to get that data into the hands of the right people to yield potential transformational benefits. However, it was a strategic priority for the company that this would happen so investments and resources were made available.

Another challenge for the company was to provide learning assets in local language to support employees across the globe. This was a time-consuming effort – and one that the company had not appreciated quite from the start of the journey. More importantly, the cultural change element proved to be fundamental in the whole process.

## Considerations on Data Skills Development

Because of the speed of change of technology, the dramatic growth in volume of available data is growing exponentially. it is therefore of paramount importance to create a continuous learning culture and embed this into the core of the organisation. Employees have to understand what is in it for them and how they can prepare and thrive by adopting digital tools and mindsets Over time, it is the company's ambition is to build digital behaviours into strategic workforce planning and its talent management and skills strategy.

# 3.4 Orange Group – Using Data to Reinvent Operating Model and Accelerate Growth

This case study provides an overview and analysis of Orange Group's transformation programme and the consequences on the learning strategies within data management and data analysis in the company.

## Case Study Description

Orange Group has more than 148,000 employees, of which 88,000 are in France, reporting revenues of more than 41 billion Euros. It is one of the world's leading telecommunications operators and IT services providers. The development of data analysis and AI capability at Orange is part of a larger transformation programme – Engage 2025, launched in December 2019 and aimed at reinventing Orange's operator model and accelerate in growth areas. It also puts data and AI at the heart of its innovation model to achieve smarter networks, a reinvented customer experience and a greater operational efficiency (Figure 1).

**Figure 1**

Orange has combined the development of AI and data analysis capabilities, as the goals of smart networks, customer experience and operational efficiency are such that both AI and data management are required. As a consequence, ethics, regulatory compliance and corporate responsibility is required as a foundation for the development and trustworthiness of the outcome. Through this foundation, data governance has become an element of the programme, and, as Fayçal Boujemaa, Technology Strategist at "Data&AI" Department of Orange Innovation says, "data is the raw material we need to manage better to extract more value via Data Analytics and AI".

The data analytics and AI programme has three parts:

1. Building the data strategy: defining the elements and tools required to achieve the operational targets.
2. Building the internal organisation, as the operational goals are dependent on the skills and capabilities of the Orange organisation.
3. Building the ecosystem, as Orange has a large network of partners, on which part of the success of the Engage 2025 programme depends.

The organization has the goal to train 20,000 employees in data management and AI skills. The objective goes far beyond the data professionals; its importance comes from the skills it brings to the lines of business – the data users.

Orange will invest more than €1.5 billion in a skills-building programme (part of the Digital Transformation actions about skills-building – including AI and Data skills-building/improvement for AI adoption acceleration) that is open to all employees around the world. To implement this programme, Orange Campus will become a networked school open to all employees and also to the Orange ecosystem of partners and customers. The intention is not only to achieve training and promote the efficient use of products and services, but also to strengthen the ability to attract talent.

## Main Business Benefits

One objective for the combined data and AI strategy is to improve the efficiency in customer experience, and among many use cases, also in the customer call handling. The root cause of an issue in the network or the service needs to be found faster and be more accurate. The current rule-based root cause analysis covers approximately 70% of the cases, but for the remaining 30% the use of data is imperative. A service issue may involve a field engineer, which is an expensive process step. The AI solution is quicker and more accurate in the diagnostics, it is also helping to decide whether a field intervention is needed or not. The benefits come both from improvements in accuracy in the assistance phase, and from avoidance of field intervention, but in terms of pure cost benefits the avoidance of intervention dominates. Orange estimates that around 280,000 field engineer visits have been avoided, saving around €20 million a year to the company.

Another use case is fraud management, within international voice traffic. This has typically been a manual and painstaking effort but, by improving data and AI skills, an automated model can analyze more than 100 million calls per day, cutting losses from fraud by €37 million a year.

Also, in the mobile network planning/extension, operators tend to prioritise investments at sites where population is most dense, but, starting in Spain, Orange uses data management and AI-based predictive methods, to identify (before deployment) which sites deliver the biggest margins and/or reduce churn. This has improved the revenue by between 10% and 20% (measured when the new mobile network cell is actually being deployed).

## Main Challenges

Skilling itself is a big challenge because the target groups within the company and within the ecosystem of partners are diverse – different skill levels and different backgrounds. The programme addresses not just the internal audience; it is important to raise the skills levels with partners and customers as well. The courses, the approach, the learning paths and the methods to reach and teach employees and partners need to be as diverse and rich as the audience it addresses. Also, Orange takes the approach that AI and data management is more than technology and science, and therefore the challenge in the skills development is that it cannot only address the technology foundation, it also needs to address skills required to meet the business objectives – efficiency, innovation and optimization.

Recruiting is another challenge that Orange brings up. Europe has access to a large number of data and AI talent, but the competition from other regions is fierce. In many cases, European talent (both young graduates as well as experienced data and AI professionals) prefer working for US based companies, either based in Europe or in US. Salaries are higher, and the investment climate for new enterprise initiatives is more generous.

## Considerations on Data Skills Development

The development of data skills goes far beyond the use and implementation of tools and technology. The benefits of efficient use of data have impact for the business – obviously – but has also important impact on trust, sustainability, ethics and social responsibility. These aspects are a mere consequence of any larger data management programme, especially when deployed in AI, and should be included in an organisation's development strategy.

The competition for talent in Europe is becoming fierce, particularly in specialist areas like data analysis, data science and data management. The competition comes not only from Europe, but also from US and China. The climate for new innovations and startups in US has also proven to attract European talent. European organisations need to be aware of the competition, sharpening employee value propositions, corporate innovation culture, and the ability to fund and promote European startups.

More can also be gained in the collaboration between academic research and education and European technology organisations. The growth in demand for data skills outweighs the supply from universities, and data management should become part of the curriculum of many educational programmes. The Orange example shows that the value of data training and data management skills goes far beyond data professionals needs for technology and science. Data and AI are and will be tools for many other professionals in the company and hence must be mastered by many other employees (beyond, Data Engineers, Data Scientists, and AI experts).

# 3.5 European Data Science Academy – Higher Education in a Data Science Era

This case study illustrates the **European Data Science Academy (ESDA)** research project[13],[14] funded by the Horizon 2020 Framework Progamme of the European Union that ran between February 2015 and January 2018. The project was looking to bridge the European data science skills gap by developing multimodal open courseware tailored to the real needs of data practitioners.

## Case study description:

The EDSA project was led by a consortium of nine partners from six European countries. Partners included the Open University (UK), the University of Southampton (UK), the Institut Josef Stefan (Slovenia), the Fraunhofer

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[13] EDSA is a research project funded by the Horizon 2020 Framework Programme of the European Union, Grant Agreement no. 643937.
[14] Data Science Training and Data Science Education in the European Union, https://edsa-project.eu/

Institut (Germany), KTH Royal Institute of Technology (Sweden), ideXlab (France), Persontyle Limited (UK), the Technische Universitaet Eindhoven (the Netherlands), the Open Date Institute LBG (ODI) (UK).

The **European Data Science Academy (EDSA)** project's objective was to provide critical learning tools for closing the EU's data science skills gap. One of its primary goals was to boost Europe's competitiveness in data science. Furthermore, connecting the demand for data science skills with the available supply of learning tools was a top priority. Throughout the project a rigorous process and set of best practices were developed to create and design a curriculum for data scientists.

**Demand Analysis***:* As a starting point, the project partners have set up a methodology to monitor trends across Europe to analyze the demands for specific data science skills and experiences based on job descriptions and discussions with experts across Europe's leading industrial sector. To better understand which skills are indispensable in data science, an in-depth analysis was conducted that included over 100 face-to-face interviews and 692 responses covering all 28 Member States of the EU[15]. At the same time, an *Industrial Advisory Board* including various industry representatives (Spotify, Rabobank, BBC, etc.) was established to supervise the project and correspond to actual market and industry trends; their input helped ensure the criteria aligned with the demands of the community. The results of this demand analysis led to a creation of an interactive *Dashboard[16]* where users can discover the latest state of the European Data Science landscape. The Dashboard provides real time analysis of European job openings across the EU, in 2018, there were 53,401 data science jobs, out of 4,887,507 jobs on the site[17]. The site also highlights the necessary skills for each role and proposes appropriate learning materials and courses to gain the expected skills.

**Curricula Development**: Using the results of the analysis, the data collected for the dashboard, and by leveraging the power of technology, through Learning Analytics, the developers were able to collect data about user's experience and incorporate it into the curricula design. Over the course of the project, a *Data Science Curriculum* was developed based on the topics identified through the demand analysis. The EDSA curriculum targeted four themes: *Foundation of data science, Data Storage and Processing, Data Analysis, Data Interpretation, and Use*.

**Training Delivery and Learning Analytics:** The results of these activities were used to create an eBook and *online course portfolio[18]* that covered a variety of learning formats (Massive Open Online Course, Facet-to face courses and Online courses, Blended Courses). The online courses platform aggregates a total of 61 data science courses from within the project consortiums and external organisations. It provides access to over 20,000 semi-automatically curated Data Science related courses and video lectures[19]. The online platform is available to the public for free; users can choose courses depending on their interests and requirements. Aside from that, they can explore four different data science learning pathways (Data Analytics, Data Science Engineering, Data Management, Business Process Management) for specific professions, as well as recommended materials for gaining the necessary skills for these positions. The Ebook contains textual learning and self-study courses.

## Main Business Benefits:

In order to maximize the impact of the EDSA project's outcomes, the project partners have established and continue to operate an **Online Institute** which hosts the project's outcomes. Therefore, the project's website is still available, users can access the dashboard of the European Data Science landscape, the developed curriculums, courses, datasets, learning analytics, and the video lectures. Over the three-year period, the project website had around 100,000 views[20] and still continues to attract traffic mainly from individual learners. For instance, during the first lockdown of the Covid-19 crisis, a peak of users could be tracked on the online courses' portal.

One of the most significant accomplishments of the EDSA project was the closer collaboration of academics and various industry actors. The Advisory Board, comprised of representatives from major corporations, as well as the Ambassadors, provided an invaluable networking opportunity for the consortium members, allowing them to

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[15] D1.4 Study Evaluation Report 2, 2016, Page 39. Link: https://edsa-project.eu/edsa-data/uploads/2015/02/EDSA-2016-P-D14-FINAL-withouthPrivateAppendix.pdf

[16] EDSA Dashboard, Link: https://edsa-project.eu/resources/dashboard/

[17] D4.5 Final community engagement and networking report, 2018, Page 8. Link: https://edsa-project.eu/edsa-data/uploads/2018/02/EDSA-2018-P-D45-FINAL.pdf

[18] EDSA Online Courses Portal, https://courses.edsa-project.eu/

[19] D5.2 Establishing the EDSI, 2018, Page 10, Link: https://edsa-project.eu/edsa-data/uploads/2018/05/EDSA-2018-P-D52-FINAL-v1.2-without-confidential-appendix.pdf

[20] D4.5 Final community engagement and networking report, 2018, Page 24. Link: https://edsa-project.eu/edsa-data/uploads/2018/02/EDSA-2018-P-D45-FINAL.pdf

establish important relationships and strong links with the private sector. In the long run, this resulted in the establishment of new partnerships and engagements in a number of EU-funded projects.

The lessons learned and feedback received from the data science community on the developed curriculum and courses led to a collection of best practices on how to design and deliver data science curricula. These recommendations and the acquired experiences can be used as a basis across various subjects when creating and planning new courses portfolios and curricula. For example, relaying on the outcomes of the EDSA projects a new Master Program "Autonomous Systems" for the students of KTH and EIT Digital Master School was developed. Also, the *FutureLearn*[21] education platform was still a start-up at the time of the project, but it has since evolved and now has over a million users[22]. Through EDSA, the Open University and the University of Southampton leveraged the online courses catalogue and parts of the developed curriculum to shape FutureLearn programme and courses offerings for data scientists. Overall, as a result of the project's partners' efforts, 30 new or revised courses have been produced, all of which are based on the findings and deliverables of the EDSA project itself[23].

## Main Challenges:

A major challenge that the consortium recognized throughout the duration of the project was the difficulty and the complexity of creating a longstanding curricula and courseware for data scientists due to the fast-changing pace of this field. With the new emerging technologies and the accelerated pace of innovation, well established patterns can easily become obsolete. Therefore, providing students with accurate courses and trainings acquires academia to implement an adaptive approach while creating and designing curricula for the future data scientists.

## Considerations on Data Skills Development:

The primary aim of the project was to examine and better understand the problem around data literacy and skills scarcity in Europe. As the project partners explained at the beginning, two essential needs were identified: 1. The lack of comprehensive analysis of the skills in demand in the data science sector and 2. The lack of curricula to meet those needs. The results of the project speak for themself; more than 120,000 participants were registered on e-Learning or MOOC courses or participated in face-to-face training, passing more than 50% of the initial target[24]. The partners also predicted a continuous rise in demand for data science technical and business skills, as well as continued demand for relevant education and training in various forms from traditional to online learning.

Having a greater understanding of the needs of the European labour market and matching them with the academia and the relevant institutions significantly contributes to resolving the initial problem that this project attempted to answer. As described in the final findings of the project, in order to have a curriculum that is linked with the industry demand for skill, close cooperation of the private and sector is indispensable.

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[21] FutureLearn: Online Courses and Degrees from Top Universities, Link: https://www.futurelearn.com/
22 FutureLearn reaches 10 million learners, November 2019, Link: https://www.futurelearn.com/info/press-releases/futurelearn-reaches-10-million-learners
[23] D5.4 Project Exploitation Report, 2018, Page 5. Link: https://edsa-project.eu/edsa-data/uploads/2018/02/EDSA-2018-P-D54-FINAL.pdf
[24] Ibidem, Page 18.

# 4 CONCLUSIONS AND POLICY IMPLICATIONS

The case-studies presented in this paper revolve around the overarching issue of building skills within vital business functions. The aspects and approaches that the examples bring forward are different and diverse and reflect the diversity and the complexity in building the appropriate skills when the business is changing and the skills required to manage the change are neither at hand, nor can they be easily sourced externally.

The case from a **European life sciences company** demonstrates how data skills development allows for an organization to meet broad operational requirements. The operational processes had hitherto been focused on clinical testing. The considerable amount of newly generated data made it necessary to merge original operational skills with new data management skills not just within a department or business area, but across the board. This brought an outstanding progress of a lifelong learning mindset among the employees that resulted having 63% new drugs from the previous year. Such change of broad processes can be expected in many industries, wherever data moves from being a value-add, to become a necessity in understanding and managing the business – Retail and Healthcare will experience this change, Automotive, Banking and Insurance are already underway, Professional services will follow as customers demand data management to become an integral part of service delivery, and even Construction are, with the advent of intelligent buildings and the necessity for sustainability in real estate management, following the same path.

The **Orange Group** example highlights the close link between data and AI and underlines how improvements through AI are not possible or relevant without accurate and high-quality data. By implementing robust data and AI strategy and switching from manual to automated AI solutions, the Orange Group managed to improve revenue between 10% and 20% and save around €20 million a year to the company.

It also brings forward an important aspect of skills sourcing – the skills gap in data management cannot be filled with internal skills development alone as there must also exist an inflow of new talent – young graduates as well as experienced data management and AI professionals. One of the main challenges is that Europe suffers from a brain-drain to some extent, where the conditions offered by employers in other regions of the word (mainly from the U.S.) often outweigh the ones in Europe – both salary wise and in ability to nurture new ideas and innovations.

The **Ernst & Young** case study shows that data management skills is no longer a matter for the data professionals only. For a business dependent on the ability to understand employee, market and customers, it will become imperative to, like Ernst & Young, infuse data management skills in all segments of the business. Now data, analytics, and AI are major components in about 85 % of engagements.

The case of the **Medium Sized European Data Consulting and Training** company emphasizes that digital literacy and the acquisition of appropriate skills are not limited to people with a specific background. Trainings not only for STEM graduates show how reskilling can help create new opportunities and talents.

The **European Data Science Academy** demonstrated the complexity of building an appropriate curriculum and course portfolio that meets the demands of the European data science industry. This case demonstrated the critical role that academics can play in overcoming the problem of Europe's data skills gap.

## Policy implications

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[25] , and it is estimated that the demand for data management professionals will grow with 8.7% in the EU in the next 5 years. Given the attrition from retirement, more than 300,000 new data professionals will be required in the same period.

Beyond the private sector, governments and policymakers also have a crucial role in finding responses to these emerging challenges. The European Commission has acknowledged the need for digitally skilled citizens and highly skilled digital professionals in its digital skills policy plans. In her recent State of the Union address, President

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[25]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)

von der Leyen emphasised the importance of equipping European citizens with digital skills and proposing a policy programme with a concrete delivery mechanism under the "Path to the Digital Decade". Earlier this year, as part of its digital ambitions for 2030, the Commission has set up a goal to employ 20 million ICT specialists and encourage women to work in tech with the help of new initiatives such as the European Digital Skills and Jobs Platform.

As the case studies illustrated, the private sector is already taking essential steps to enable the digital transformation of business and thus contribute to the EU's ambitious digital goals by developing competent data professionals. The result of this study provides us with a set of policy conclusions that we present below:

**Invest in Data Skills Development**

A common denominator seen in all the four examples, whether we were looking at small and medium-sized or large companies, is the investment and development of adequate training strategies. Some companies have created online data academies or digital awareness hubs that resulted in enterprise-wide digital literacy, data and analytics capability. Consequently, it has brought several benefits to businesses such as better ability to redeploy people, greater flexibility, resilience, and new career opportunities.

**Build a Digital Mindset**

The EY case has unveiled that around 85% of companies' engagements have data, analytics, and AI as significant components. However, the usage and application of tools and technologies goes beyond developing digital pioneers. Implementing technologies involves a substantial cultural change across organisations. The societal and ethical implications of technology should be always considered by the top management and the leadership of businesses.

**Encourage Public and Private collaboration**

Business and government organisations are both impacted by the lack of talent. Fostering public-private collaboration could significantly contribute to bring change in this area. Academia and the private sector should work together to develop programmes for young talents and fresh graduates to make sure students are equipped with the right set of digital skills that responds to the emerging needs of the IT industry and their wider business environment.

**Retain talent in Europe**

Addressing brain drain of ICT specialists in Europe has been a long-standing dilemma over the past decade. The competition to keep talents in Europe in fields such as data analysis, data science, and data management has been a real challenge, which clearly goes beyond the borders of the European Single Market. According to LinkedIn's Economic Graph Report from 2019, Europe is lagging behind its competitors. For instance, the U.S. employs twice as many AI-skilled individuals as the EU, despite its total labor force being just half the size[26]. As highlighted by the *Orange Group* example, in order to keep up with the US and China, business and policy makers need to create better conditions by sharpening employee value propositions, enabling corporate innovation, and promoting European startups.

**Discover untapped potentials with neurodiversity**

Even though a growing number of companies took actions and reformed their hiring processes, according to Autism Europe, it is estimated that less than 10% people on the autism spectrum are employed mostly in low-paid jobs across the European Union[27]. The *Neurodiverse Centres of Excellence* launched by EY, made the company realize the untapped potential of neurodivergent individuals' excellence in data analytics and other digital skills. Businesses and policy makers could further explore these examples and new approaches to harnessing the neurodiverse potential to help with the digital talent shortage.

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[26]AI Talent in the European Labour Market , November 2019, AI-TAlent-in-the-European-Labour-Market.pdf (linkedin.com)

[27] Autism-Europe's presentation to the European Parliament's Committee on Employment and Social Affairs on 5 November 2019, retrieved here: https://www.autismeurope.org/wp-content/uploads/2019/11/presentation_employment_autism_final2.pptx.pdf

**Encourage gender equality**

The case studies demonstrated the significance of company cultures and mindsets. According to a McKinsey report[28], companies with more than 30% female executives outperformed those with 10% to 30% female executives. Only by applying a thorough selection procedure, a company obtained three times higher female participation than average in the data analysis market. Even though the European Union already took several initiatives to encourage women in STEM and increase opportunities for women and girls in this field, a continuous effort is needed by the private and public sectors.

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[28] How Diversity & Inclusion Matter | McKinsey, May 2020