Analytical Report n2

Analytical Report 2: E-skills and Open Data

EUROPEAN
DATA PORTAL

Analytical Report 2:
E-skills and Open Data

Last update: December 2015

www: http://www.europeandataportal.eu/
@: info@europeandataportal.eu
License: CC-BY

Authors: Wendy Carrara, Sander Fischer, Eva van Steenbergen

Executive Summary

An increasing amount of companies appoint a Chief Data Officer, which emphasizes the increasing need – and pressure – to create value with the ever growing amount of data. Until recently, only employees of the National Statistics Office were working with data in the public sector. To work in those institutions, statistical skills are primarily required. However, are those skills the only ones you need to work with Open Data? Can everyone do this? Or are certain skills required? Is there a myth around (Open) Data and the need for in-depth technical skills?

This report aims at answering the question regarding the skills needed to work with Open Data, the so-called e-skills. In addition to desk research, several parties have been interviewed about their perceptions of the required (e-)skills. They all agreed in stating that analytical, statistical and technological skills are needed, next to communication skills and domain knowledge. It is important that people who work with data have the necessary technical skills to understand the data. These skills can cover basic to in-depth programming, as well as other tools like Hadoop, SPSS or R. In addition, domain knowledge - that is to say a sector specific background - is also required in order to derive insight from the data. Finally, to leverage the insight extracted from the data, one should be able to communicate the results to the relevant stakeholders. Individuals with all those skills well-developed are a rare commodity!

Data scientists need both hard & soft skills

The perceptions found during the interviews confirm the need for both soft skills and hard skills. The hard skills are described as subject matter expertise, mathematic and statistical knowledge as well as technical skills, whereas the soft skills include problem solving, storytelling, collaboration, curiosity, communication and creativity.

All these aspects were both mentioned by the interviewees as well as found throughout desk research. However, the importance of teaching basic statistical and programming skills at primary schools was emphasised during most of the interviews.

The European Commission recognises the fact that a skills gap exists and has already set up policies and supports research to address this gap. Businesses are also developing training plans and establishing partnerships to create a pipeline with technical, managerial and communication talents.

Better than chasing "Open Data unicorns", people with well-developed skills in different disciplines, build a team. Not everyone needs to be able to learn programming to work with data, but some basic understanding is preferred. A multidisciplinary team where skills can be complemented is key. Each team member can have a basic understanding of all aspects and excel in one area. These are the key steps to develop interesting new insights, products and services based on Open Data.

1. Introduction

In 2014, there were more than 100 Chief Data Officers (CDO) active in large global companies.[1] The appointment of a CDO indicates the importance of data within the organisation. Several governments have also appointed CDO's. President Obama of the United States was the first to appoint a Chief Technology Officer (CTO), and more recently a CDO.[2] A similar British initiative is the introduction of the Government Digital Service (GDS). The GDS is leading the digital transformation of the British government, making public services digital by default.[3] In France, a CDO was appointed in 2014 that is now head of the French Agency for public Open Data called Etalab.[4] This shows the growing importance of data within governments.

Figure 1 – CDO tasks

A typical CDO is focused on all tasks related to data and is responsible for the governance, quality, management, and integration of data. Also, a CDO is responsible for data policies, recruiting skilled data professionals, establishing a data-driven corporate culture, team-building around data-centric business objectives, and acquisition and oversight of corporate data technologies.[5] The need to create value with data is increasing fast, especially since the amount of data is growing each day.

Executives with the CDO title are working in different fields of the economy, the majority can be found in finance, government and technology.[5] Most of these sectors possess a lot of data and aim at working with increasing amounts of data – often referred to as Big Data. Big Data consist of high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making.[6] If the data is generated, created, collected, processed, preserved, maintained, disseminated or funded by or for the government or a public institution, it is called Public Sector Information (PSI).[7] PSI that is released and can be freely used, modified, and shared by anyone for any purpose is called Open Data.[8] However, are the skills requirements comparable when considering Big and Open Data?

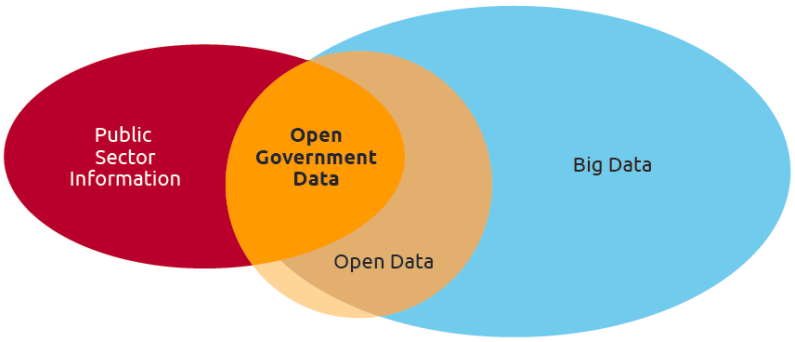


Figure 2 – Overlap Open Data and Big Data

Since the emergence of Open Data, civil servants are expected to release data that they are responsible for in a machine-readable format online. Also, the ability to work with (Open) Data within public bodies is gaining importance. Until recently, every European country only had civil servants working with data at their National Statistics Office. Those institutions focus primarily on data management and hire their employees based on their statistical skills. However, cost savings for the public sector are estimated to be 1.7 billion EUR in 2020 for the EU28 and EFTA countries[9]. As the importance of data analysis and data re-use grows throughout the public body, should these bodies hire employees with statistical skills as well? Or are we talking about slightly different skills? What does it require to work with Open Data? Can everyone do this? Or are certain skills required? Is there a general myth around the skills required to work with Open Data?

This analytical report provides insight into the skills needed to work with Open Data. Several stakeholders have been interviewed about their perceptions of required e-skills. In addition, desk research was done to identify different studies addressing data related skills. The identified skills required are discussed. Also, the current supply of skills on the European job market is compared with the demand for e-skills, to identify if a skills-gap exists and how it could be addressed.

E-skills

E-skills or electronic skills include those needed to make use of Information and Communication Technologies (ICT) as well as those required to apply and develop them

Figure 3 – Definition of e-skills[10]

2. Perception of skills required to use Open Data

The answer given when enquiring about the skills required to work with Open Data, e-skills, is depending on who you ask your question. This may seem obvious, but numerous perceptions exist. The answer of an ICT professional may differ from a business manager's answer. Also, a difference in perception of the skills needed might exist whether you address someone from the public and the private sector.

For example, currently in the United States President Obama is recruiting his own start-up team for the White House. Employees of top private-sector companies are recruited to work for the US government. The goal is to build a team of about 500 people by the end of 2016. Only people with a specific set of e-skills are hired: "When you are dealing with IT and software and program design, it is a creative process that cannot be treated the same way as a bulk purchase of pencils."[2]

Are people with IT skills the only ones suitable for the job or is it only perception?

To answer this question, the research team interviewed several people from different organisations to find out more about their perceptions around e-skills.

2.1. Benefits and barriers of working with (Open) Data

First of all, the main personal benefits and barriers of working with data were discussed. Here again, answers could differ.

2.1.1. Benefits

The interviewees indicate that an important benefit is that data gives insight to help decision making either in a visualised form or as a benchmark. One interesting example is to create prediction models based on Open Data. Another important benefit is helping others to discover the value of re-using data. The scientific community needs data to do research and develop knowledge; Open Data therefore offers an avenue of data in all different scientific fields.

2.1.2. Barriers

An important barrier, on the other hand, consists of the quality of the data. It is often poorly documented and metadata is lacking. Also, it is difficult to find information about specific topics, especially when it is only available in non machine-readable format. Furthermore, the more general issue that still exists around data is privacy and how to secure the data. It is a challenge to anonymise large datasets. Another challenge is to change the cultural mindset. Public officials were told to keep all data closed for a long time. Currently, they are asked to release all data which required a shift in the way of thinking about data. Another barrier is the collaboration within different departments. Every department is working with its own system in its own silo. To improve interoperability, data must be released in the same format by all departments. Initiatives like Code for Europe[11] could help the myths around working with data in public administrations disappear.

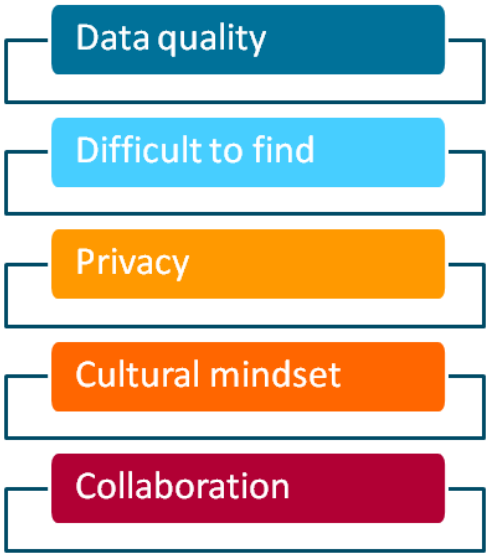


Figure 4 – Barriers overview

2.2. First thoughts

What skills are required to work with Open Data? The initial response is that one needs to be able to find it and make use of it. You need to be able to work with the file containing the data and extract the output you need to feed into the analysis. In addition, one needs to understand what Open Data

is (data with an open licence) and what it is not (all data you can find on the internet that does not come with an explicit open licence).

Programming should be a basic skill, like getting a driver's license: everyone needs to have it.

A prerequisite lies also in defining the research question, or the hypothesis one wants to document. This implies defining what one is trying to answer and / or solve. Working with data requires both business and technology skills. Storytelling is an important part of analysing data: communicating results clearly is key! Half the interviewees mentioned that basic statistical and programming skills to work with data are required as well and should be part of primary education to address statistical literacy.

2.3. So, what are the skills that are really needed?

The technical skills are only one part of the equation. There are many more skills involved when dealing with data.

2.3.1. Technical skills

Everyone mentioned technical skills as one of the required skills to work with data. However, the importance of those technical skills was something not all interviewees agreed upon. The technical aspect is over exaggerated according to 64% of the interviewees. Thanks to a growing number of free tools and software packages easily accessible online, analysing data becomes much easier, even without a technical background. A few interviewees indicated that at least one team member should understand the data processing behind the tools though. When one puts all the data in a software platform without knowing how the programme is structuring the data, it is difficult to assess factors that could influence the process. The analysis of data is done by statisticians, whereas programming algorithms and Machine Learning are more technical skills. The demarcation between technical and statistical skills is blurred.

Data is just a means to an end.

Compared to Big Data, Open Data is easier to use, easier to create an app with and easier to create value with.

2.3.2. Statistical skills

Knowledge of statistical tools is required to do the analysis of the data, which enable one to clean and analyse the data using different functions (Excel). Statistics also involves some programming. Many educated people lack the knowledge of basic statistics. Especially while looking at the health sector, students are not interested or do not see the point in learning how to do analysis using tools as SPSS or R. To be able to perform an analysis, understanding the different statistical tests is a requirement. However, business and politics need to be linked to the data analysis and the technical solution.

2.3.3. Analytical skills and personality

As a data scientist, a researcher or an enthusiast wanting to develop innovative new products and services, you want to work with data and obtain valuable insights from it. To be able to gain those insights, it is crucial to start with a good understanding of the problem to be able to answer the right questions. Analytical skills are needed to analyse the problem first and to think of the best approach to solve this problem using data. Once the data is available, the type of analysis needs to be thought through as well. It is not only about doing something with a statistical tool, but the focus is on the reason why the data is being analysed in the first place. For what purpose? Some interviewees did not mention analytical skills explicitly, but talked about keeping an overview and seeing the bigger picture. Another related subject that was mentioned by one third of the interviewees is that one should be aware what Open Data is and what the consequences will be of the analysis that is done. Does it have political implications? Are certain social groups excluded? It is necessary to focus on the context around the problem. The most important drivers to work with data are curiosity and motivation; curiosity to define research questions and desire to solve problems. 64% of the interviewees agreed that motivation matters most beyond programming skills. Furthermore, you need to be able to build a bridge between IT, business and politics. Communication is the key capability to bridge the gap between those two worlds and was mentioned by one third of the interviewees.

2.3.4. Business insight and domain knowledge

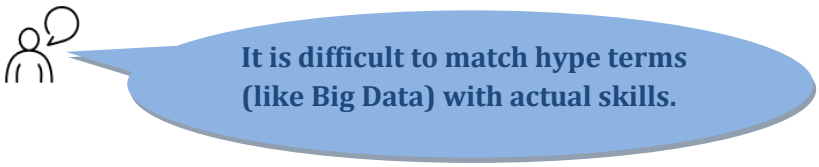
Another important part of working with data is to understand the market your business operates in. People that start to work with data need to focus on marketing to promote their new product or service. A business strategy is needed to create a strong brand with all activities aligned towards reaching one specific goal. Knowing about sales processes and having a basic understanding of negotiation techniques can equally be useful. Start-ups need to focus on how to raise money to continue doing business. These activities are complementary to the assessment of data and will ensure the insight gain from the data can serve a purpose.

All interviewees also agreed that besides business insight one needs to have domain-specific knowledge to be able to understand the data from a specific sector. If one searches health data, it is best having some understanding of the health sector, the structure of this specific sector as well as the jargon that is specific to it. The technical and communicational skills required are the same throughout all sectors, but to be able to interpret the data you need to know the sector. However, not all sectors are comparable in terms of data maturity. For example, social scientists and data journalists are used to focus on the message instead of graphs and tables. However, in manufacturing the data subject is relatively new.

To summarise, basic technical skills are required to understand the analysis that is going on, but the most important skills are **communication** to connect the technical solution with the business problem and **domain knowledge** to understand the implications.

2.4. The data scientist: myth or reality?

The data scientist is not a myth, but a professional that is very hard to find. There are no recognised qualifications for this specific position and definitions are rather large. At the same time, it is almost impossible to find one person with all the skills mentioned above as well-developed. Individuals that do have all those skills exist. They remain difficult to find and may appear expensive to hire at the beginning of the data journey. Our research and the interviews suggest building a team is the best way to leverage the opportunities offered by Open Data. Each team member can develop an overall understanding of the different processes and skills and excel in one or two key skills. Skills can then be complemented across the team. There could be one person with a more technical focus and another more business focused. People with strong technical skills may not be able to define the right hypothesis, whereas business people that communicate well may lack the technical skills. The interviewed academics indicated that young people have an advantage above elderly, because they are what we call "digital natives"; people born or brought up during the age of digital technology and familiar with computers and the internet from an early age.[12] They receive more multidisciplinary training as well.



An important part of the training to be a data scientist is learning on the job. Recent graduates do not have the experience yet to work with data, but do absorb new information fast. Senior colleagues with more experience show the new hires how to solve a problem by working on it together. Also, education and training material is currently developed to meet the demand of data related skills. A lot of people actually learn programming on their own initiative by searching for solutions online, but that requires motivation and time. However, technology is an ever changing discipline which means that continues learning is always needed.

Businesses are looking for the "Open Data unicorn": a creature that knows everything, but does not exist in real-life. However, the point is not finding one person, the data scientist, who is able to work the whole process on his own, from data aggregation to the end product or service. Rather, it is about working in a team with effective leadership. A good leader will facilitate change, recognize performance of the team members, stimulate collaboration between them, is committed to development of employees, and able to manage decisions and provide direction.

2.5. Challenges ahead

The interviewees foresee some challenges that should be addressed in the near future.

2.5.1. Raise awareness

The biggest challenge to reap the benefits of Open Data is raising awareness. One needs to know about Open Data before the required skills become relevant and to know how Open Data drives innovation. The economic study conducted by the European Data Portal team estimates that between 2016 and 2020, the market size of Open Data is expected to increase by 36.9% to a value of 75.7 bn EUR in 2020[9]. This economic potential can only be realised when the existence of Open Data is communicated broadly.

Public administrations need to see the benefits through storytelling and examples.

2.5.2. Manage cultural change

An important cultural challenge within public administrations is the fear to lose control over data. The public sector needs to be convinced of the benefits first. In the health domain, the challenge is mainly focused around privacy and resistance against commercial use of health data. It is important that citizens have trust in how their data is handled. Beyond a first "Big Brother" fear, data benefits could be further communicated by showing examples of high societal value.

2.5.3. Basic statistical and mathematical skills

The interpretation of the data is crucial and not everyone that works with data is able to retrieve the best insight. Basic statistical skills need to be further developed to be able to assess with *certainty* what the *uncertainty* of the results is. Data analysis is not simply about getting a result that answers the hypothesis formulated, but the statistician needs to understand how reliable those results are. People that do not have the statistical or technical skills think it is harder to obtain the proper skills than it actually is. The collaboration between team members is very important to achieve the desired results from the data.

Working with Open Data starts with the understanding of the data and seeing the possibilities. Public and private organisations have the potential to create much more value. Open Data might die quietly if the media turns away from it. If the government does not see that data is used, they will stop releasing it. Therefore, we need to keep the discussion going in both the public and private sector.

3. Skills required

As the previous chapter has shown, different perceptions around e-skills exist. To address the skills required to work with Open Data, first the content in which Open Data is used needs to be understood. Open Data is data that is generated, created, collected, processed, preserved, maintained, disseminated or funded by or for a government or public institution and that can be freely used, modified, and shared by anyone for any purpose.[8]

Open Data can be used in four different ways, as described by the Data Value Chain. The first two steps of the Value Chain, as shown in Figure 5, focus on data creation and storage. Most public sector bodies spend more time on the first two steps of the Value Chain, data creation and data storage,

than they do analysing it.[13] The quality of the data is depending on the skills of the civil servant involved in the data storage and release on, for example, a national Open Data portal.

Figure 5 – Data Value Chain[13]

The data provided by the public sector is analysed and turned into insights mostly by other parties. The group of people involved in these steps of the Data Value Chain, data analysis and data insight, is adding value to the raw Open Data that is provided by the public sector. For example, private companies analyse the data that is provided and use it to develop applications, or they sell data insights. This process is visualised in Figure 6.

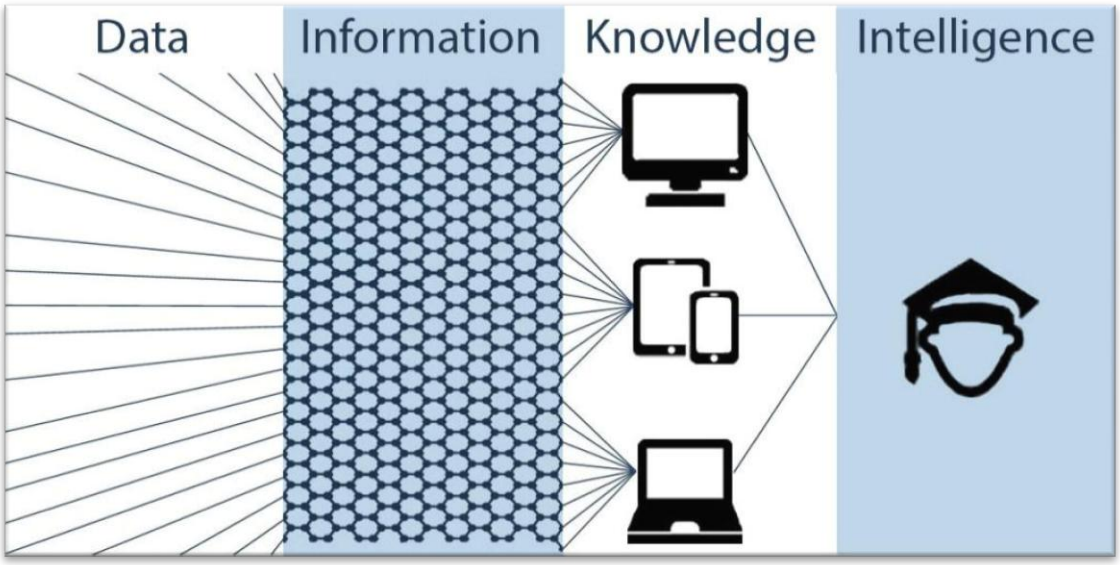


Figure 6 – How data fuels intelligence[14]

An important barrier for the adoption of data analytics in government is the 'data paradox', which describes the dilemma presented by having too much data, but too little insight. More data does not lead to more insight. It is not just about having more relevant information, but also about eliminating the irrelevant information that is reported.[15] Employees should have insight in the subject to be able to judge about the relevance. The interviewees also indicated that domain knowledge is important to be able to understand the data.

The importance of acquiring e-skills is well understood by the European Commission.[16] The EC states that in the near future 90% of jobs will require some level of e-skills. This goes for all kinds of careers, from engineering to accounting, nursing, medicine, art, architecture, and many more. Furthermore, the EC states that every citizen should have at least basic e-skills in order to live, work, learn and participate in the modern society. But what does it require to work with Open Data?

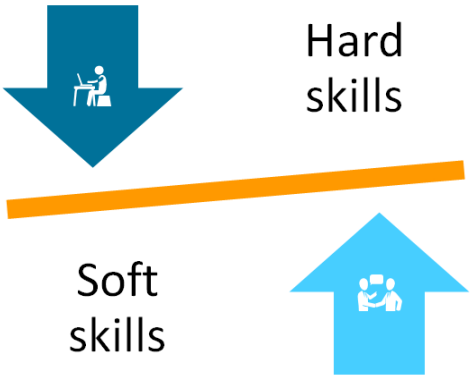
E-skills should at least enable employees to use the tools required to understand, manage and manipulate the data organisations are gathering.[17] However, e-skills go beyond what is required for tra-

ditional analytics applications. For instance, data scientists need to be not only well versed in understanding analytics and IT, they should also have the ability to communicate effectively with decision makers.[18] Open Data does not only rely on technology, but also on communication.[19]

The European e-Competence Framework (e-CF) provides a standardised way of describing competences that are required for specific ICT jobs. It uses common language regarding competences, skills and proficiency levels that can be understood across Europe.[22] The role of 'data scientist' was also described using the e-CF. The competences are shown in Table 1.

e-Competence	Level[20]
A.3. Business Plan Development	Level 5
A.8. Application design	Level 2
A.7. Technology Trend Monitoring	Level 2
A.9. Innovating	Level 5
B.1. Application development	Level 3
B.4. Solution deployment	Level 3
B.5. Documentation Production	Level 3
D.10. Information and Knowledge Management	Level 5
D.11. Needs Identification	Level 4
D.12. Digital marketing	Level 3
E.1. Forecast Development	Level 4
E.3. Risk management	Level 2
E.4. Relationship management	Level 3

Table 1 - Required e-competences for data scientist position[21]



The different skills described can be divided into hard skills and soft skills. The hard skills can be compared to what is expected from IT-professionals: subject matter expertise, data & technical skills, and maths & statistics knowledge. However, e-skills also require a lot of soft skills, like collaboration, problem solving and communication which was also mentioned by the interviewees. A description of those skills is provided in Table 2.

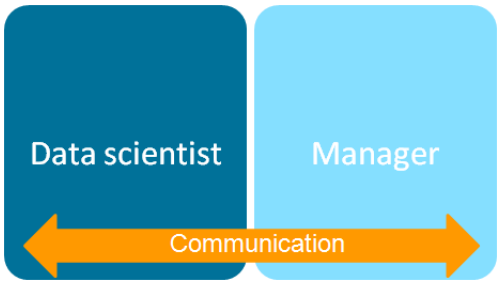
	Skill	Definition
Hard skills	Subject matter expertise	Person who is an authority in a particular area or topic. Often referred to as person with special knowledge or skills in a particular area of endeavour.
	Maths & statistics knowledge	Knowledge of the science that deals with the collection, analysis, and interpretation of numerical data, often using probability theory.
	Technical skill	The knowledge and abilities needed to accomplish mathematical, engineering, scientific or computer-related duties, as well as other specific tasks.
Soft skills	Problem solving	The process of working through details of a problem to reach a solution. Problem solving may include mathematical or systematic operations and can be a gauge of an individual's critical thinking skills.
	Storytelling	Storytelling is a method of explaining a series of events through narrative. It is used as a tool to illustrate an otherwise difficult concept or a point.
	Collaboration	To work with another person or group in order to achieve or do something. Effective method of transferring 'know how' among individuals.
	Curiosity	The urge felt to know more about something. A desire to know or learn.
	Communication	Two-way process of reaching mutual understanding, in which participants not only exchange information, ideas, feelings but also create and share meaning.
	Creativity	The ability to transcend traditional ideas, rules, patterns, relationships, or the like, and to create meaningful new ideas, forms, methods, and interpretations.

Table 2 – Definitions of different skills

Soft skills are often overlooked when thinking about Open Data and data analytics in general. Creativity and curiosity are needed to define a working hypothesis and to measure the possibilities of-

fered by a given dataset. Indeed, to start processing the data, one has to have an idea what to do with the data. What types of insight can one gain? Which insights can possibly be created? This requires soft skills. This is also the reason president Obama insisted on hiring the top employees of Silicon Valley, as "working with data requires much more than just the skills to work with data. An important factor is to be creative and to know which organisational insight is needed."[2] This is also visible in many start-ups. The start-ups did not start by working with data, they started with a good idea which required working with data. From there, they developed a business model.

Another reason soft skills are important, is the collaboration with the business. Managers are expecting to apply the insights gathered by data analysis into their daily operations. To be able to do so, the employees analysing the data need to be able to communicate their findings in an understandable way. IT professionals need to invest in their communication skills if they want to make an impact in their organisations.[23] They need to work on the storytelling and communication.



As shown in Table 1, e-Competence Framework competence A3 is business plan development. Open Data may be part of a business model providing data insight to clients after thorough analysis or selling mobile navigations applications. Often, managers have specific business questions they like to answer using data. Marketing requires extensive reports on potential clients. Within the financial world, trends need to be foreseen. Dealing with these questions does not solely require hard skills like subject matter expertise and technical skills, but it also requires problem-solving skills. Therefore, employees working with data do not only need creativity to come up with insights themselves, they also need skills to help solve problems presented to them by the business.

4. The skills gap

To work with Open Data, e-skills are needed. These skills consist of both hard and soft skills. However, there seems to be a gap between the demand for skilled data workers and the supply of such employees: this is commonly called the skills gap.

Neelie Kroes, the former EU's digital agenda commissioner, has addressed the skills gap in Europe on several occasions. She described the EU's global competitiveness as "under threat" economically and competitively by the shortage of IT and other technical specialty skills.[24] According to Kroes, the number of "digital jobs" in the EU is growing by about 100,000 every year and the number of graduates with the required ICT skills is not keeping pace with the demand. It is estimated by the European Commission that there will be 825,000 unfilled vacancies for ICT professionals by 2020.[16] IDC estimated that there are half a million unfilled data worker roles constituting a 7.5% of the total demand for ICT professionals across the EU, and a 25% gap between demand and supply[25]. According to the current president of the Commission, Juncker, Europe should be able "to see every consumer getting the best deals and every business accessing the widest market - wherever they are in Europe"[26].

To tackle the skills gap, the European Commission is developing policy and is supporting research to make learners fit for 21st century life and work.[16] With the European Data Science Academy (EDSA) launched in 2015, the

Commission set up a structure that develops learning materials (actual learning resources as well as curricula for use in learning organisations) built on an on-going analysis of the industry requirements with respect to skilled data scientists and data workers[27]. The number of graduates with the required ICT skills should keep better pace with the demand. More students should be encouraged to choose courses in technical and scientific subjects and mathematics throughout all levels of education, beginning at the earliest possible age.[28] However, while digital technologies gradually embrace wider parts of everyday life, 60% of students never use digital equipment in their classroom. The full potential for improving education through ICT in Europe remains yet to be discovered.[29] Nonetheless, governments should focus on encouraging students to choose more digital courses.

Some examples already exist of governments trying to close the gap. The initiative Code for Europe that was mentioned previously strives to solve local civic challenges, by enabling agile temporary teams of developers to create solutions that are easily re-useable in other European cities[11]. Singapore showed that education is one of the most important factors to stimulate the supply side. They succeeded with their programme by investing large portions of the public budget in education, a strong civil service and the development of leaders. Thereby, they proactively move the economy away from basic manufacturing, to higher value technology-based manufacturing and to knowledge-based R&D sectors.[29] Most recently, Singapore launched the SkillsFuture initiative, including a fund where the government provides a yearly stipend to be used for continuing education at all levels. Government expenditure on education remains dramatically higher than it is in other OECD countries. The unemployment rate in Singapore is very low as a result and was 2.0% in 2014.[30]

The solution does not lie solely with the government. The e-skills gap is also being recognised by the industry itself. Businesses need to consider a short, mid and long term strategy to prevent falling behind and to stay competitive. A short-term way of re-using data is to run professionally organised hackathons (such as Ultrahack hackathon in Helsinki[31], Open Data Day London 2015[32]) where external people create products or services with companies' and public sector's data. A mid-term possibility is to invest in training for the staff in data science, management and engineering (but to recruit as well). A long-term strategy would be to build strong partnerships with communities who are working with young programmers to build a solid pipeline of technical talent.[33] For instance, the banking sector realised new skill sets are needed to benefit from Big Data analytics. However, as this combination of skills is rare, three-quarters of banks do not have the right resources to gain value from Big Data. Therefore, banks are also looking at the possibility to train end-users of Big Data, who may not be data experts themselves, but need to use data to enhance decision-making.[18]

5. And now, what is next?

5.1. Conclusion

The majority of the interviewees indicated that it is possible to find the right skilled people, half of them also indicated that programming should be part of primary education. The European Commission recognises that data related education and training needs to be further developed. Part of that training could be learning on the job, as a lot of different skills are needed to work with data. People that have very strong technical, statistical and analytical skills are hard to find, but the whole process of data analysis does not need to be done by one person only. A multidisciplinary team where skills can be complemented is key. Each team member can have a basic understanding of all aspects and excel in one area. These are the key steps to develop interesting new insights, products and services based on Open Data.

This report has identified the e-skills needed to work with Open Data. However, a gap between demand and supply for e-skills was described. To close this gap, several recommendations can be made.

5.2. Stimulate education & training

First of all, the number of graduates with the required ICT skills should keep better pace with the demand. More students should be encouraged to choose courses in technical and scientific subjects and mathematics throughout all levels of education. Universities and secondary schools should play an active role in organising information events to promote technical education. Women should also be further encouraged to follow technical courses.

Besides actions taken by the public sector, private firms also need to move quickly to shape their workforce.[17] Companies only have a short lead time to prepare for the (big) data age. To ensure that the staff is comfortable with data as early as possible, firms should consider implementing a Shared Data policy where the default position is to make most information available to the workforce. One step further, companies could even consider opening their data to the public. Managers should be leading by example in using data to guide decisions and highlighting the information and processes leading to those conclusions. An Open Data and decision-making environment encourages staff to experiment with information analytics and to use that knowledge to make better-informed business decisions at an operational level.

Furthermore, giving staff the opportunity to develop skills through in-house training programmes is an efficient way of developing the required capabilities to compete in the data-driven economy. Some of that training can be through structured programmes or through ad hoc support groups and some of the areas for study can include data analytics, coding and user design. For example, the European Data Portal provides thirteen online training modules to discover more about Open Data[34]. At a recruitment level, focusing on staff with data science skills and associated qualifications is becoming essential as information management becomes a far more critical part of their everyday roles.

Having the tools within the workplace to use data effectively is also a critical piece of the digital

workforce puzzle. Software that properly stores and manages data across its lifecycle is essential to developing an empowered workforce that has all the information it needs.

5.3. Pro-active government

Governments are the biggest re-users of Open Data. Still, they need to make sure that Open Data is incorporated in everyday life and will not be forgotten after a few years when the hype is over. Success stories need to be shared to emphasize the value of Open Data. All interviewees agreed that the best way to motivate people is to show them practical examples of actual value creation through Open Data re-use. A lot of examples are out there, but scattered across different countries, portals and communities. For example, CommoPrices is a French start-up using customs data to provide the private sector with data analytics and insights[35]. It is currently looking to extend their activities to other countries, but only a few European countries release customs data as Open Data already. Governments should lead by example and pro-actively share the re-use made of the data they shared, like the customs data in France. On the other hand, citizens and businesses should redistribute the data sets they created to contribute to the Open Data landscape. By giving back the data to the community, governments see proof of the usefulness of their data which stimulates continued release and updates of more data sets.

Endnotes

[1] http://www.financialexecutives.org/KenticoCMS/Communities/Committees/Finance---IT-(CFIT)/CFIT-files/January-2014-Ad/cio_advisory_the_chief_data__254672.aspx
[2] http://www.fastcompany.com/3046756/obama-and-his-geeks
[3] https://gds.blog.gov.uk/about/
[4] https://www.etalab.gouv.fr/the-government-creates-and-shapes-the-role-of-its-chief-data-officer-cdo
[5] http://ie.theinnovationenterprise.com/event_executive_summaries/chief-data-officer.pdf
[6] http://www.gartner.com/it-glossary/big-data
[7] OECD (2015), "Assessing government initiatives on public sector information: A review of the OECD Council Recommendation", OECD Digital Economy Papers, No. 248, OECD Publishing, Paris.
[8] http://opendefinition.org/
[9] European Union (2015), Creating Value through Open Data.
[10] http://ec.europa.eu/eurostat/statistics-explained/index.php/Glossary:E-skills
[11] http://codeforeurope.net/
[12] http://www.oxforddictionaries.com/definition/english/digital-native
[13] Based on MEPSIR (2006) and http://ec.europa.eu/information_society/newsroom/cf/dae/document.cfm?doc_id=3488
[14] http://onboardinformatics.com/blog/power-local-information/?utm_content=16343959&utm_medium=social&utm_source=googleplus
[15] http://www-01.ibm.com/common/ssi/cgi-bin/ssialias?infotype=PM&subtype=XB&appname=GBSE_GB_TI_USEN&htmlfid=GBE03392USEN&attachment=GBE03392USEN.PDF#loaded
[16] http://ec.europa.eu/digital-agenda/en/skills-jobs
[17] http://www.businessspectator.com.au/article/2015/7/17/industries/data-new-oil
[18] http://www.slideshare.net/capgemini/big-data-in-bank-ing?utm_source=slideshow02&utm_medium=ssemail&utm_campaign=share_slideshow_loggedout
[19] http://www.ictjournal.ch/fr-CH/News/2015/08/31/Un-Suisse-sur-deux-connat-lexistence-du-portail-open-data-de-la-Confederation.aspx
[20] The proficiency levels (e-1 to e-5) of each e-competence range from e-1 being an associate to e-5 being a principal.
[21] http://e-cf.nl/wp-content/uploads/2013/03/Onderzoeksverslag-e-CF-profielen-ECP.pdf
[22] http://www.ecompetences.eu/
[23] http://www.computerweekly.com/news/1280095604/Gartner-IT-professionals-need-to-make-communication-a-top-priority
[24] http://careers.ieee.org/article/European_Job_Outlook_0414.php
[25] http://edsa-project.eu/addressing-the-big-data-and-data-science-skills-gap-at-ict2015/
[26] http://europa.eu/rapid/press-release_IP-15-4919_en.htm
[27] http://edsa-project.eu/
[28] https://bertmaes.wordpress.com/report-skills-shortage/
[29] https://hbr.org/2015/08/leading-job-growth-in-the-digital-economy
[30] http://stats.mom.gov.sg/Pages/Unemployment-Summary-Table.aspx
[31] http://forumvirium.fi/en/event/open-data-day-helsinki-hackathon
[32] http://attending.io/events/open-data-day-london-2015
[33] http://www.yourreadybusiness.co.uk/open-data-bridging-the-digital-skills-gap/
[34] http://europeandataportal.eu/elearning/en/#/id/co-01
[35] https://commoprices.com/