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5G for Europe: The importance of youth in the data economy[1]

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- Over 1 out of 3 employers from nine industry groups[i] stated that they are struggling to fill jobs.[ii]
- 5G is expected to transform mobile technology into a General Purpose Technology. In the EU its implementation could create 2.3 million jobs by 2025 and revenues of €113.1 billion per year.
- Data workers are essential to fully capitalise on this opportunity; however, they are increasingly scarce in the EU labour market.
- Addressing this gap requires measures in promoting data skill formation among youth (age 16-25), as well as collaboration between universities and industries.

What is the issue?

The creation of each technology generation is an advancement that serves the purpose of meeting the requirements identified between each technology and its predecessor. 5G refers to the 5th generation of mobile telecommunications technology. The main difference between 5G and its predecessor, 4G, is that 5G will have higher data rates, lower latency,[iii] and higher connection density.[iv] For these reasons, it is expected to be the most critical building block of the digital society in the next decade.[v] 5G has the capability to turn mobile technology into a General Purpose Technology, i.e. one adopted across multiple industries and with the transformative potential to redefine work processes and the rules of competitive economic advantage.[vi]

5G´s standard, IMT-2020, which will define how the network operates and interworks, is planned to be agreed upon by 2020. It will allow the implementation of the following three key technologies[vii]:

- **Enhanced mobile broadband** (eMBB): is able to handle more devices and higher data volume, decreasing the cost per gigabyte (by 10 times compared to a basic 4G site[viii]). At the same time, the lower prices would increase the demand of mobile services, fostering its deployment.
- **Ultra-reliable and low-latency communications** (URLLC): enables low-latency monitoring and real-time control. It would support applications such as autonomous vehicles, by improving the cooperative automatic driving through the real time exchanged among cars connected in the same area, and the deployment of the Industry 4.0,[ix] by the implementation of time-critical process control, intra/inter-enterprise communication and connected goods.[x]
- **Massive machine type communications** (mMTC): allows the connectivity to tens of billions of machine-type terminals,[xixii] boosting, for example, the development of smart cities through the efficient allocation of resources, the better provision of public services and a decreased environmental impact.[xiii]

[1] This policy brief is part of the project ***The Future of Work and Opportunities Arising from Non-traditional Working Arrangements.*** For more information, please read page 4.

In spite of its relevance, its implementation in the European Union faces a series of challenges that can be gathered into three categories. The first one is *standardisation*: in 2013, the European Commission launched a Public-Private-Partnership (5G-PPP) with the 5G Infrastructure Association to deliver solutions, architectures, technologies and standards for the 5G communication infrastructures.[xiv] The second is *spectrum assignation*: in 2016, the European Electronic Communications Code was proposed to support the deployment of the 5G network, in particular with regards to the assignation of the radio spectrum.[xv] And the last one is *skills formation*: the EU has taken several measures to address the digital skills gap.[xvi] Moreover, one of the objectives of the 5G-PPP is to develop the skilled personnel needed for the advancement and operation of advanced communication networks and the secondary and vertical markets steaming from its implementation.[xvii]

However, none of them focus specifically on data workers, who are defined as 'workers who collect, store, manage and analyse data as their primary, or as a relevant, part of their activity. Data workers must be proficient with the use of structured and unstructured data, should be able to work with a huge amount of data and be familiar with emerging database technologies. They elaborate and visualise structured and unstructured data to support analysis and decision-making processes.'[xviii] They are indeed essential for creating value at the different stages of the data value chain, which is at the core of the data economy. Their main task, which is the improvement of analytics and data processing, has the potential to transform Europe's service industries by means of the creation of an array of innovative information products and services, increase the productivity of all sectors of the economy, speed up innovation and reduce the cost through the implementation of more personalised services.[xix]

For this group of specialists, the gap between the total demand and supply in the EU labour market was 6.2% of the total demand in 2016, and this is expected to rise to 9.8% by 2020.[xx] These workers contribute to all sectors of the economy, most prominently in the areas of ICT (11%), manufacturing (12%), wholesale and retail (18%), and professional services (20%). These four sectors accounted for approximately 62% of data workers in 2016.[xxi] Additionally, the forecasted gap for Big Data analysts (a highly specialised type of data workers)[xxii] is expected to correspond to almost 17% of the demand by 2020.

Large enterprises are more resilient to cope with this gap since they can easily adopt these new technologies and hire and retain data workers. Nevertheless, their smaller counterparts do not have the skillset or the budget to follow suit. European non-high technological SMEs generally lack awareness of data technologies and the promising advantages of data-driven innovation in their businesses. According to the EC, the SMEs barriers to enter the data market include 'lack of skills, low investments in ICT innovation, insufficient access to large datasets and enabling infrastructures, [and] less economies of scale'.[xxiii]

Why is this important?

The European Commission has repeatedly stated that very high-capacity networks like 5G will be a key asset for Europe to compete in the global market.[xxiv] Moreover, the implementation of the 5G network will allow the full deployment of the digital economy, which in the EU could create 2.3 million jobs by 2025 and revenues of €113.1 billion per year in four key sectors (automotive, health, transport and energy).[xxv]

The implementation of 5G technology is expected to increase mobile data traffic at a compound annual growth rate of 42% between 2016 and 2022.[xxvi] For this reason, data workers become essential for the capitalisation of these data assets and therefore bridging the existing gap in their labour market should be an urgent issue to be addressed by policy makers.

What should policymakers do?

1. **Increase the data skills among youth** (age 16-25) and encourage them to pursue a career as data workers.
2. **Accelerate the industry-university collaboration** to increase the number of data-related internships and traineeships.

How should they do it?

1. Increase the data skills among youth (age 16-25) and encourage them to pursue a career as a data worker: one of the specific commitments of the private sector of the 5G-PPP is to 'leverage on EIT KIC ICT Labs[xxvii] to develop skills and competencies in 5G through establishment of a MoU [Memorandum of Understanding] with EIT ICT Labs'.[xxviii] However, this measure targets only graduate students and professionals already working within the industry. According to Resolution 198 of the International Telecommunication Union (ITU), as of 2014 youth under the age of 25 accounted for 42.5% of the world's population and they were the most active in terms of internet use, as well as digital natives and the best promoters of ICT.[xxix] Moreover, as of 2015 in the EU the share of young people (age 16–29) that reported experience in computer programming and web page design was almost twice the respective share for the whole population.[xxx] Therefore, it is necessary to address youth, specifically secondary school students and undergraduates, in order to bridge the gap existing in the EU labour market of data workers. The set of skills that has to be promoted to bridge the gap not only of data workers but in particular of Big Data analysts, is: data analytics, programming, machine learning, data mining and data visualisation.

2. Accelerate industry-university collaboration to increase the number of data-related internships and traineeships: academia is a member of the 5G-PPP, and it already collaborates in its framework with the industry. This synergy has to be promoted and extended so as to increase the number of data-related entry level programmes. A special focus should be placed on the collaboration with SMEs, which have only a participation of 20% in the PPP,[xxxi] but play an important role in developing, piloting and deploying 5G technologies.[xxxii]

Information about the project

Project	This policy brief is part of the project ***The Future of Work and Opportunities Arising from Non-traditional Working Arrangements.***
Supervisor	Dr. Edgar Aragón
Institutions	The project is carried on by students of the Willy Brandt School of Public Policy, in partnership with the European Centre for International Political Economy (ECIPE).
Focus	The project is focused on the European Union (with emphasis on the specific situation of Germany, France, Greece, Poland and Sweden), the United States and Japan.
Date	The project was executed between October 2017 and February 2018.

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[i] Employers are from nine industry groups identified by the WEF: Basic and infrastructure, consumer, energy, financial services and investors, healthcare, information and communication technology, media, entertainment and information, mobility, and professional services.
[ii] World Economic Forum. (2016). The Global Competitiveness Report 2016–2017. World Economic Forum Reports 2016. https://doi.org/92-95044-35-5
[iii] End-to-end round trip delay (GSMA. (2014). Understanding 5G: Perspectives on future technological advancements in mobile. Retrieved from: https://www.gsmaintelligence.com/research/?file=141208-5g.pdf&download)
[iv] International Telecommunication Union. (2017). 5G roadmap: challenges and opportunities ahead. Retrieved from: https://www.itu.int/en/ITU-D/Conferences/GSR/Documents/GSR2017/IMT2020%20roadmap%20GSR17%20V1%202017-06-21.pdf
[v] https://ec.europa.eu/digital-single-market/en/policies/5G
[vi] IHS Economics & IHS Technology. (2017). The 5G economy: How 5G technology will contribute to the global economy. Retrieved from: https://cdn.ihs.com/www/pdf/IHS-Technology-5G-Economic-Impact-Study.pdf
[vii] International Telecommunication Union. (2017). Minimum requirements related to technical performance for IMT-2020 radio interface(s). Retrieved from: https://www.itu.int/md/R15-SG05-C-0040/en
[viii] Ericsson. (2018). The 5G consumer business case: An economic study of enhanced mobile broadband. Retrieved from: https://www.ericsson.com/assets/local/narratives/networks/documents/report-eab-18000943-rev-a-uen.pdf
[ix] Also referred as the fourth industrial revolution, it entails the digitalization of the industrial processes, as well as the integration of the value chain. (https://www.pwc.com/gx/en/industries/industry-4.0/what-we-mean.html)
[x] 5G-PPP. (2016). 5G empowering vertical industries. Retrieved from: https://5g-ppp.eu/wp-content/uploads/2016/02/BROCHURE_5PPP_BAT2_PL.pdf
[xi] C. Bockelmann et al. (2016). Massive machine-type communications in 5g: physical and MAC-layer solutions. IEEE Communications Magazine, vol. 54, no. 9, pp. 59-65.
[xii] eMBB and URLLC enable high-performance Internet of Things (IoT) use cases (also called Critical IoT), while mMTC allows low-complexity IoT (also called massive IoT). (https://www.qualcomm.com/news/ong/2017/06/15/lte-iot-starting-connect-massive-iot-today-thanks-emtc-and-nb-iot)
[xiii] https://ec.europa.eu/digital-single-market/en/policies/smart-cities
[xiv] https://5g-ppp.eu/
[xv] European Commission. (2016). Directive of the European Parliament and of the council establishing the European Electronic Communications Code. Retrieved from: http://eur-lex.europa.eu/resource.html?uri=cellar:c5ee8d55-7a56-11e6-b076-01aa75ed71a1.0001.02/DOC_3&format=PDF
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[xxii] 'Big Data analysts require solid knowledge in statistical foundations and advanced data analysis methods combined with a thorough understanding of scalable data management, with the associated technical and implementation aspects' (IDC. (2017). European Data Market. Retrieved from: https://sites.google.com/a/open-evidence.com/download/repository/SMART20130063_Final%20Report_030417_2.pdf?attredirects=0&d=1)
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https://www.gsmaintelligence.com/research/?file=89a59299ac2f37508b252124726a1139&download
[xxvii] The European Institute of Innovation & Technology (EIT) is an independent body of the European Union created to boost innovation and entrepreneurship across Europe (http://eit.europa.eu/).
[xxviii] https://5g-ppp.eu/contract/
[xxix] International Telecommunication Union. (2014). Resolution 198: Empowerment of youth through telecommunication/information and communication technology. Retrieved from: https://www.itu.int/en/ITU-D/Digital-Inclusion/Documents/Resolutions/Resolution198_PP_BUSAN_14.pdf
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