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Report on the United Kingdom: technological capacities and key policy measures

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Introduction

This report has been prepared in the framework of the Advanced Technologies for Industry (ATI) project, initiated by the European Commission, Directorate General for Internal Market, Industry, Entrepreneurship and SMEs and the European Innovation Council and Small and Medium-sized Enterprises Executive Agency.

The objective of the international country reports is to explore the technology and policy landscape of selected non-EU countries. Country performance in advanced technologies is presented based on patent, trade and investment data. The reports provide also a concise and informative review of policies relevant for advanced technology development and deployment.

The starting point of this analysis has been sixteen advanced technologies that are a priority for European industrial policy and that enable process, product and service innovation throughout the economy and hence foster industrial modernisation.

Advanced technologies are defined as recent or future technologies that are expected to substantially alter the business and social environment and *include Advanced Materials, Advanced Manufacturing, Artificial Intelligence, Augmented and Virtual Reality, Big Data, Blockchain, Cloud Technologies, Connectivity, Industrial Biotechnology, the Internet of Things, Micro and Nanoelectronics, Mobility, Nanotechnology, Photonics, Robotics* and *Security*. The full methodology behind the data calculations is available on the ATI website[1].

The report is structured as the following:

The first section outlines the capacities of the UK in terms of technology generation (patent applications), followed by an analysis of international competitiveness in technology-based products (export shares) and, eventually, entrepreneurial dynamism (venture capital activities and investments in tech firms).

The second section analyses the main UK policy strategy in support of advanced technologies and provides an overview of some of the key policy initiatives and policy measures in the field.

[1] https://ati.ec.europa.eu/reports/eu-reports/advanced-technologies-industry-methodological-report

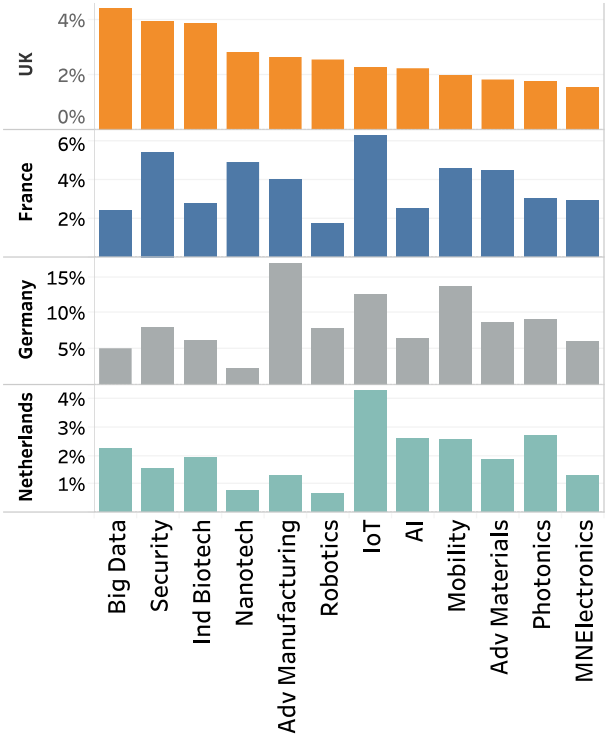
Section 1

1. Activities and capacities in advanced technologies

1.1 Patent applications

The UK has a long history of generating science and technology. To assess its current technological performance, we rely on the analysis of its share of transnational patent applications in twelve advanced technologies. Figure 1 displays this measure for the UK in 2018, as well as for 3 other European technology leaders from the EU27 that serve the purpose of comparison.

Figure 1: Share in global transnational patent applications in advanced technologies (2018)[2]

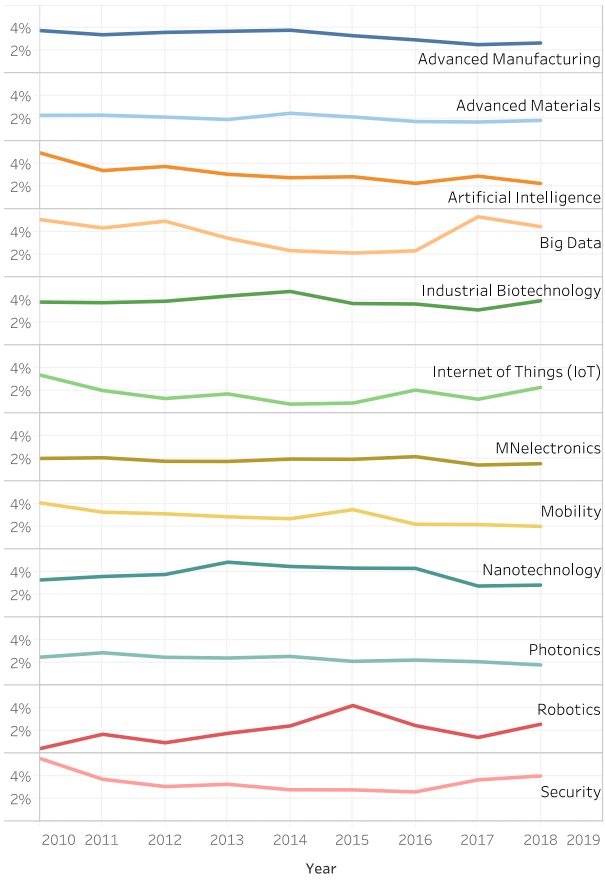


Source: Fraunhofer ISI, based on EPO PATSTAT, tableau

Overall, the UK holds a comparable share of global transnational patent applications as France and the Netherlands, with an advantage for France and the Netherlands slightly lagging behind. However, the three countries lag far behind Germany. Nevertheless, out of the twelve advanced technologies in focus, there is one for which the UK stands out as it displays the highest share of worldwide transnational patent applications in Big Data (5.27%). For all the other advanced technologies, UK is beaten by another EU country. More specifically, UK usually ranks third, behind Germany and France, except for photonics, Internet of Things and IT related to mobility where it is also surpassed by the Netherlands.

The trends over the period from 2010 to 2018 suggest that the UK has kept its global position across various technologies. Its share in Robotics has increased in particular.

Figure 2: Trends in global transnational patent applications in advanced technologies (2010-2018)



Source: Fraunhofer ISI, based on EPO PATSTAT

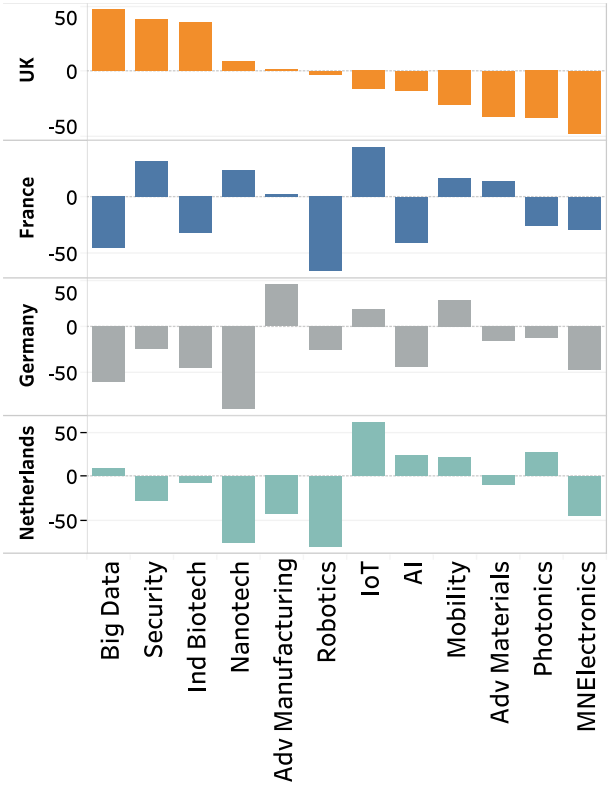
The relative technological specialisation of UK is assessed by the analysis of the RPA-index[3] for the twelve advanced technologies in focus and is visualised in Figure 2. Again, UK's performance is

[2] The diagrams in this report have been prepared with the software tableau.

[3] The RPA-Index illustrates the relative specialisation on a scale from -100 to +100, putting the share of a specific field in national applications in relation to the global average share.

to be compared with Germany, France and Netherlands.

Figure 3: Technological specialisation RPA-Index of the UK, Germany, France and the Netherlands (2018)



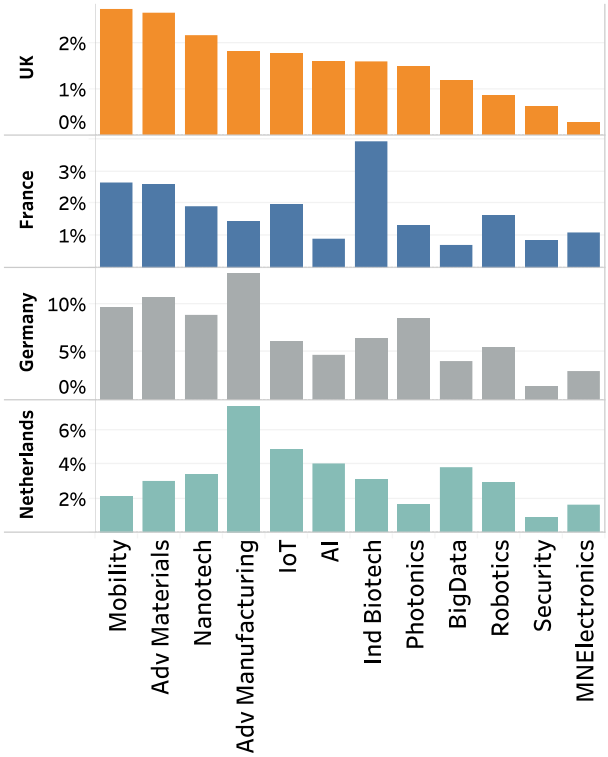
Source: Fraunhofer ISI, based on EPO PATSTAT, tableau

UK has a high relative specialisation in Big Data, Security and Industrial Biotechnology, and a slightly positive one in Advanced Manufacturing Technologies and Nanotechnology, although less pronounced than in France. Negative specialisation is found in Robotics, Internet of Things, Artificial Intelligence, Mobility, Advanced Materials, Photonics and Micro- and Nano Electronics. The worst performance compared to the three other countries is seen in Micro- and Nano Electronics.

1.2 International competitiveness

Trade measures are a common indicator of global competitiveness, as they document the attractiveness of a country's products beyond the home market. Total exports provide evidence about a country's role as a producer, and trade balance captures its sovereignty in certain areas of production. Figure visualises the UK share of global technology exports in 2016 and compares it to Germany, France and the Netherlands.

Figure 4: Export share in world total (2018)

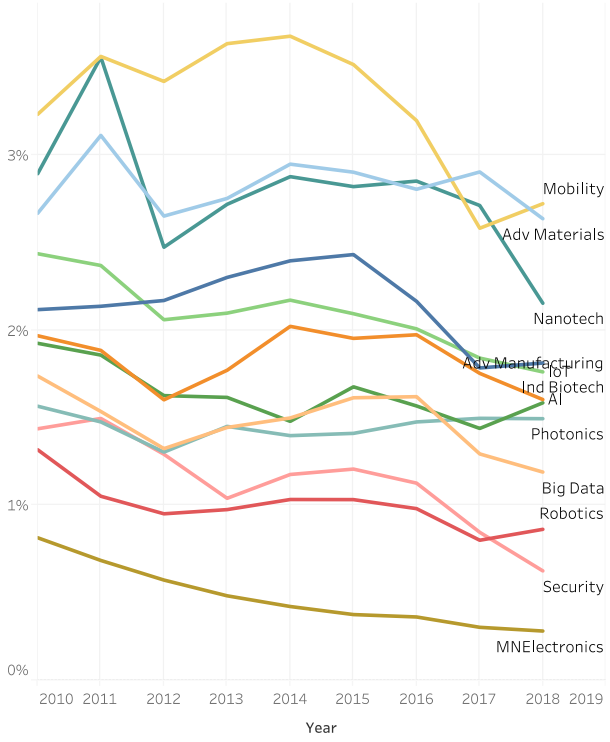


Source: Fraunhofer ISI, based on UN COMTRADE

The advanced technologies for which UK has the highest share of exports are Mobility (2.41%) and Advanced Manufacturing Technologies (1.94%), while the lowest share is observed for Micro and Nano Electronics (0.18%), followed by Security, Robotics and Nanotech.

Compared to Germany, France and Netherlands, the UK is the top exporter for none of the twelve advanced technologies, and usually ranks third or fourth in terms of world export share (except for photonics where it ranks second behind Germany). For all technologies, Germany is the top exporter, which causes again its performance to be displayed on a larger scale.

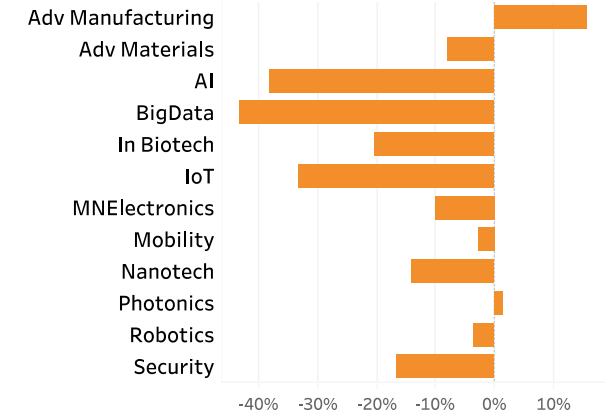
Figure 5: Change in the export share of the UK in world total (2010-2018)



Source: Fraunhofer ISI, based on UN COMTRADE

Figure 6 visualises the trade balance[4] in relation to the total trade volume of the UK in 2016.

Figure 6: Trade balance in relation to overall trade volume (exports - imports) (2018)



Source: Fraunhofer ISI, based on UN COMTRADE

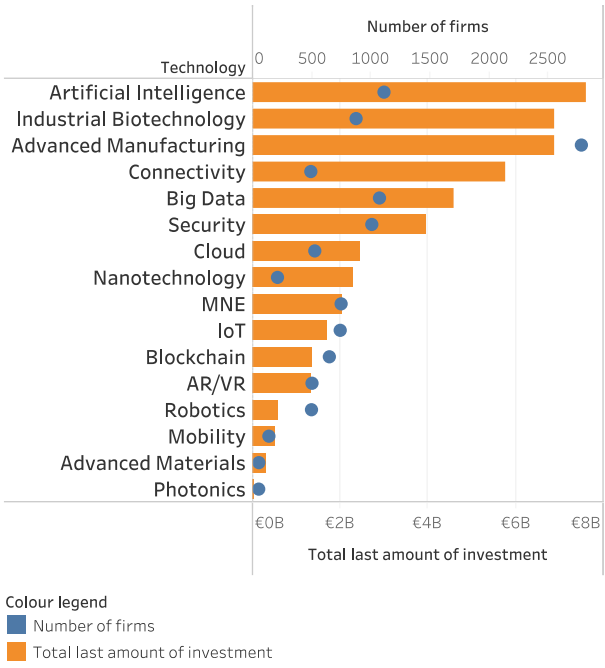
Besides a marked export surplus in Advanced Manufacturing, the UK displays a strong relative trade deficit with regard to goods relevant for all advanced technologies. Overall, however, this situation does not differ much from that of the EU, since the main exporters of advanced technology related goods are located in East Asia at least since the mid-1990s.

1.3 Investment activities

The following figure analyses private equity and venture capital (VC) investments in advanced technologies in the UK. Figure illustrates the number of investment-backed firms that develop advanced technologies and the amount of last VC funding based on Crunchbase[5] and Dealroom data.

The analysis suggests that the number of active, investment-backed firms was the highest in the fields of Advanced Manufacturing and AI in the UK in 2020, however, the level of investment was the highest in **Artificial Intelligence** followed up by **Industrial Biotechnology**.

Figure 7: The number of active investment-backed firms and the total amount of last VC funding in advanced technologies in the UK (2020)



Source: Technopolis Group based on Crunchbase and Dealroom

[4] Exports - Imports

[5] Private equity, venture capital investment and related innovative start-up creation have been explored based on a merged dataset available in Crunchbase and Dealroom. Crunchbase provides information on venture capital backed innovative companies.

Section 2

2. Key actors, policy and governance framework

2.1 Country overview

Table 1: Overview of policy strategies and measures in support of advanced technologies

Policy Strategy		
Title	***Year***	
UK Digital Strategy 2017	2017	
Realising Scotland's full potential in a digital world	2017	
Delivering a digital Wales	2010	
UK R&D Place Strategy	2020	
Policy Measures		
Title	***Year***	***Funding***
Catapult Centres	2011	£90 million/year (approximately €100 m) for 5 years (initial funding £10 million each, approximately €11 m)
Small Business Research Initiative (SBRI)	2015	£20 million (approximately €22 m)
Digital Training and Support Framework	2016	£35 million (approximately €39 m)
National Cyber Security Strategy	2016	£1.9 billion (approximately €2 bn)
IoT UK Programme	2017	A fraction of £40 million (approximately €44 m) for advancement in IoT
AI Sector Deal	2017	£950 million (approximately €1050 m) (plus funding from other projects)
Additive Manufacturing UK National Strategy 2018-2025	2017	£225 million (approximately €250 m)
National Industrial Biotechnology Strategy to 2030	2017	Par of £4.7 billion (approximately €5.2 bn) allocated to UK Industrial Strategy Challenge
Grand Photonic Challenges	2017	£2.3 billion (approximately €2.5 bn) in 2021/2022
UK Research and Innovation	2018	£7 billion (approximately €7.8 bn)
Building Digital UK (BDUK)	2021	£5 billion (approximately €5.5 bn)
Industrial Strategy Challenge Fund	2016	£2.6 billion (approximately €3 bn)

Source: authors

The United Kingdom is a multicultural and vibrant nation that is leveraging the innovativeness and broad exchange of ideas driven by the coexistence of different cultures in the same place. For these reasons, the UK and single country governments (Wales and Scotland in particular) are relentlessly working to create a well-structured and funded innovation landscape. However, there are still major improvements that can be done. According to the latest OECD figures, the UK gross domestic spending on R&D for 2019 was 1.7%, lower than the EU28 figures at 2.0% and OECD average set at 2.4%[6]. Despite the slightly lagging spending on R&D, in 2019 the United Kingdom was the sixth country in terms of ICT value added with 7.4% - in the first places there were Ireland (13.8%), South Korea (9.6%), Japan (8.1%) and Switzerland (7.4%) – though above the 6.0% OECD average[7].

The United Kingdom is on the right path to success in delivering innovation at scale as it is continuously updating its 'Digital Strategy', adding new technologies or related projects and funding. Noteworthy are also the digital policies set by each single Nation. For example, the Scottish digital strategy 'Realising Scotland's full potential in a digital world'[8] and the Welsh ICT strategy 'Delivering a digital Wales'[9]. Northern Ireland is lagging compared to the other two countries.

Broadly speaking, the leading UK's digital strategy is based on 5 key principles[10]: first, '*Pro-technology government*' with which the government has at the heart the transformation of the economy (and the government itself) pushing on the role of technologies to transform the relationships between government and citizens. Second, '*Sharing the benefits of technology widely and fairly*' to provide increased digitisation and productivity to open opportunities, especially outside London and the South East. This principle relates also to improve digital skills to better leverage opportunities from digital technologies. Third, '*Pro-innovation regulation*' where regulatory initiatives need to be set to implement sandboxes in financial and information services, and regulations have to effectively facilitate the adoption and widespread of technologies. Fourth, '*Protecting the vulnerable and ensuring safety and security*' envisions the combination of technical tools and education to enable people to take more confident and informed digital decisions, especially when sharing personal data. Last, '*Free and open Internet*' foresees open access Internet across the country and a multi-stakeholder governance to prevent limitation to freedom of expression and rights.

2.2 Government policies towards technology development and adoption

United Kingdom

In March 2017, the United Kingdom government published its last digital strategy document under the name '**UK Digital Strategy 2017**', following the previous Autumn Statement 2016[11,12]. This latest strategy plans to proactively build on UK's strengths and numerous opportunities to create a 'stronger, fairer country that works for everyone, not just the privileged few'[13]. The strategy was already built to lay the foundations for the post-Brexit economy, looking at long-term investments and opportunities for existing businesses and future ones, and for citizens and the future generations. Setting this long-term view is possible because of the long-standing history of (digital) innovation spur from the UK in the last century – noteworthy, Alan Turing and Enigma during the Second World War up to recent days with the growing number of UK born and based start-ups, scale-ups and unicorns especially in FinTech but also video games and EdTech.

The strategy, aiming at strengthening the vibrant potential in UK, is based on seven key pillars connecting the entire economy, from businesses to citizens, to leverage the benefits of the digital economy but with a careful eye to protect everyone from the potential risks driven by it.

- **Building world-class digital infrastructure for the UK**. With this first pillar, the UK government aims to set a properly up-to-date infrastructure across the country to help organisations and citizens to thrive in and access to the digital world. Connectivity is the focal point of this first pillar and it means setting 4G and superfast broadband across the

[6] OECD (2021), Gross domestic spending on R&D (indicator). doi: 10.1787/d8b068b4-en (Accessed on 02 August 2021)
[7] OECD (2021), ICT value added (indicator). doi: 10.1787/4bc7753c-en (Accessed on 02 August 2021)
[8] https://www.gov.scot/policies/digital/
[9] https://gov.wales/digital-wales
[10] https://www.techuk.org/insights/opinions/item/16630-five-principals-to-guide-government-digital-policy
[11] The Autumn Statement is a document defining government's plans for the UK economy based on latest forecast from the Office of Budget Responsibilities (OBR). Already in Budget 2016, the UK government stated a £390 million (approximately €432 m) for future transport technologies (infrastructure tests for driverless cars, electric and hybrid buses, and ultra-low emission vehicles); £1 billion (approximately €1.1 bn)for full-fibre broadband (by 2020-2021) and trialling 5G networks; £2 billion more (approximately € 2.2 bn) per year in R&D funding by 2020-21 (especially dedicated to businesses and universities with R&D projects in the pipelines). https://www.gov.uk/government/news/autumn-statement-2016-some-of-the-things-weve-announced
[12] https://www.gov.uk/government/news/autumn-statement-2016-some-of-the-things-weve-announced
[13] https://www.gov.uk/government/publications/uk-digital-strategy/uk-digital-strategy

country to have the right foundations to rapidly roll-out 5G.

- **Giving everyone access to the digital skills they need**. The second pillar envisions changes in the education system to improve children digital skills and knowledge. However, this is not only about future generations: the UK government aims to fill the gap in digital skills for people already accounted in the workforce to harness productivity benefits that the digital innovation brings.
- **Making the UK the best place to start and grow a digital business**. UK is already a nation with a well-structured and flourishing tech environment. There are already several tech hubs across the country (Leeds, Liverpool, Manchester, Newcastle, Sheffield, and Croydon Tech City), but this is not enough. These hubs need to be multiplied and grow stronger, and for this reason the government already in late 2016 decided to invest even further to strengthen 2020-2021 R&D funding to support Internet of Things (IoT), autonomous vehicles programs, EdTech and HealthTech, along the already well-nourished Artificial Intelligence, FinTech and gaming ecosystems.
- **Helping every British business become a digital business**. This fourth pillar strongly relies on the implementation of the second one – 'Giving everyone access to the digital skills they need' – as the adoption of digital technologies can be addressed only if the working population is able to understand and use them. The deployment of digital solutions by every business in the country will boost productivity and further innovation. In this context, the UK government plans strategies to increase exports and broaden the number of businesses with access to e-marketplaces.
- **Maintaining the UK government as a world leader in serving its citizens online**. This fifth pillar is around government implication and involvement in the digital economy. With this pillar, the government intends to act upon the idea of 'Government as a Platform' to secure the use, reuse and sharing of data across the different governmental departments and cabinets. This will further boost the strong position of the UK digital government, especially in providing online services to citizens and organisations, improving efficiency, reducing costs, and ensuring an increasingly broader usage of online services.
- **Unlocking the power of data in the UK economy and improving public confidence in its use**. This last pillar focuses on recognising UK as a world-leader data-driven economy, in which organisations, citizens and the government are enabled to access and use data to fuel economy in a secure and trusted way, coupling UK regulations on data protection with the European General Data Protection Regulation (GDPR).

UK R&D Place Strategy

Through its **UK Research and Development Roadmap**, the UK has developed a comprehensive and ambitious **R&D Place Strategy** with the goal to drive place-based outcomes from UK R&D system, thus accelerating the country's economic recovery and levelling up disparities across the UK after the Covid-19 crisis. The Place Strategy will set out how the government will invest in research and innovation in places around the UK and align this with devolved priorities and initiatives. The development of this programme is expected to support economic recovery by protecting and backing the most promising regional R&D clusters.

The government will consider the case for developing new schemes and initiatives in consultation with place-based representatives to achieve the ambitions – new forms of funding, new investments and new partnerships. A set of stakeholders will be working together like administrations, businesses, academics, universities, charities and local leaders who will dedicate their work on how to ensure that more parts of the UK are attractive to private investment – including from overseas – to unlock their full potential for R&D growth.

Scotland

Before setting the new digital strategy, Scotland was relying on what was called 'Scotland's Digital Future: A Strategy for Scotland'[14], published in 2011. Already with this strategy the Scottish government was aiming at extending the connectivity, promoting the digital economy, and sustaining active digital participation, and plans to digitise the public sector and the services provided. With the issue of the '**Realising**

[14] https://www.gov.scot/publications/scotlands-digital-future-strategy-scotland/

Scotland's full potential in a digital world', the Scottish Government 'will ensure that Scotland is recognised throughout the world as a vibrant, inclusive, open and outward-looking digital nation'[15]. This will be made possible as the strategy defines guidelines and plans to embed digital in every action done to deliver inclusive growth, diffused digital skills and literacy, and reduce social exclusion. Among the long list provided in the action plan some items stand out as critical to achieve Scottish digital development:

- Launch a new Digital Growth Fund to fill the existing gaps in the availability of digital skills.
- Broaden the Digital Boost program to sustain and grow the digital maturity of businesses across Scotland.
- Set the 'digital conditions' to support industries to thrive and employing over 150 000 people in digital technology roles by 2025.
- Provide 30 megabits broadband across the nation (Digital Scotland Superfast Broadband[16]), help citizens to better understand how personal data can be safely used for the public benefit, and set a platform to grant people access to the digital world in respecting digital rights and responsibilities.
- Test and ensure the Critical National Infrastructure is secured by cyber-attacks.

Wales

The aim of '**Delivering a digital Wales**' is to create 'a smarter, better connected society and economy making sure everybody in Wales has access to digital technologies and know how to use them'[17] (December 2010). Hence, the Walsh digital plan has 5 main principles: inclusivity, enhancing skills, strengthen the economy, modernise public services and improve infrastructures. With an integrated though holistic approach, the Walsh government is working to create collaborations among a wide range of potential partners from business, to academia and society to achieve the expected digital modernisation. The Welsh digital agenda is built around connecting and advancing both the private and public sectors, creating ways to grasp the opportunities open by the rapid pace of technological development to boost the economy and society. More in depth, the objectives of the Wales digital strategy are[18]:

- An inclusive, sustainable and prosperous society – this allows citizens to access to digital technologies and improve the quality of their lives.
- Skilled and competent people – empower citizens with the necessary digital skills and digital literacy. This is a mandate that covers every citizen of any age, from children to elderly, as it is critical to enhance trainings to people in the ICT space.
- A thriving and competitive digital economy – boost the Welsh ICT space, creating opportunities to innovate, exploit and commercialise innovations, especially when this comes from Welsh organisations.
- Transform public services – this objective aims to deliver public services in a cost-effective and quicker way, enforcing the concept of digital-first.
- First class digital infrastructure – strengthen the Welsh digital infrastructure to increase global competitiveness of the Nations and leaving space for forward-looking initiatives to deliver a Digital Wales.

2.3 Government initiatives to foster specific advanced technologies

This paragraph presents only technology related programs issued by the UK government following the different digital strategies. Noteworthy, these projects are a selection of all the technology measures adopted by the UK government. As the broad coverage of the digital strategies, different Ministries are involved in the creation and roll-out of technology policies as they span from education to technology development and to commercialisation.

Digital Training and Support Framework[19]

The framework, initiated in 2016 to be carried out until 2021, was created to provide the communities with 'assisted digital and digital inclusion services'[20] as part of the Government Digital Inclusion Strategy. Within the digital inclusion services, noteworthy are the ones dedicated to research and analysis and digital training courses to improve skills and

[15]https://www.gov.scot/publications/realising-scotlands-full-potential-digital-world-digital-strategy-scotland/pages/1/
[16] https://www.scotlandsuperfast.com/
[17] https://gov.wales/digital-wales
[18]https://gov.wales/sites/default/files/publications/2019-07/delivering-a-digital-wales.pdf
[19]https://www.contractsfinder.service.gov.uk/Notice/c887d39a-626d-43a4-982a-e39bf5de6048?_ga=2.149435830.181034415.1595494209-1534312908.1583406408
[20] https://www.crowncommercial.gov.uk/agreements/RM3765

understanding of the digital world by users with different backgrounds and within different communities. The total value of this framework, generated as a tender, was of £35 million (approximately €39 m) for the 5-year period.

The Digital Centres[21]

Despite this programme being initiated in 2011 (by Innovate UK[22]), it is still of a major relevance for the UK digital and technological development. The nine Catapult Centres aim at promoting the research and development of technologies and sectors with business-led collaborations (private-academia-public) to provide scientists and engineers with the right environment to innovate, create and subsequently exploit them through market opportunities. The catapults are funded thanks to a joint funding: one third is the 'core' £10 million (approximately €11 m) funding provided by the government (per year for five years), one-third comes from commercial funding and the last third comes from collaborative – private and public – research and development funding. The nine catapults cover different areas of expertise: High Value Manufacturing[23] (October 2011), Cell and Gene Therapy[24] (October 2012), Satellite Applications[25] (December 2012), Offshore Renewable Energy[26] (March 2013), Digital[27] (June 2013), Energy Systems[28] (April 2015), Medicines Discovery[29] (December 2015), Compound Semiconductors Applications[30] (2016) and Connected Places[31] (April 2019 – merger of 2 previous different projects).

UK Research and Innovation[32]

This is a broad partnership created to allow stronger relationships among universities, research organisations, businesses, charities and the government to lay the foundation to thrive in research and innovation. The initial 2018's funding was of £7 billion (approximately €8 bn), combined budget) and it aims at increasing the R&D expenditure to 2.4% of GDP by 2027. To achieve the increase in the R&D expenditure, the partnership relies on core principles, such as nurturing a diverse but inclusive culture – where people with different education but also cultural background can come together to leverage chances of co-creation -, strengthening the business process from research to commercialisation of ideas and projects, and create leadership in the world key industries.

IoT UK Programme[33]

This is a joint programme between the Digital Catapult and the Connected Places Catapult (Future Cities) created to advance the leadership of UK in the IoT space and leverage the potential driven by this technology. This project funded in 2017 is part of an investment of £40 million (approximately €44 m) in the IoT space. The expected outcome is to enable UK organisations and public sector to strengthen IoT usage in specific areas, such as trust, data interoperability, investment justification and design development. Within this programme, one also finds the new UK regulation to achieve household safety and security in the IoT space: 'We want to make the UK the safest place to be online with pro-innovation regulation that breeds confidence in modern technology'[34] (Matt Warman, UK Digital Minister).

National Cyber Security Strategy[35]

This 2016 strategy is the revamp of the previous £860 million (approximately €954 m) 'National Cyber Security Strategy' defined in 2011. The renewed strategy envisions a total funding of £1.9 billion (approximately €2.1 bn) over a period of 5 years (2016-2021). The 2021 vision is to create a secure and resilient environment against cyber threats and build in parallel a prosperous and confident digital world. This strategy is based on three key objectives: *defend* the UK against cyber threats and being able to resiliently respond to incidents, *deter* potential cyber-attacks and creating a regulatory plan to pursue and prosecute offenders, and *develop* an innovative and vibrant cyber security community, sustained by organisations and research institutes which actively engage in research and development.

Small Business Research Initiative (SBRI)[36]

The SBRI is a project designed to enable the public sector, on one hand, to easily access new ideas and technologies to speed up the adoption while supporting innovators, on the other hand, innovators will obtain visibility and funding for their projects, ideas and innovations. The public sector will engage with innovators (physical

[21] https://catapult.org.uk/catapult-centres/
[22] https://www.gov.uk/government/organisations/innovate-uk
[23] https://hvm.catapult.org.uk/
[24] https://ct.catapult.org.uk/
[25] https://sa.catapult.org.uk/
[26] https://ore.catapult.org.uk/
[27] https://www.digicatapult.org.uk/
[28] https://es.catapult.org.uk/
[29] https://md.catapult.org.uk/
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[33] https://www.digicatapult.org.uk/for-large-businesses/collaborative-research-and-development/iotuk
[34] https://www.uktech.news/news/government-to-strengthen-security-of-internet-connected-products-20200127
[35] https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/567242/national_cyber_security_strategy_2016.pdf
[36] https://www.gov.uk/government/collections/sbri-the-small-business-research-initiative

people or organisations) already in the early stages of development until the commercialisation phase, which will be primarily adopted by the UK or local governments. This initiative is part of the UK Industrial Strategy[37] and the Government Technology Innovation Strategy[38] with a funding of £20 million (approximately €22 m).

AI Sector Deal[39]

As part of the Industrial Strategy, the AI Sector Deal is a programme aiming at strengthening the AI and Big Data industry in UK, especially creating clusters in Belfast, Bristol, Cambridge and Edinburgh. This is a joint programme between organisations and government and it spans from supporting university and PhD degrees, granting visa to prominent talents from abroad and supporting the process from research to commercialisation, both on the market but also with the government as first buyer. Among the main topics covered, data sharing, data trust, ethics in AI are the major ones. The deal was launched in 2019 and it envisions almost £950 million (approximately €1 054 m) to support the sector, in addition to £603 million (approximately €669 m) of new funding, £342 million (approximately €380 m) of already existing budget, plus £250 million (approximately €277 m) coming from the Connected and Autonomous Vehicles.

Among the initiatives highlighted, several others have been designed by the UK government over the years. Some other examples are the National Data Strategy[40] (to build a leading data economy and ensure trust in data usage), the Code4Health Initiative[41] (supported by NHS England and NHS Digital to understand and set best practices in using digital tools and technology in healthcare), and the Mobile Data Strategy[42] (a long-term strategy to improve the capacity of mobile networks to make front to the rapidly increase of mobile data usage from smartphones, tablets and laptops).

Additive Manufacturing UK National Strategy 2018-2025[43]

Since 2014, experts and researchers have closely worked to expand UK's research and knowledge in additive manufacturing. In 2017, UK created a multi-year strategy to foster knowledge, development and commercialisation of additive manufacturing technologies in order to empower its manufacturing sector. The programme is supposed to receive government-based funding for £225 million (approximately €250 m) over the 2018-2025 period, on top of private organisations/industry and institutes funding. The program's objectives are listed in a long list detailing different purposes but of extreme relevance are identifying and overcoming market barriers to foster commercialisation, exploiting competitive advantages from leading research, and creating a solid and connected ecosystem where players can thrive[44].

National Industrial Biotechnology Strategy to 2030[45]

In 2017, the UK government launched the multipurpose 'Industrial Strategy', in which it set also the basis for the biotechnology initiatives. The National Industrial Biotechnology Strategy to 2030 aims to create and connect the industrial British biotechnology community to foster innovation and uptake of industrial biotechnology. In the same period, the British government has also set the roadmap for the 'Clean Growth Strategy'[46]. This strategy to 2030 aims to ensure that the correct framework is in place to collaborate and foster innovation and competitiveness. Funds for this project are a mix of public and private. For instance, this is partially funded by £4.7 billion (approximately €5.2 bn) provided by the UK government for the 'UK Industrial Strategy Challenge' (2017-2021), which includes around £1 billion (approximately €1.1 bn) for areas linked to bioeconomy (healthcare, robotics and AI, telemedicine, manufacturing materials of the future, etc.). Further to this, also local national plans provide for a partial funding of these projects (i.e. the Scottish National Plan for Industrial Biotechnology). Over the last decade, more than £300 million (approximately €333 m) has been invested by the public sector. In addition, specific initiatives within the strategy have received additional funds, for example, sustainable plastic packaging initiatives has been funded with £60 million (approximately €66.5 m)[47].

[37]https://www.gov.uk/government/publications/industrial-strategy-building-a-britain-fit-for-the-future
[38]https://www.gov.uk/government/publications/the-government-technology-innovation-strategy
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[47]https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/761854/181205_BEIS_Growing_the_Bioeconomy__Web_DPS_.pdf

Grand Photonic Challenges[48]

According to 2018's 'UK Photonics: The Hidden Economic Engine' report, the UK photonic industry is valued around £12.9 billion (approximately €14 bn) a year, hence this is a relevant sector for the British economy[49]. For this reason, the UK government committed an investment of £2.3 billion (approximately €2.5 bn) for 2021/2022 for the photonics R&D – budget allocated in the Government's Autumn Budget (2017). With this further funding, the budget for this initiative for 2021/2022 will reach £12.5 billion (approximately €14 bn). As this challenge touches upon and crosses many other different research areas/challenges, such as AI and data economy, clean growth, future of mobility and ageing population, this initiative will be boosted with further government investments that are shifted or split from other research areas to photonics.

Building Digital UK (BDUK)

Building Digital UK (BDUK)[50], is part of the Department for Digital, Culture, Media & Sport (DCMS) and responsible for ensuring that every UK home and business can access fast and reliable digital connectivity. UK government is investing £5 billion (approximately €5.5 bn) to ensure that the entire country will have the same access to gigabit-capable broadband.

More than one million hard-to-reach homes and businesses will have next generation gigabit broadband inbuilt in the first phase of this infrastructure project. As a result, Project Gigabit will accelerate Covid recovery, fire up high growth sectors like tech and the creative industries and level up the country, spreading wealth and creating jobs.

The successful Gigabit Broadband Voucher Scheme is also being relaunched with up to £210 million (approximately €245 m) to give people in eligible rural areas immediate financial help to get gigabit speeds. On top of this the UK government is making up to £110 million (approximately €128 m) available to connect public sector buildings - such as surgeries, libraries and schools - in the hardest-to-reach parts of the UK with this infrastructure.

Industrial Strategy Challenge Fund

The Industrial Strategy Challenge Fund (ISCF)[51] addresses the big societal challenges being faced by UK businesses today. It is made up of 23 challenges, covering the four themes of the government's industrial strategy: clean growth, ageing society, future of mobility, artificial intelligence and data economy.

The fund is backed by £2.6 billion (approximately €3 bn) of public money, with £3 billion (approximately €3.5 bn) in matched funding from the private sector to invest in challenges ranging from Quantum Technologies and Robotics, through to Small Modular Reactors. Following the impact of Covid-19, as well as the UK forging a new outward-looking future outside of the EU and across globe, ISCF is planned to do even more to support new and emerging industries, push for greater regional regeneration and take a more flexible and agile approach to deliver results.

[48] https://photonicsuk.org/revolutionising-our-world/grand-photonic-challenges
[49] https://photonicsuk.org/wp-content/uploads/2018/05/UK_Photonics_The_Hidden_Economy.pdf
[50] https://www.gov.uk/guidance/building-digital-uk
[51] https://www.ukri.org/our-work/our-main-funds/industrial-strategy-challenge-fund/

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About the 'Advanced Technologies for Industry' project

The EU's industrial policy strategy promotes the creation of a competitive European industry. In order to properly support the implementation of policies and initiatives, a systematic monitoring of technological trends and reliable, up-to-date data on advanced technologies is needed. To this end, the Advanced Technologies for Industry (ATI) project has been set up. The project provides policymakers, industry representatives and academia with:

- Statistical data on the production and use of advanced technologies including enabling conditions such as skills, investment or entrepreneurship;
- Analytical reports such as on technological trends, sectoral insights and products;
- Analyses of policy measures and policy tools related to the uptake of advanced technologies;
- Analysis of technological trends in competing economies such as in the US, China or Japan;
- Access to technology centres and innovation hubs across EU countries.

You may find more information about the 16 technologies here: https://ati.ec.europa.eu.

The project is undertaken on behalf of the European Commission, Directorate General for Internal Market, Industry, Entrepreneurship and SMEs and the European Innovation Council and Small and Medium-sized Enterprises Executive Agency (EISMEA) by IDC, Technopolis Group, Capgemini, Fraunhofer, IDEA Consult and NESTA.

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