



European data economies trade project: Background research and mapping

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About this report

From April 2018 to March 2019, the Open Data Institute will be working to support international trade opportunities for data-enabled businesses - in particular, in Germany, France, the Netherlands, and Belgium. The ODI commissioned this report from Oxford Insights to help inform its decisions about how best to invest time and effort in 2018-19.

Summary

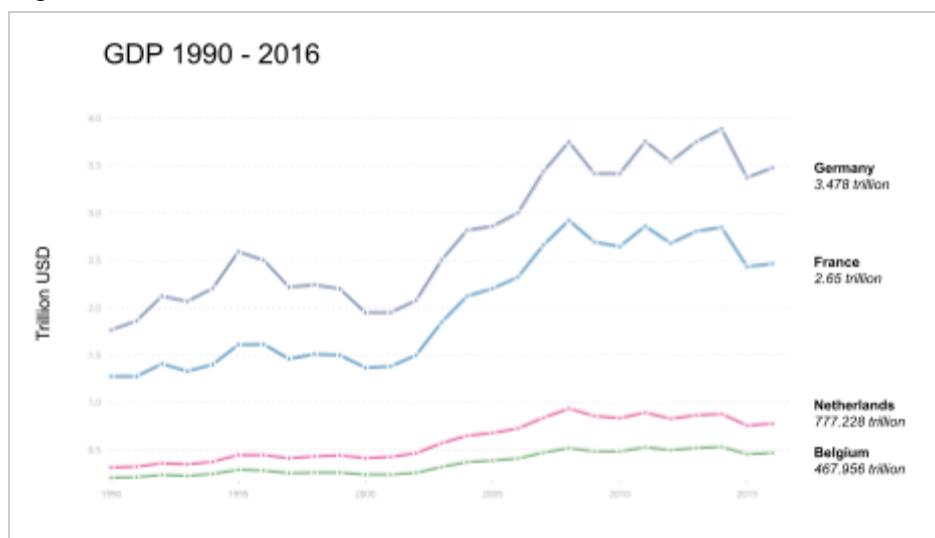
This report is a high-level analysis of the data economies of Germany, France, the Netherlands, and Belgium: ‘sizing the prize’, mapping out key stakeholders, and assessing the impetus for change. Our emphasis was breadth rather than depth, with a view to directing future research and development resources.

Our analysis is divided by country, with each consisting of the following sections: mapping the data economy; an overview of relevant data-related legislation and regulation, including the likely impact of GDPR; high-level qualitative mapping of the finance, transport, artificial intelligence, healthcare, and energy and utilities sectors.

The four countries reviewed are all making strong progress both in opening up and capitalising on the value of data, but this progress is uneven across countries and sectors.

National data economies: an overview

Different pictures emerged of the data economies in each of the countries we studied. The four economies range in size: Germany is the largest economy in the EU, France the 3rd, the Netherlands is 6th and Belgium 9th.¹ However, in terms of the EU’s Digital Economy and Society Index (DESI), which measures digital performance and competitiveness, the most advanced digital economy of this group is the Netherlands, which is 4th, and Belgium is 6th, while Germany and France lag behind them at 11th and 17th respectively.² Digital progress is not dictated purely by economic might.

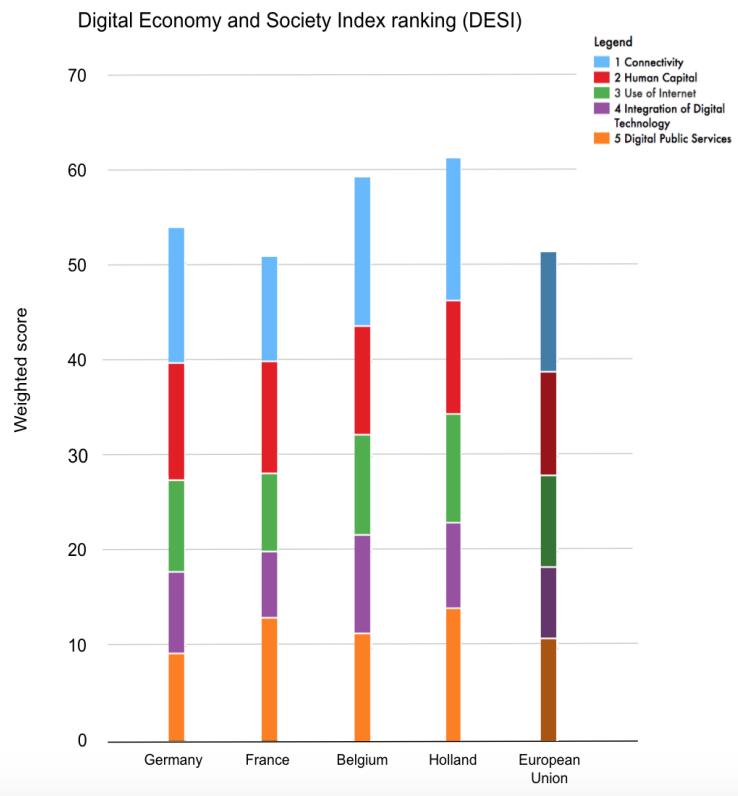


Source: World Bank³

¹ [Eurostat \(2017\) Share of Member States in EU GDP](#)

² [European Commission \(2017\) The Digital Economy And Society Index \(DESI\)](#)

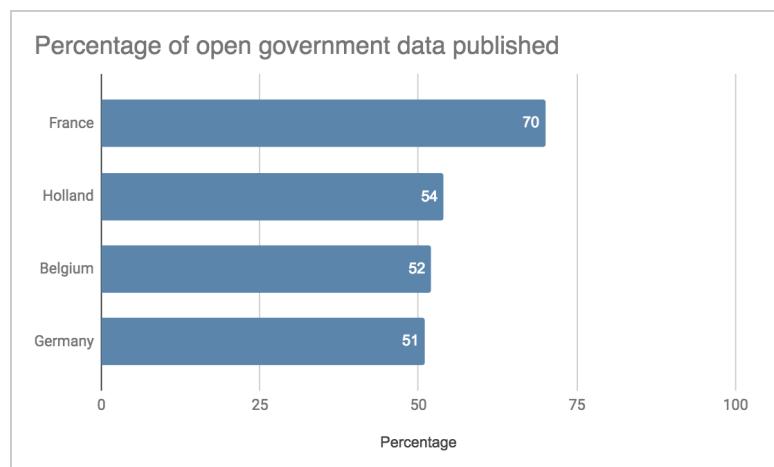
³ [World Bank \(2017\) DataBank](#)



Source: EU Digital Economy and Society Index 2017⁴

The Global Open Data Index, which measures open government data publication, told a further story: France is the leader here, in 3rd place, while the Netherlands (20th), Belgium (22nd) and Germany (24th) all perform relatively poorly given their high DESI rankings and large economies.

Country	Open Data Index 2017 Rank
France	3rd
Netherlands	20th
Belgium	22nd
Germany	24th

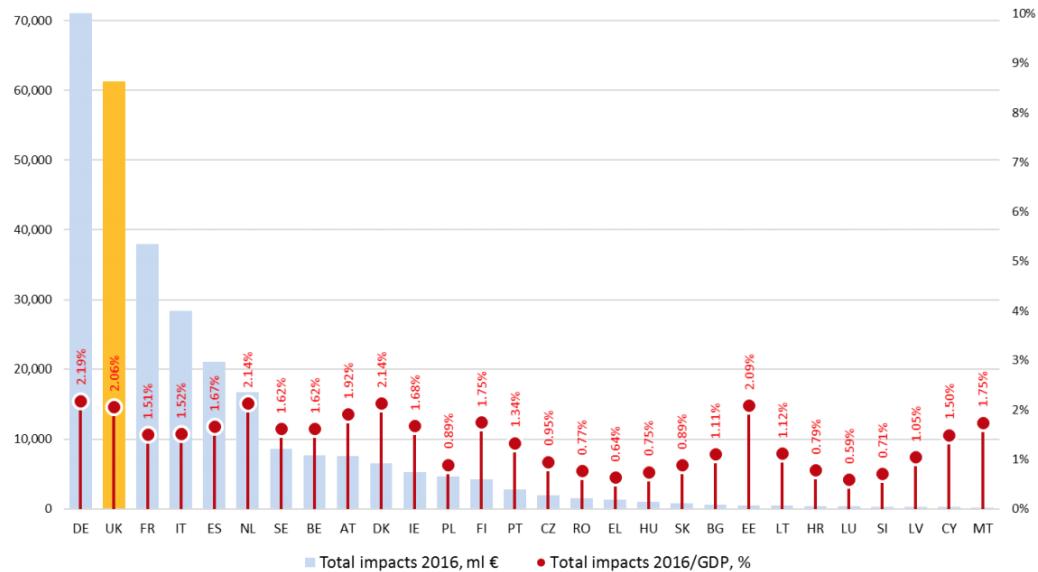


Source: The Global Open Data Index 2017⁵

⁴ [EU Commission \(2017\) The Digital Economy and Society Index](#)

⁵ [Open Knowledge International \(2017\) Global Open Data Index](#)

The International Data Corporation's 2017 report⁶ into the European data market reports on the value of the data market for each country. These findings are displayed in the graph below. In the EU, Germany's data market is the most valuable, France's is third, e Netherlands' is sixth and Belgium's is eighth. As per IDC analysis, this suggests that all the countries studied here already have relatively high market penetration of data products and services. All are therefore theoretically well positioned to take advantage of the economic benefits of the data economy.



Graph displaying the value of European countries' data markets. Source: European Data Market Monitoring Tool, IDC October 2016⁷

High-level sector mapping: an overview

Finance

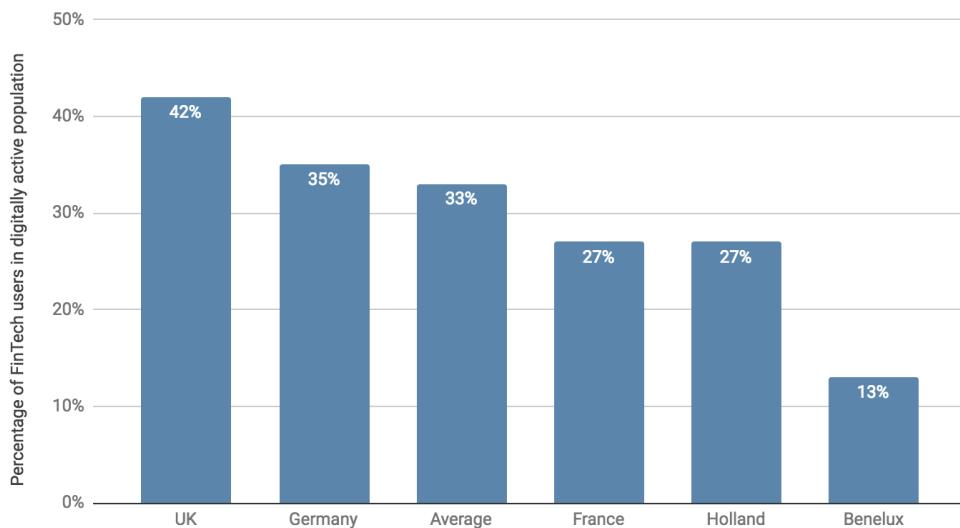
All of the countries studied here have reasonably strong and growing FinTech sectors. There is also a trend of banks in these countries successfully collaborating with tech firms and taking advantage of the opportunities presented by big data and new technologies. They have varying rates of consumer FinTech adoption amongst the digitally active population, however (as displayed in the graph below): Germany leads with 35 percent; France has 27 percent; Netherlands has 27 percent; and Belgium and Luxembourg together have 13 percent (the average of countries studied was 33 percent).⁸

⁶ [International Data Corporation \(2017\) European Data Market: Final Report](#)

⁷ *Ibid.*

⁸ [Ernst and Young \(2017\) EY FinTech Adoption Index 2017](#)

European FinTech adoption rates



Source: EY FinTech Adoption Index 2017⁹

In the Netherlands, there is political will to drive the FinTech sector, with the 2017 coalition agreement explicitly recognising the value of innovative financial technology and recognising the need for relaxing regulation to foster innovation. Applications of big data in banking is one of the focus areas of the country's Commit2Data programme. The Belgian government has similarly acknowledged the value of the sector, with Finance Minister Johan van Overtveldt seeking to build bridges with UK FinTech firms to maintain links after Brexit. The German government has, amongst other measures, set up FinCamps to promote dialogue with German FinTech companies. The French government has similarly sought to attract FinTech from the UK after Brexit.

Transport

Given the integrated nature of Europe's transport network, there is a significant amount of EU-level cooperation and initiatives involving big data and tech to improve transport. All four countries are part of the EU's C-Roads project, which aims to use tech to enable vehicles to communicate with one another as part of a move towards a smart roads network.

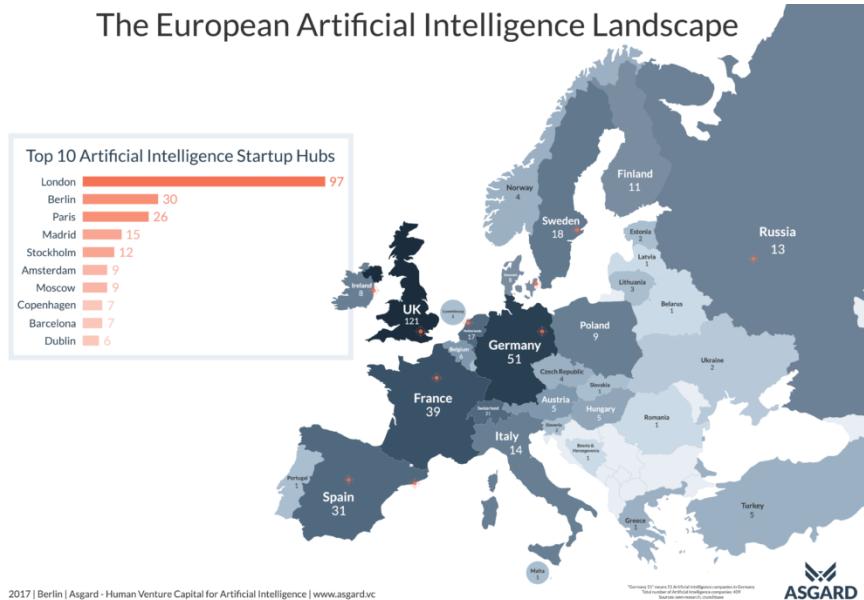
At a national level, there is a policy focus on intelligent transport and autonomous vehicles, with governments such as Germany and the Netherlands stating their intentions to make progress in these areas. There has been significant private sector innovation in the transport sphere, as seen in the success of companies such as German taxi-hailing app Mytaxi and French ride-sharing app BlaBlaCar. There is also a trend of more traditional transport industry giants investing in innovative new tech companies, such as Daimler buying a share of Mytaxi, Volkswagen investing in taxi-hailing app Get, and TomTom buying a self-driving car startup.

⁹ *ibid.*

Artificial intelligence

Under Macron, France is taking a number of steps to reverse its traditionally anti-tech, anti-entrepreneur image. AI has been a focal point of the current administration, including the country becoming one of the first ten in the world to publish a national AI strategy (#FranceIA), and Macron recently announcing €1.5 billion of investment into AI research.¹⁰ Germany, the Netherlands and Belgium currently do not have comprehensive national AI strategies, although the German and Dutch governments seem to be more committed than the Belgian government to making AI a national priority area based on statements and policy documents.

The European Artificial Intelligence Landscape



Source: Asgard¹¹

In the private sector, the capital cities of each of these countries except Belgium are major tech hubs: Berlin, Paris and Amsterdam are the 2nd, 3rd and 6th biggest AI startup hubs in Europe respectively.¹² Germany also has Munich at 5th position and Frankfurt at 11th, and the Netherlands has the Hague at 13th. Although Belgium tends to lag behind the other three countries in terms of its AI sector, it does still have two of the top 15 hubs of AI talent in Europe: Brussels (12th) and Antwerp (14th).¹³

At the EU level, there is the issue that amounts of data available for training algorithms for AI is very different to, for example, the US, where there are huge data lakes held by commercial companies, or China, where Alibaba can be trained using government data. The fragmented nature of data across the EU limits the speed of developing AI.¹⁴

¹⁰ Cerulus, L. (2018) [Macron: France to invest nearly €1.5B for AI until 2022](#), Politico

¹¹ Fabian (2017) [The European Artificial Intelligence Landscape](#)

¹² *ibid.*

¹³ Tibau, F. (2016) [Brussels and Antwerp in top 15 European AI hubs](#), Startups.be

¹⁴ Interview with Ton Zijlstra, European open data expert, 12 April 2018

Healthcare

Most countries have struggled with the issue of how to handle personal privacy when considering how to capitalise on patient data to enable large-scale digitisation of healthcare. Belgium and France have recently announced new regulations or amendments to existing regulations to address this, but cumbersome regulation remains a limitation to eHealth in Germany, in particular.

All the countries included in this report recognise the potential of eHealth and the need to digitise healthcare, but large-scale digitisation seems to remain fairly elusive. The Netherlands, Belgium and Germany have established or plan to establish ‘Health Valleys’ to encourage cooperation between the public and private sector to foster innovations in the field of eHealth. This is a key area in which other governments may learn from the UK, as the NHS is a good example of the opening up of selected healthcare data, and how this can be used to make the system more efficient.

Energy and utilities

Across Europe, governments are seeking to make the transition toward greater use of renewable energy sources, a process which most recognise will require greater reliance on digital technologies and the use of big data. Smart networks featuring smart grids and smart meters to transmit data on energy consumption are an extremely popular innovation in all four countries and a useful source of big data. Using this data is not always straightforward, as seen in the Netherlands where public-private energy transporters can be forced to turn down open data requests due to privacy concerns and contractual confusion around the conditions under which public and private entities and individuals share their data into the pool.¹⁵

Partly as a result of EU directives to liberalised energy markets, there has been major innovation taking place in the energy sectors of the countries in this report. This has led to movement away from traditional oligopolies consisting of a small number of energy giants in each country, which has created space in the market for smaller digital and data-driven companies to flourish. As a result, start-ups are springing up with solutions for problems such as how to optimise energy use using customer data, and how to store energy from renewable sources. The field of ‘clean tech’ startups in each of these countries is rapidly developing and highly innovative, and will be worth monitoring closely over the coming years.

¹⁵ *ibid.*

Defining the data economy

There is a lack of consensus regarding the definition of a data economy. We considered a number of possible definitions, including an attempt to crowdsource a definition on social media (with limited success). Ultimately, the definition we have settled on for the purposes of this report follows most closely that used by the Big Data Value Association (an EU Commission strategic partner):

The data economy is the total social and economic value derived from using data.

When measuring the data economy, there are a number of possible indicators to take into account. As per the International Data Corporation's report on the European data market,¹⁶ these include the total number of data workers (those who collect, store, manage and analyse data), companies that produce and deliver data-related products and services, and the value of the overall data market.

¹⁶ [International Data Corporation \(2017\) European Data Market: Final Report](#)

Germany

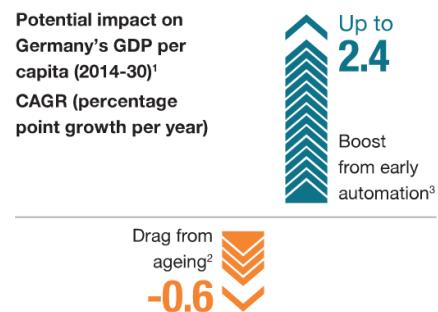
Mapping the data economy

Germany is the economic powerhouse of Europe. It is the fourth largest economy in the world, and the largest in the EU, accounting for around 21 percent of total EU GDP.¹⁷ As of 2017, it is the second fastest growing economy in the G7 (after Canada), with a growth rate of 0.6 percent in the first quarter of that year.¹⁸ Additionally, employment in the country has increased by over 10 percent over the last decade.¹⁹ Germany's strengths as a large, fast-growing economy with increasing employment mean that it is well placed not only to manage, but to take advantage of, disruption caused by technological change. Germany's GDP is forecast to potentially increase by €82 billion if German businesses capacity to exploit digital technologies is fully realised.²⁰ However, thus far digital progress has tended to lag behind other indicators, and Germany ranks 11th in the 2017 Digital Economy and Society Index.²¹

The country's 'Digital Strategy 2025'²² emphasises the idea that data is the backbone of Germany's planned digital transformation. It also explicitly references the value of data to businesses and the economy: "how data is handled is a decisive factor in the success of modern business...in the long run, the key competencies of successful companies will revolve around collecting, processing, linking and protecting data".²³ The need to ensure that manufacturing companies, production sectors and other businesses can continue to compete with new market players with superior understanding of data is recognised as an urgent priority for policymakers to address.²⁴

Data was also a key theme in the recent Coalition Agreement,²⁵ signalling the country's commitment to focus on digital policy and data as a central dependency for this. This is a change in approach, as Germany has not previously had a strong focus on data openness, and is only a

Automation could boost Germany's economy and offset population decline



Source: McKinsey report on Germany's digital economy (2017)

¹⁷ Eurostat (2017) Share of Member States in EU GDP

¹⁸ Goodley, S. & Inman, P. (2017) UK comes bottom of G7 growth league as Canada takes lead. The Guardian

¹⁹ *ibid.*

²⁰ Federal Ministry for Economic Affairs and Energy (2016) Digital Strategy 2025: 6

²¹ European Commission (2017) The Digital Economy And Society Index (DESI)

²² *ibid.*

²³ *ibid.*: 6

²⁴ *ibid.*: 8

²⁵ [German] Coalition Agreement between the CDU, CSU and SPD (2018)

recent member of the Open Government Partnership (2016).²⁶ Pledges included a new law on open data, an intensive review of data protection in mid-2020, and the prioritisation of data as a central dependency of the new goal to spend 3.5 percent of GDP on areas including AI and digitisation. Additionally, Germany plans to establish an e-Government agency to carry out pilots with the aim of improving public services and governance. The government also announced a €500 million commitment to help ensure that citizens' data is used in a transparent manner, including exploring the possibilities offered by Blockchain for public authorities. Germany has also committed to a national research data infrastructure, to help standardise and improve access to banks of data.²⁷

As well as this action from central government, which has contributed to Germany improving its rank in EU's Open Data readiness index from 20th in 2016 to 17th in 2017,²⁸ there is significant 'bottom-up' impetus, from both the state level, and citizens. (Examples of state-level legislation promoting open data are discussed in the 'key legislation and regulation' section of this chapter, below). The drive by citizens and businesses for open data can be seen in the abundance of hackathons organised throughout Germany, and the number of startups that applied for the European Commission's Open Data Incubator for Europe programme (133, meaning the country ranked third after the UK and Spain).²⁹ The country continues to lag in open data rankings, however, behind its European economic rivals: it is currently 24th in the Global Open Data Index, behind Britain (2nd), France (3rd), the Netherlands (20th) and Belgium (22nd).³⁰ This is at least in part due to the country's historically strong stance on protecting individuals' data.

According to Financial Times analysis from 2017,³¹ German industry is lagging when it comes to taking advantage of the opportunities afforded by big data and digital disruption. Although Germany is an economic powerhouse and home of automobile industry giants such as BMW, Audi, and Mercedes-Benz, many fear that digitisation could undermine Germany's position of economic strength, and that Germany's 'old' industries are not well placed to cope with digital disruption. As German Chancellor Angela Merkel said in 2014: "We have the opportunity for a digital economic miracle. The question is whether or not it will happen in Germany".

If German industry does not digitally transform, it risks a decline in industrial value added of €220 billion by 2025.³² German companies could instead become subcontractors for digital platforms that connect consumers and hardware products. Germany's response to the risk of disruption posed by tech giants thus far has tended to be additional regulation, such as the banning of Uber and Airbnb in several major cities. There is uncertainty over whether Germany has the capacity or

²⁶ The Open Government Partnership is a multilateral initiative established in 2011 by governments and civil society representatives, with a central aim of enhancing and promoting open government.

²⁷ [Nove \(2018\) New Grand Coalition in Germany: Analysis of the Coalition Agreement](#)

²⁸ [Radu, C. \(2018\) Open Data in Europe: placing public administrations in the driver's seat of innovation, Capgemini](#)

²⁹ *ibid.*

³⁰ [Global Open Data Index \(2017\)](#)

³¹ [Chazan, G. \(2017\) Why German needs to accelerate into the digital fast lane, The Financial Times](#)

³² *ibid.*

drive to process the big data needed for the fourth industrial revolution with connected factories and automated production.³³

Data legislation and regulation

Key legislation and regulation

The 2018 coalition agreement confirms Germany's long-held commitment to implementing regulation to protect its citizens' data. The agreement lays out the country's plans to introduce an ePrivacy regulation in line with GDPR.³⁴ If there is a delay in the EU's ePrivacy Regulation (beyond the anticipated deadline of 25 May 2018), then any legislative loopholes will be addressed through national legislation which will put into action the ePrivacy Directive 2002/58/EC (GDPR's predecessor), as well as the German Telemedia Act.³⁵

Aside from GDPR and the ePrivacy regulation, the State Secretary for Economic Affairs Matthias Machnig presented a white paper on digital platforms at the 2017 CeBIT fair.³⁶ This white paper represents what would be the country's first comprehensive set of rules for a digital regulatory policy, with Section 3.2 entitled 'Creating a modern data economy'. This states that "an innovative, data-centred economy with a strong industrial base is the European model to secure prosperity".³⁷ The paper outlines a number of steps for the government to "politically accompany the creation of a modern data economy":³⁸

- Establish a clear legal framework for data usage;
- Advance seal and certification solutions for greater transparency, using GDPR as a foundation for more data sovereignty and portability;
- Introduce basic transparency and information duties for digital platforms;
- Make online business transactions and e-Government simpler and more secure by passing a Trust Services Act (VDG) on the basis of the EU's requirements for trust services (the eIDAS Regulation), to make it easier for the public, businesses and authorities to verify identities;
- Establish 'experimentation rooms' or 'real laboratories' for innovative digital networked business models.

Although it is still unclear whether these proposals will be enacted into law, they represent a commitment from the Ministry of the Economy to advancing the creation of a data economy in the country. As such, it is worth following the development of these proposals going forward.

³³ *ibid.*

³⁴ [Nove \(2018\) New Grand Coalition in Germany: Analysis of the Coalition Agreement](#)

³⁵ [Splittgerber, A. & Schonhofen, S. \(2017\) Pre-Christmas Update on the ePrivacy Regulation, ReedSmith Technology Law Dispatch](#)

³⁶ [Federal Ministry for Economic Affairs and Energy \(2017\) White Paper on Digital Platforms](#)

³⁷ *ibid.*: 66

³⁸ *ibid.*: 107-108

Germany's first federal Open Data law came into effect on 13 July 2017. The law amended the earlier e-Government law,³⁹ and seeks to make German government data 'open by default'.⁴⁰ The law establishes a legal basis for citizens to access information from public authorities, as well as providing clarity for providers as to what must be published. It stipulates that this data must be provided in a machine-readable format, and that the government will establish a central data agency to support public authorities on questions relating open data provision, as well as to act as a central contact point for regional authorities. Expected benefits of the law include better public sector products and services, as well as new digital transformation growth areas and better management in the private sector, due to the availability of more high quality data. The German Ministry of Interior, which presented the bill, forecast that this will generate up to €130 billion of economic gains over the next decade.⁴¹ In a statement following the adoption of the Federal Open Data Act, a parliamentary spokesperson commented on the potential value of this data: "the systematic publication of administrative data...creates opportunities for startups and SMEs...and therefore the basis for data driven business models are laid".⁴²

The Open Government Partnership, however, lists a number of exemptions the Open Data Law:⁴³

- It only covers data in electronic form (written documents are exempt);
- The law does not cover the regional authorities (*Bundesländer*), and thus only applies to data from authorities directly subordinate to the federal government (though several states have their own open data policies, as described below);
- Universities and research bodies indirectly subordinate to the federal government are exempt.

Organisations such as the Open Government Partnership⁴⁴ have been lobbying the German government to agree to commit to an open data law since 2013,⁴⁵ when their efforts were focused on getting the government to include a statement on the matter in their coalition agreement. They did so on the basis that "the inclusion of such phrases [as 'open data law'] is crucial in the law-making process because it provides a point of reference for future lobbying efforts, especially once the topic is out of the public's attention".⁴⁶ This makes the 2018 coalition agreement particularly pertinent, with its pledge to introduce a new law on open data, to "assess opportunities for citizens and government authorities inherent in open data".⁴⁷ At present, further details of this proposed legislation are elusive, but it potentially represents a major opportunity to help German businesses extract value from data.

³⁹ [\[German\] Law for the Promotion of Electronic Administration \(E-Government Law\)](#); unofficial English translation: [Von Michael. P. \(2017\) German Open Data Law in English. Open Knowledge Foundation Deutschland](#)

⁴⁰ [European Data Portal \(2017\) Germany brings Open Data into law](#)

⁴¹ *ibid.*

⁴² [European Data Portal \(2017\) New Open Data Act in Germany](#)

⁴³ [Open Government Partnership \(2017\) Germany Finally has an Open Data Law](#)

⁴⁴ [The Open Government Partnership website](#)

⁴⁵ [Open Government Partnership \(2017\) Germany Finally has an Open Data Law](#)

⁴⁶ *ibid.*

⁴⁷ [Nove \(2018\) New Grand Coalition in Germany: Analysis of the Coalition Agreement : 2](#)

As well as this top-down action from the federal government, which also included acceding to the Open Government Partnership in late 2016, there has been significant impetus for open data from the federal state level.⁴⁸ Transparency laws have been adopted in the states of Bremen, Hamburg and Rhineland-Palatinate, whilst North Rhine-Westphalia is drafting its own Open Data Act.⁴⁹

Germany remains a staunch advocate of personal data protection and has played a key role in EU privacy legislation, partly as a result of historic factors such as the country's legacy as a police state during the Cold War. In response to the recent Facebook-Cambridge Analytica scandal, the Justice Minister Katrina Barley announced plans to pass new laws on social media to enable tighter supervision of companies like Facebook and allocate more power to the central government to punish data protection violations.⁵⁰ Such a law would be a further layer of regulation for social media giants, who were also recently subject to controversial new law the Network Enforcement Act (known as NetzDG), under which platforms face fines of up to €50 million if they do not remove 'obviously illegal' hate speech within 24 hours of being notified of it.⁵¹ The Act came into force on 1 January 2018, prompting Facebook and Twitter to add extra features for flagging content, and hire and train moderators. The legislation has provoked controversy as critics say it could curtail free speech.

Impact of GDPR and the European ePrivacy Regulation

Due to a lack of clarity on both the final wording and timelines of the ePrivacy regulation, organisations which use electronic communications services may struggle with preparations for the new regulation.⁵² There is an ongoing rush by many businesses to create and own consumer login systems, to help their businesses adapt to new ePrivacy laws, in the event that they will require consumer consent for cookie use.⁵³ This has resulted in cross-industry 'login collectives', or 'alliances'⁵⁴ comprised of publishing groups and non-publisher partners. These combine national newspapers such as *Bild* and *Die Welt* with industry giants such as car manufacturers Daimler, insurance firm Allianz, Deutsche Bank, Lufthansa, and Deutsche Telekom. The aim of these alliances is to create single sign-in platform for all customers, to allow people to more easily manage the data that businesses hold on them. This is to help businesses compete with the tech giants such as Amazon and Google after GDPR comes in, as these companies already hold vast quantities of login data and in theory will more easily be able to communicate new consent requirements to customers than those with non-logged in or registered audiences.⁵⁵

⁴⁸ Radu, C. (2018) *Open Data in Europe: placing public administrations in the driver's seat of innovation*. Capgemini

⁴⁹ *ibid.*

⁵⁰ Rettman, A. (2018) Germany pledges 'strict' laws after Facebook data breach. *EU Observer*

⁵¹ Oltermann, P. (2018) Tough new German law puts tech firms and free speech in spotlight. *The Guardian*

⁵² *ibid.*

⁵³ Davies, J. (2018) With ePrivacy looming, German publishers scramble to get users logged in. *Digiday UK*

⁵⁴ Davies, J. (2017) German publishers are joining forces against the duopoly. *Digiday UK*

⁵⁵ Davies, J. (2017) With an eye on the duopoly, German broadcasters create a unified consumer login. *Digiday UK*

There is also concern among publishers that they could lose up to 30 percent of income from digital advertising sales, as a result of the new EU ePrivacy Regulation, an amount equivalent to around €300 million.⁵⁶ This adds to ongoing concerns about the relative advantage held by big platform operators when GDPR and new ePrivacy regulations are implemented. Dr Rudolf Thiemann, President of the Association of German Magazine Publishers (*Verband Deutscher Zeitschriftenverleger*, or VBZ), has called on the German government to oppose the new EU regulation as a result.⁵⁷

High-level market analysis

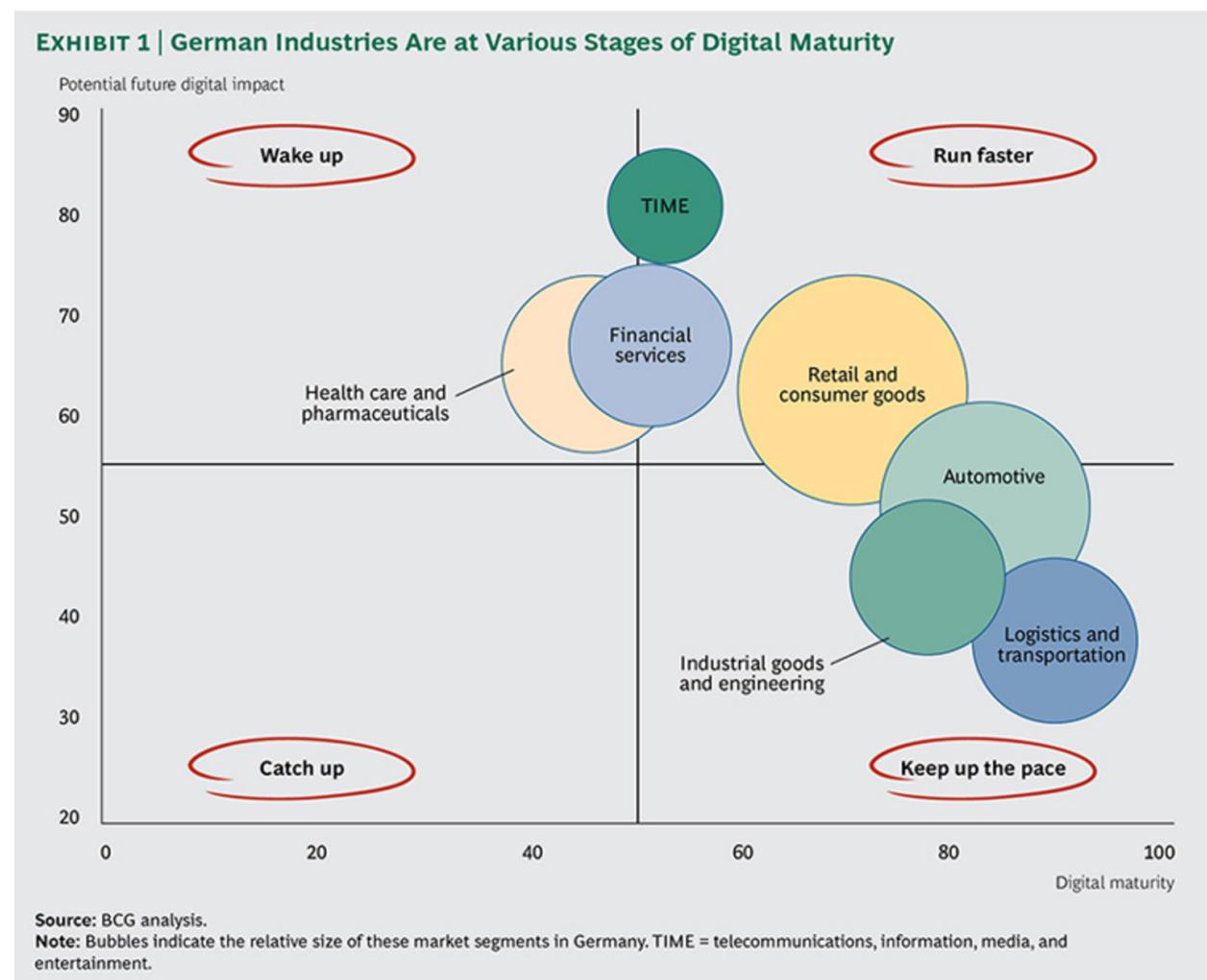


Diagram displaying digital maturity of German industries. Source: BCG report on Digital Germany⁵⁸

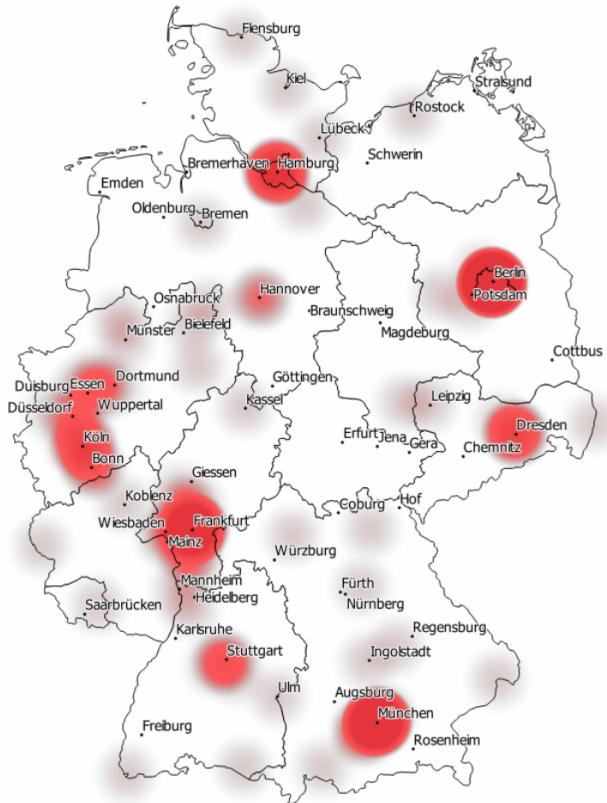
⁵⁶ [Verband Deutscher Zeitschriftenverleger \(2018\) ePrivacy: A loss of more than 30 percent in digital advertising sales for journalistic media](#)

⁵⁷ *ibid.*

⁵⁸ [Gumsheimer, T., Hecker, M. & Kruger, T. \(2015\) Digital Germany, BCG](#)

Finance

The collaboration between banks and the tech industry is a major success story of Germany's digital economy: it is estimated that around 87 percent of German banks currently work with FinTech organisations.⁵⁹ Germany has a strong and growing FinTech landscape, with an estimated 300 FinTechs in total, employing 13,000 people, attracting increasing investment flows and being used by around 35 percent of the digitally active population (above the EU average of 33 percent).⁶⁰ There are multiple FinTech hubs around the country, including Berlin, Hamburg, Frankfurt and Munich, as demonstrated by the map on the right. Models of collaboration between financial institutions and FinTechs takes a variety of forms, the most widespread of which involves financial institutions relying on FinTechs to provide innovative tech services.⁶¹



Geographic distribution of German FinTech companies.

*Source: The Federal Ministry of Finance report
on the FinTech market in Germany⁶²*

A 2016 report into the FinTech market in Germany conducted for the Federal Ministry of Finance⁶³ found that nearly all of the FinTechs and some of the banks surveyed for the report had criticisms over the state of technology in Germany. These included:⁶⁴

- Outdated systems used by the German central bank ;
- Poor internet connections in rural areas;
- Inadequate data supply;
- No uniform procedure for data protection between states;

⁵⁹ [Federal Ministry for Economic Affairs and Energy \(2018\) Minister Brigitte Zypries visits Tech-Quartier in Frankfurt am Main](#)

⁶⁰ [Ernst and Young \(2017\) Germany FinTech Landscape](#): 2

⁶¹ *ibid.*: 15

⁶² [Dorfleitner, G. & Hornuf, L. \(2016\) The FinTech Market in Germany](#)

⁶³ *Ibid.*

⁶⁴ *ibid.*: 42, 45 and 49

- Regulatory issues, including very dense and complex legislation, which is expensive for businesses and potentially an issue for startup FinTechs.

The government has recently taken a number of steps to improve regulation to encourage FinTechs. Major steps taken include:⁶⁵

- Reforming tax rules regarding carrying forward losses, to help remove obstacles that prevent new businesses gaining access to capital;
- New legislation to introduce the EU's second Payments Services Directives which should permit the growth of new business models, as it mandates access to payment accounts held by credit institutions for approved service providers.

Berlin-based N26⁶⁶ is an influential player in the German finance/FinTech world. It is a free direct online bank, available in all Eurozone countries except Cyprus and Malta. The bank recently secured the biggest round of funding ever for a German FinTech company, raising \$160 million from investors led by Chinese internet and social media giant, Tencent, and Allianz X, the insurance group.⁶⁷ The company is due to launch in the UK and US in 2018.

Transport

It is a stated priority of the Federal Ministry of Transport and Digital Infrastructure (BMVI) to accelerate the employment of intelligent transport systems.⁶⁸ This is particularly focused on intelligent vehicle and road systems which can improve road safety, and make travel more efficient and more environmentally friendly. The Ministry is promoting such systems not only at the national level, but also seeking to cooperate with other European partners. As a result, the Ministry has helped to draw up a European directive for the use of intelligent transport systems, to encourage their adoption and cooperation. They have also produced a National Intelligent Transport Systems Action Plan for road travel, covering the period to 2020.⁶⁹

According to BCG analysis of seven sectors in Germany, the logistics and transportation sector is likely to see the fewest changes from digitisation, partly because the sector already makes substantial use of digital technologies and processes.⁷⁰ Applications such as Uber and Mytaxi are extremely popular in Germany, and have transformed the way people access taxi services. Mytaxi is a Hamburg-based start up,⁷¹ which now employs 600 people across Europe and South America.⁷² It is Germany's most popular app for booking taxis, with one in five German taxi drivers

⁶⁵ [Federal Ministry of Finance \(2017\) Innovation and digitisation are a must, not an option](#)

⁶⁶ [N26 website](#)

⁶⁷ [Buck, T. \(2018\) Tencent and Allianz lead \\$160m funding for German online bank N26. The Financial Times](#)

⁶⁸ [Federal Ministry of Transport and Digital Infrastructure. Intelligent transport systems in the field of road transport](#)

⁶⁹ [Federal Ministry of Transport, Building and Urban Development \(2012\) ITS Action Plan for the Roads](#)

⁷⁰ [Gumsheimer, T., Hecker, M. & Kruger, T. \(2015\) Digital Germany. BCG](#)

⁷¹ [Mytaxi website](#)

⁷² [Mytaxi website. About Mytaxi](#)

signed up and over 120,000 drivers globally.⁷³ In September 2017, when Transport for London announced it would not be renewing Uber's license in London, the CEO of Mytaxi Andrew Pinnington announced his intention for Mytaxi to capitalise on the opportunity.⁷⁴

German automobile giant Daimler has a 60 percent stake in Mytaxi - primarily for its data, to help Daimler develop their own autonomous vehicle programme.⁷⁵ This is also part of a broader trend of automobile giants investing in tech startups, at least in part due to the access to customer data this provides: Daimler have also invested in British mapping company what3words,⁷⁶ while Volkswagen have invested in taxi app Gett.⁷⁷ These actions suggest that the traditional manufacturing giants of the automobile sector in Germany are actively seeking opportunities to capitalise on the data economy in this sector.

Artificial intelligence

According to research carried out by venture capital firm Asgard, the most significant fields for AI startups in Germany (accounting for 48 percent of German AI startups) are:⁷⁸

- Customer support;
- Customer communication;
- Sales and marketing;
- Software development;
- Computer vision/image recognition.

Around 54 percent of these AI startups are located in Berlin, making the city the fourth largest AI hub in the world after Silicon Valley, London and Paris.⁷⁹

Two of the ten best-funded European artificial intelligence companies are based in Germany. Arago,⁸⁰ which works on process automation and general problem-solving AI, is based in Frankfurt, while KONUX,⁸¹ an Internet of Things company which helps to monitor and improve infrastructure and operations, is based in Munich. Berlin-based startups had a good year in 2017, raising €2.97 billion, up from €1.1 billion in the previous year. This made the city second only to London among European tech hubs for raising investment.⁸²

According to 2017 Financial Times analysis,⁸³ Germany has so far lacked the commercialisation success of its major research institutions as seen in places like Silicon Valley which are populated

⁷³ *ibid.*; [Mytaxi website](#). [About Mytaxi](#)

⁷⁴ Hobbs, T. (2017) Mytaxi's CEO on how it plans to 'capitalise' on Uber's London failings

⁷⁵ Kennedy, J. (2017) Mytaxi CEO: 'Our real driving force is data'. [Silicon Republic](#)

⁷⁶ Barber, L. (2018) Daimler invests in What3Words, a British tech startup mapping the entire world with words. [City AM](#)

⁷⁷ Price, R. (2016) Volkswagen is making a \$300 million bet on one of Uber's rivals. [Business Insider UK](#)

⁷⁸ Asgard (2017) [The German Artificial Intelligence Landscape](#)

⁷⁹ *ibid.*

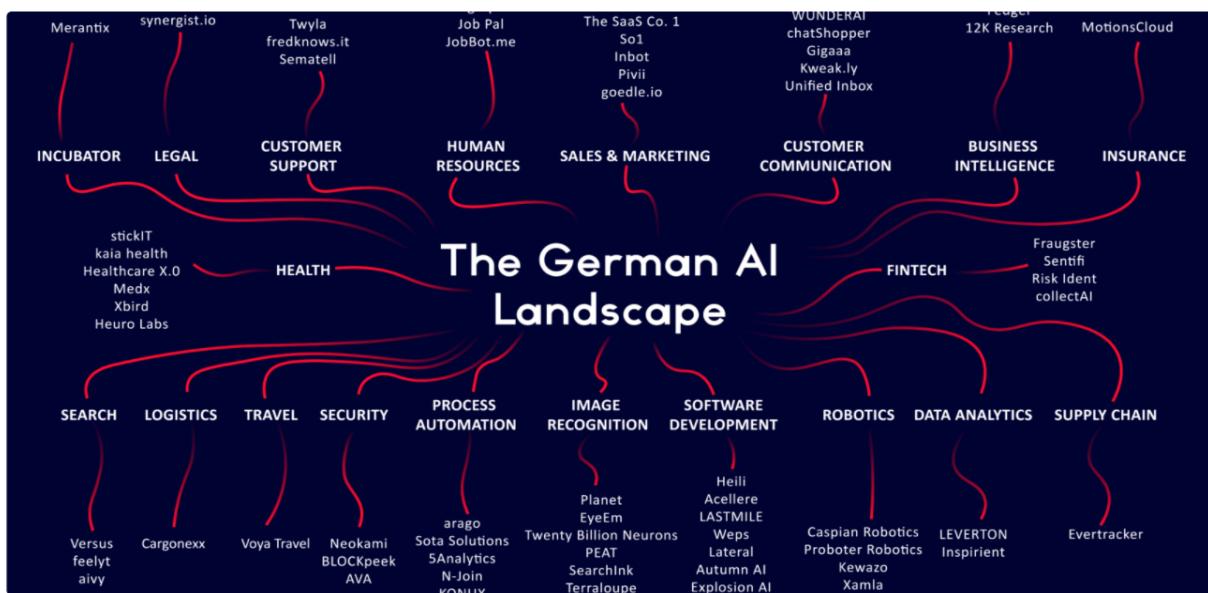
⁸⁰ [Arago website](#)

⁸¹ [KONUX website](#)

⁸² Buck, T. (2018) Tencent and Allianz lead \$160m funding for German online bank N26. [The Financial Times](#)

⁸³ McGee, P. (2017) Germany's Cyber Valley aims to become leading AI hub. [The Financial Times](#)

with companies run by Stanford alumni. To counter this, Germany has announced plans to create a new tech hub, ‘Cyber Valley’, in the south of the country between Stuttgart and Tübingen, to encourage collaboration between academia and business, as well as to boost Germany’s nascent startup culture.⁸⁴ Central to this is a project focusing on AI research, comprised of the Max Planck Society, two technical universities, Württemberg (Germany’s biggest exporting state) and Porsche, Daimler and Bosch.



The German AI landscape. Source: Asgard⁸⁵

Healthcare

According to advisory firm Brunswick’s commentary,⁸⁶ Germany has unfavourable conditions for the digitisation of healthcare in comparison with other European neighbours. This is due to a number of factors:

- Out-of-date healthcare policy, with outdated regulations and excessive data protection requirements;
- Sustainable investments in healthcare innovations are scarce;
- Patient-system communication are outdated, e.g. there is a ban on remote diagnosis and treatment and mail-order prescription drugs.

McKinsey also recently found that three out of five German hospitals lack a digitisation strategy.⁸⁷ 85 percent of hospital directors say that the progress toward digitisation at their own hospitals is ‘inadequate’.⁸⁸ Brunswick attribute this lack of progress to all parts of the system, including the

⁸⁴ *ibid.*

⁸⁵ Fabian (2017) The European Artificial Intelligence Landscape

⁸⁶ Brunswick (2017) Commentary on the Digitization of the German Healthcare System

⁸⁷ *ibid.*

⁸⁸ *ibid.*

'digitally averse' medical professionals, the 'legislatively ignorant' medical market, and a digital infrastructure currently not set up for the integration of apps.

They call on politicians to lobby for and drive change, with the Federal Joint Committee having acknowledged the problems with the situation. Federal Minister for Economics and Energy Brigitte Zypries has long been an advocate for the digitisation of healthcare, and has previously put forward a list of demands to improve the current situation. The change, Brunswick argue, will come from the startup scene - but is currently being stymied by a lack of clarity over regulation.⁸⁹ Last year the government named the Bavarian Medical Valley the Digital Hub for Health.⁹⁰ The 'Valley' fosters collaboration between business, science, healthcare and politics, and is similar to the Health Valleys of the Netherlands and the planned one in Belgium.

The German Institute of Medical Documentation and Information (DIMDI)⁹¹ is the online publisher of medical standards and classifications. It develops and runs database systems for drugs, medical devices and healthcare data. Part of DIMDI is a data trust,⁹² established in 2014, responsible for pseudonymisation healthcare data from statutory health insurance funds to help analyse the country's healthcare situation. The system is funded by the health insurance funds.

The German medical device market is Europe's largest, and the third largest in the world (its estimated worth in 2014 was \$26 billion).⁹³ It combines major players with a majority of small- and medium-sized companies. There is significant demand for new and innovative medical technologies within the German market.⁹⁴

Energy and utilities

As part of its digital agenda, the Federal Ministry for Economic Affairs and Energy is funding pre-commercial research and development projects. The smart data programme is looking for widely applicable big data solutions in key sectors including energy, mobility and healthcare.⁹⁵

The Digital Agenda also launched the 'Smart Networks' initiative, which aimed to make better use of the social and economic opportunities from digital networking (or the optimised use of ICT) in sectors including energy, health and transport.⁹⁶ Innovations include the Smart Grid⁹⁷ and Smart Meter.⁹⁸ There is a focus on smart electricity grids with smart meters continuously monitoring household consumption, allowing electricity generation to align with up-to-date demands. Data

⁸⁹ *ibid.*

⁹⁰ [Invest in Bavaria \(2017\) Bavarian Medical Valley Named Germany's Digital Hub for Health by Federal Government](#)

⁹¹ [DIMDI website](#)

⁹² [DIMDI website. Health Care Data](#)

⁹³ [EMERGO \(2018\) Germany - Overview of medical device industry and healthcare statistics](#)

⁹⁴ *ibid.*

⁹⁵ [Federal Ministry for Economic Affairs and Energy. Taking control of the digital transformation](#)

⁹⁶ [Federal Ministry for Economic Affairs and Energy. Smart networking](#)

⁹⁷ [Federal Ministry for Economic Affairs and Energy. Smart grids](#)

⁹⁸ [Federal Ministry for Economic Affairs and Energy. The digitisation of the energy transition](#)

generated by smart meters is governed by the strictest data security rules in Europe, as introduced through the Act on the Digitisation of the Energy Transition.⁹⁹

There is significant innovation taking place around energy in the private sector, which is evolving away from being concentrated around the traditional model of a small number of energy providers. Startups are helping to solve problems such as how to store energy from renewable sources for later use, or how to make energy usage in the home more efficient. Thermondo, for example, is a German startup which uses customer data analytics to provide highly customised heating solutions, with their business model centred around improving customer interaction points.¹⁰⁰

⁹⁹ *ibid.*

¹⁰⁰ [Thermondo website](#)

France

Mapping the data economy

France is the third-largest economy in the European Union after Germany and the United Kingdom, comprising around 15 percent of EU GDP.¹⁰¹ Its GDP growth saw a significant increase in 2017 compared with 2016, rising from 1.2 percent to 1.8 percent.¹⁰² In 2013, McKinsey measured France's 'digital GDP' at €113 billion, or 5.5 percent of its GDP. McKinsey also suggests that this has the potential to grow to €276 billion, or 10.8 percent of GDP, by 2020.¹⁰³ However, this would require French businesses to overcome what McKinsey described as a resistance to using digital techniques.¹⁰⁴ They state that this is due to a general inability to invest in digital and innovate due to small margins in certain companies and limited interest in digital from those at the top level of some firms. For example, where 26 percent of German companies took online orders in 2013, the same was true for only 14 percent of French firms.¹⁰⁵

Despite these apparent limitations in the private sector, French government policy has not neglected big data. In 2014, the French government included big data as an important element in creating a 'New Industrial France',¹⁰⁶ releasing a Big Data Road Map. This sought to create or support 137,000 jobs, with a focus on employment in the IT industry or IT-related tasks within firms.¹⁰⁷ In 2016, the New Industrial France project launched a Big Data Observatory designed to measure 40 sectors' progress in using big data.¹⁰⁸

France has also demonstrated its commitment to international cooperation in search of data and digital-driven economic growth. This includes collaboration with the two other largest EU economies, Germany and the UK. In March 2015, the German and French Economic Ministers stated their intention to further integrate their digital economies,¹⁰⁹ while the UK and France launched a 2015 taskforce to investigate how they could use the 'data revolution' for mutual economic benefit.¹¹⁰ The taskforce's recommendations included a passport programme for startups, allowing companies to explore the digital business environment in both countries.

¹⁰¹ [Eurostat \(2018\) GDP and main components \(output, expenditure and income\)](#).

¹⁰² [European Commission \(2018\) Economic Forecast for France](#)

¹⁰³ [McKinsey \(2013\) Closing France's €100 billion digital gap](#)

¹⁰⁴ *ibid.*

¹⁰⁵ *ibid.*

¹⁰⁶ [Trade Bridge Consultants \(2014\) President François Hollande launches 'New Industrial France'](#)

¹⁰⁷ [Republique Française \(2014\) Big data: la feuille de route entre en action](#)

¹⁰⁸ [Republique Française \(2016\) Big data: un observatoire sur les usages des données numériques](#)

¹⁰⁹ [Republique Française \(2015\) The Borderless Digital Economy](#)

¹¹⁰ [The UK-French Data Taskforce \(2015\) Data Driven Growth: Innovation, Infrastructure, Skills and Empowerment in the Digital Age](#)

Furthermore, France released an International Digital Strategy in December 2017. Its purpose is to develop the international competitiveness of the French digital sector, including an emphasis on introducing French startups to external markets and drawing international digital talent to the country. Historically France has been viewed as somewhat ‘clunky’ and anti-technology; something President Macron is trying to address, including by capitalising on possible opportunities to lure talent back to France following Brexit.¹¹¹ He has also overseen the creation of a €10 billion fund for startups, aimed at making France a ‘startup nation’.¹¹² Additionally, Macron has recently stated that Europe needs a big data strategy to compete with China and the US.¹¹³

France is highly ranked in global measures of governments’ commitment to open data. It is placed 4th on the Global Open Data Index 2016/7,¹¹⁴ and 15th on the Digital Economy and Society Index 2017¹¹⁵ (just below the EU average). This reflects developments such as the government’s open data portal, launched in 2011,¹¹⁶ France joining the Open Government Partnership in 2014, and the creation of a State Chief Data Officer. This was the first position of its kind in Europe.¹¹⁷

Data legislation and regulation

Key legislation and regulation

France introduced the French Digital Republic Act on 7th October 2016, following a consultation process that involved over 4,000 submissions from a range of sectors.¹¹⁸ The stated purpose of the Act is as follows: firstly, to ensure France’s digital competitiveness by focusing on digital infrastructure and data; secondly, to ensure users’ rights in the digital sphere and engage them with France’s digital policy.

The Act itself has three key components:

- It expands France’s open data policy and introduces the concept of ‘data of general interest’;
- It confirms the notions of network neutrality and data transferability, determines individuals’ ‘digital rights’, and ensures that digital platforms treat consumers fairly;
- It ensures universal internet access, with a focus on accessibility for disabled people and connectivity for ‘the most disadvantaged members of society’.¹¹⁹

¹¹¹ Ram, A. (2017) France looks to steal UK tech's European crown, *The Financial Times*

¹¹² Agnew, H. (2017) Emmanuel Macron inspires entrepreneurs with start-up nation vision, *The Financial Times*

¹¹³ Hornby, L. (2018) France's Macron calls for Europe-wide big data strategy, *The Financial Times*

¹¹⁴ Global Open Data Index (2017)

¹¹⁵ European Commission (2017) The Digital Economy And Society Index (DESI)

¹¹⁶ joinup (2014) Data.gouv.fr: the French Open Platform for Open Data

¹¹⁷ Etalab (2014) Open government data: France creates the role of State Chief Data Officer

¹¹⁸ Field Fisher (2016) France Adopts Digital Republic Law; Republique Française (2016) Digital Republic Act: Explanatory Memorandum

¹¹⁹ Republique Française (2016) Digital Republic Act: Explanatory Memorandum

The Digital Republic Act's open data focus enshrines the principle of 'open by default', making it the first country in Europe to put open data provisions in law.¹²⁰ Amendments to Law No. 78-753 of July 1978, which enabled citizens to view public organizations' administrative documents,¹²¹ demand that such documents are now automatically made available online.¹²² The Act also 'aims to extend the scope of the administrative documents that may be already made available'.

Impact of GDPR and the European ePrivacy Regulation

The Digital Republic Act of 2016 prepares France for the introduction of GDPR in May 2018. In particular, it provides individuals with the right to determine how their personal data is used.¹²³ The Act introduced amendments to Act no.78-17 of January 6 1978 on Data Processing Data Files and Civil Liberties, also known as the French Data Protection Act. For example, it allows individuals to state how their data be used after death, and to demand the deletion of personal data collected on them as children.¹²⁴

While it outlines the French Data Protection Authority's ability to impose upon companies four percent of their global annual revenue for violations of GDPR Article 83, the Digital Republic Act also enables regulators to fine companies up to €3 million for violations of the Data Protection Act not covered by GDPR. This is an increase on the maximum €150,000 fines allowed by the original Data Protection Act.

An additional draft law aimed at further amending the French Data Protection Act to bring it in line with GDPR is being swiftly brought through Parliament in order to ensure its implementation by 25 May 2018.¹²⁵ Among other changes, this will introduce a right for individuals to access and delete personal data collected in relation to criminal issues.¹²⁶

High-level market analysis

Finance

France's FinTech sector is growing rapidly, with \$62.5 million invested in FinTech in 2014, rising to a record \$297.8m in 2017. The average size of FinTech deals is also growing: from around \$3.3 million in 2014 to \$7.3 million in 2017.¹²⁷ Despite this growth, the French market lags behind leading European countries in terms of its consumers' use of FinTech services. Where 42 percent of consumers in the UK, 37 percent in Spain, and 35 percent in Germany reported having used

¹²⁰ [GovInsider \(2016\) France mandates open data release across government](#)

¹²¹ [UCL Constitution Unit \(2018\) France: International Focus](#)

¹²² [République Française \(2016\) Digital Republic Act: Explanatory Memorandum](#)

¹²³ [Field Fisher \(2016\) France Adopts Digital Republic Law](#)

¹²⁴ [DAC Beachcroft \(2017\) France - Digital Republic Bill brings changes to the French data protection act.](#)

¹²⁵ [Data Guidance \(2018\) France: Accelerated GDPR bill "limited in scope"](#)

¹²⁶ [DLA Piper \(2018\) France: Draft Data Protection Law - one step close to a final version](#)

¹²⁷ [FinTech Global \(2018\) French FinTech companies received a record level of funding in 2017](#)

two or more FinTech services in 6 months in 2017, the same figure was just 27 percent for French users. This is below the global average (33 percent).¹²⁸



French FinTech companies. Source: Medici¹²⁹

Nevertheless, this relatively low rate of adoption presents an opportunity for growth in French FinTech startups. The largest FinTech deal in 2017 saw startup Younited Credit raise \$47.8 million. A crowdlending platform, YounitedCredit allows customers to borrow up to €40,000 without involving a bank; the company has also started using artificial intelligence to determine potential customers' credit-worthiness.¹³⁰

Telecoms operator Orange's recent move into mobile banking further demonstrates the potential for consumer-facing FinTech in France. Orange Bank was launched in late 2017 with the aim of gaining two million customers.¹³¹ All of its banking services take place via smartphone, putting Orange Bank in competition with German startup N26. N26 had 100,000 customers in France in October 2017 compared with Orange Bank's projected 200,000 in January 2018.

¹²⁸ Ernst & Young (2017) EY FinTech Adoption Index 2017

¹²⁹ Medici (2016) 100+ FinTech Companies Are Embracing Innovation in the Region

¹³⁰ TechCrunch (2017) Younited Credit raises \$47.8 million for its crowdlending platform

¹³¹ Jenkins, P. (2018) Orange Bank: is a phone company the future of FinTech? The Financial Times

With Brexit on the horizon, France is seeking to capitalise on the opportunity to draw UK FinTech companies and talent to France. Digital Minister Axelle Lemaire laid out a number of reasons that France might be an attractive new home to FinTech companies:¹³²

- FinTech-friendly regulation: the country's complex labour laws have been reformed (however these still remain somewhat opaque);
- Privileges for tech entrepreneurs: the 'tech ticket' programme includes a grant and fast-track visa, and has already attracted 180 entrepreneurs;
- Several incubators and financial services centres, including the Station F incubator and financial firms hub Finance Innovation;
- Tax regime: corporation tax is set to be cut from 33 percent to 28 percent (compared to 30 percent in Germany, 25 percent in the Netherlands and 29 percent in Belgium), as well as tax cuts for companies employing people in France.

France also seems to be making strides in the field of cryptocurrencies. The French Minister of the Economy Bruno Le Maire recently shared the country's intentions to become the leading jurisdiction for initial coin offering (which is how funds can be raised for cryptocurrencies).¹³³ France and Germany have also collaborated on joint proposals for regulating bitcoin, which they are to present at the 2018 G20.¹³⁴

Transport

The beta version of France's transport open data portal, transport.data.gouv.fr, launched in autumn 2017 and intended to contain a database for static data and a 'directory of external APIs for real-time data'.¹³⁵ The Ministry of Transport hosted an open data 'Barcamp' in June 2017 which allowed representatives of the transport industry and transport users to give feedback on the portal ahead of its launch.¹³⁶

Consumer-facing transportation platforms have had a significant impact on the French economy. In 2016, a BCG study showed that transportation network companies such as Uber created six percent of GDP growth in Paris and two percent nationally in the first half of 2016, while also creating one out of four new jobs in Paris.¹³⁷ In 2015, meanwhile, the French government launched an Uber-style app, Le Taxi, that used geolocation data and an open API to allow taxi operators to

¹³² [Business Insider Intelligence \(2017\) Here's why France might steal the UK's fintech crown. Business Insider UK](#)

¹³³ [Quinn, G. \(2018\) France is Upping its Game When it Comes to Fintech and Entrepreneurship. CrowdFund Insider](#)

¹³⁴ [Reuters \(2018\) France, Germany to make joint bitcoin regulation proposal at G20 summit](#)

¹³⁵ [European Data Portal \(2017\) French Ministry of Transport co-creates data platform](#)

¹³⁶ *ibid.*

¹³⁷ [BCG \(2016\) La filière VTC est à l'origine d'une création d'emploi sur 4 et de 6 percent de la croissance du PIB au premier semestre 2016 en Ile de France; Uber Under the Hood \(2016\) New Data Reveals Uber's Economic Impact in France](#)

easily attract customers and compete with Uber.¹³⁸ All data collected by the app is also made openly available.¹³⁹

French companies have also taken a leading role in developing platforms for easier journeys. BlaBlaCar, for example, was founded in 2006 and was valued at \$1.6bn in 2015.¹⁴⁰ It matches drivers with spare seats to passengers in need of a ride and operates in 22 countries with around 30 million users¹⁴¹. In France and other European countries, booking rides with BlaBlaCar is now also possible via Google Maps.¹⁴²

Artificial intelligence

Following the introduction of the Digital Republic Act, France launched its national artificial intelligence strategy, #FranceIA, in January 2017.¹⁴³ This recommends creating a fund of up to €25 million for AI startups, and emphasises the importance of guaranteeing capital for businesses to allow them to take risks.¹⁴⁴ The Digital Republic Act also mandated the National Commission for Information Technology and Liberties to conduct a large-scale consultation on AI ethics.¹⁴⁵

The momentum behind France's artificial intelligence industry increased in January 2018 when Facebook announced its intention to expand its AI research centre in Paris by investing €10 million, increase the number of AI scientists from 30 to 60 and fund 40 PhD candidates rather than 10.¹⁴⁶ The centre, launched in 2015, is Facebook's first research facility outside the USA. In the same month, software company SAP announced that it would spend more than €2 billion over five years on innovations including machine learning. They also purchased Recast.AI, a Paris-based startup, with the intention of introducing Recast.AI's natural language processing capabilities to enhance the SAP user experience.¹⁴⁷

Such decisions demonstrate France's increasing international competitiveness in AI. French President Emmanuel Macron has made clear that France thinks it can lure IT workers from London after the United Kingdom leaves the European Union; under his Presidency, France has launched a new tech visa programme and directed state money to startups.¹⁴⁸ The President also announced

¹³⁸ [The UK-French Data Taskforce \(2015\) Data Driven Growth: Innovation, Infrastructure, Skills and Empowerment in the Digital Age](#)

¹³⁹ [TheLocal.fr \(2015\) France launches own 'Le Taxi' app to rival Uber](#)

¹⁴⁰ [Quartz \(2014\) BlaBlaCar is building a global transportation network out of empty car seats; Bloomberg Technology \(2015\) BlaBlaCar Valuation Hits \\$1.6 Billion After Latest Funding Round](#)

¹⁴¹ [London Stock Exchange Group \(2018\) BlaBlaCar](#)

¹⁴² [eMarketer \(2017\) Google Maps Partnership Boosts European Ride-Hailing Service BlaBlaCar](#)

¹⁴³ [Republique Française \(2017\) #FranceIA: the national artificial intelligence strategy is underway](#)

¹⁴⁴ [Republique Française \(2017\) Rapport de Synthèse: France Intelligence Artificielle](#)

¹⁴⁵ [Republique Française \(2017\) #FranceIA: the national artificial intelligence strategy is underway](#)

¹⁴⁶ [Ram, A., Khan, M. & Agnew, H. \(2018\) Facebook invests in French centre for artificial intelligence, The Financial Times](#)

¹⁴⁷ [SAP \(2018\) SAP Increases Commitment to Powering Innovation in France](#)

¹⁴⁸ [Titcomb, J. \(2018\) UK and France agree artificial intelligence tie-up, The Telegraph](#)

at the end of March 2018 that his government would invest €1.5 billion into AI research until the end of his term in 2022, to help accelerate innovation.¹⁴⁹

France's relationship with the UK in this sphere, however, is also characterised by collaboration. In January 2018 the two countries announced their intention to host a digital conference focusing on AI as well as 'data, cyber security, digital government and digital skills'; in the same week, Imperial College London and the French National Centre for Scientific Research began working more closely together on AI-relevant subjects.¹⁵⁰

Healthcare

The 2016 Law for the Modernisation of the Health System introduced amendments to France's Data Protection Law to establish a process for acquiring personal healthcare data; it also provides some limited means for private companies to access data.¹⁵¹ This law allowed for a new national healthcare database which is projected to be 'one of the biggest healthcare databases in the world'.¹⁵² Anonymised data within the database will be made fully open, while personal data will only be made available to bodies following strict guidelines.¹⁵³ The French government also consulted extensively with the public on the opening up of healthcare data: workshops and an online consultation gathered views to be presented at a conference in July 2016.

In late 2016, it was reported that four Parisian hospitals were trialling using big data and artificial intelligence to predict the flow of admissions and allocate resources accordingly, using an open source platform that could be accessed by hospital staff.¹⁵⁴

Energy and utilities

Access to data on energy use is increasingly important to French public bodies seeking to save money and use resources efficiently. The Energy Transition for Green Growth Act of 2016 contained a section enabling public bodies to access data held by energy providers where it related to their operations.¹⁵⁵ Equally, the French Chief Data Officer has worked with the national procurement department and Ministry of Justice to understand how energy is being used in public buildings and inform 'the liberalisation of the electricity market'. This has resulted in 'millions of euros' in procurement savings.¹⁵⁶

¹⁴⁹ Cerulus, L. (2018) [Macron: France to invest nearly €1.5B for AI until 2022](#), Politico

¹⁵⁰ [UK Government \(2018\) UK and France to strengthen links in tech sector and artificial intelligence](#)

¹⁵¹ [DLA Piper \(2016\) France: new rules for processing patient health data](#)

¹⁵² [Bird & Bird \(2017\) France Launches Healthcare Big Data](#)

¹⁵³ *ibid.*

¹⁵⁴ [Forbes \(2016\) Big Data in Healthcare: Paris Hospitals Predict Admission Rates Using Machine Learning](#)

¹⁵⁵ [République Française \(2016\) Energy Transition for Green Growth Act](#)

¹⁵⁶ [The UK-French Data Taskforce \(2015\) Data Driven Growth: Innovation, Infrastructure, Skills and Empowerment in the Digital Age](#)

Other energy companies and operators publish energy-related data, including RTE and Enedis/EDF, while many energy datasets are accessible via data.gouv.fr. These include information about energy use in food production and energy data provided by regional institutions.¹⁵⁷

In the private sector, meanwhile, electricity company ENGIE has opened data for the La Haute Borne wind farm.¹⁵⁸ The purpose was to demonstrate the workings of ENGIE's Darwin big data tool. This collects real-time data from renewable energy installations across Europe; it also enables data-driven predictions about power plant maintenance and has the potential to answer customer enquiries via a chatbot.¹⁵⁹

¹⁵⁷ [Think Smartgrids \(2016\) Yet more Open Data for Smart Grid players](#)

¹⁵⁸ [ENGIE \(2017\) Welcome to ENGIE's first open data windfarm](#)

¹⁵⁹ [Renewables Now \(2017\) Engie to open data for 21 MW French wind farm - report](#)

Netherlands

Mapping the data economy

The Netherlands is the 18th largest economy in the world,¹⁶⁰ and the sixth largest in Europe, accounting for 4.7 percent of total EU GDP.¹⁶¹ As of 2016, the Dutch digital economy was estimated to be worth €182 billion.¹⁶² The country ranks fourth in the EU Digital Economy and Society Index (DESI) 2017, scoring highly for the digitisation of services and having a digitally skilled, active and connected population.¹⁶³ DESI's findings also show that the country faces the challenge of improving the uptake of technology by businesses.¹⁶⁴

The country currently ranks at 20th (of 94 countries) in the Global Open Data Index.¹⁶⁵ The 2017 coalition agreement¹⁶⁶ affirms the government's commitment to open data and outlines plans to develop an 'ambitious, broad agenda' for digitising public services. In support of this promise, a 2017 amendment to the General Administrative Law Act stated that all citizens and businesses have the right to conduct all of their affairs with the government digitally. The government has also created a connected system of 13 key databases that all of government uses frequently, which serves as the backbone to other data efforts. Where possible this information is also published as open data, such as the vehicle register, cadastral maps, addresses, and buildings.¹⁶⁷

The government is to come out with a new digital strategy later this year, which is likely to contain a substantial section on the value of big data and potentially a new regulative model for data sharing.¹⁶⁸ A new Open Government Action Plan is also set to be launched this spring, featuring nine action topics, one of which is to be open algorithms and the principle of open by design for government agencies.¹⁶⁹ The Secretary-General at the Dutch Economic Affairs Ministry Maarten Camps announced at the start of 2018 that all companies, including data-rich businesses such as Google, Facebook and Apple should share anonymous user data as part of a new model for economic regulation. Camps said that this data was extremely valuable for businesses and improving services, and failure to share it inhibits competition and allows for monopolies. New plans for data sharing would still need to protect personal privacy, and companies may receive financial compensation for data.

¹⁶⁰ [IMF \(2017\) World Economic Outlook \(October 2017\)](#)

¹⁶¹ [Eurostat \(2017\) Share of Member States in EU GDP](#)

¹⁶² [Warmerdam, M. \(2017\) Dutch Digital Economy Worth €182 Billion](#)

¹⁶³ [EU DESI \(2017\) Netherlands](#)

¹⁶⁴ *ibid.*

¹⁶⁵ [Global Open Data Index \(2017\)](#)

¹⁶⁶ [Coalition Agreement between VVD, CDA, D66 and the Christian Union \(2017\) Confidence in the Future](#)

¹⁶⁷ Interview with Ton Zijlstra, European open data expert, 12 April 2018

¹⁶⁸ [International Institute of Communications \(2018\) Netherlands Pronounces on the Digital Economy](#)

¹⁶⁹ Interview with Ton Zijlstra, European open data expert, 12 April 2018

The country's current digital strategy document (dated 2016)¹⁷⁰ recognises data as one of their main 'challenges'. Key issues for data include:

- The declining price of sensors, data storage and processing capacity. This leads to increasing amounts of data online, and intensifies pressure on the capacity of digital infrastructure;
- Privacy and cybersecurity, and the following questions:
 - What data is collected?
 - On what legal basis is it collected?
 - Who can access the data?
 - What is done with it?

The strategy paper recognises that data privacy and cybersecurity represents an opportunity as well as a challenge:¹⁷¹

'the guarantee of security and privacy is an important condition for purchasing products and services. By ensuring these preconditions are met and by offering innovative products and services in the field of cybersecurity, the Dutch business sector can stand out from its competitors throughout the rest of the world'.

Ongoing governmental actions outlined in the Digital Strategy in relation to data include:

- Schemes to train big data scientists in-country, as 300 more are needed every year;
- New public-private partnerships (PPPs) in four sectors: energy, healthcare, cybersecurity and industry. These have been initiated by Team ICT, the government body for digitisation. In 2016-17 they sought to apply big data analysis to find solutions to social issues, such as smart networks for energy, and diagnostics and prevention in healthcare;
- Giving €50 million per year to fiscal measures for startups and SMEs.

The Dutch government has also created Commit2Data. This is a multi-year national research and innovation programme aimed at developing the collection and use of data as a basis for economic growth.¹⁷² This project is made up of Big Data Hubs, which focus on individual sectors, to try to establish connections with economic clusters and regional field labs through PPPs. The hubs are a pre-competitive environment where researchers, SMEs and large companies collaborate on short-cycle real use cases.

Largely due to the country's liberal corporate taxation laws, there is substantial foreign direct investment in the ICT sector in the Netherlands, particularly focused in Amsterdam. Several major players have chosen to situate their European headquarters here, including Facebook, Netflix and Uber. Google and Microsoft also both have their European data centres in the Netherlands.

¹⁷⁰ [The Ministry of Economic Affairs \(2016\) Digital Agenda for the Netherlands](#)

¹⁷¹ *ibid.*

¹⁷² [Commit2Data website](#)

The country is also home to a number of smart cities including Eindhoven and Utrecht, where tech is being used to tackle issues such as traffic, noise and crime.¹⁷³ This includes amassing substantial data using means such as wifi trackers, cameras and microphones on lamp posts. This creates issues around personal privacy, particularly given that, in Utrecht (and other cities), a significant number of smart projects are outsourced to private companies. CityTec, for example, who manage car parks, traffic lights and lamp posts, have previously refused to share their data with municipalities. In Amsterdam, these efforts tend to be based on a model of data sharing, rather than open data, which would provide a more level playing field. Indeed, Amsterdam seems to have more or less dropped ‘open data’ from their discourse.¹⁷⁴ Some of these issues are a product of local governments failing to draw up a clear agenda or set of procedures for the contracts needed for these projects, resulting in data monopolies for specific companies. To help address this, Geonovum (an association of geodata users including governments) have released a tool¹⁷⁵ to help local governments define their different roles as regulators, guardians of public spaces, data users, and providers of public environments as innovations platforms.¹⁷⁶

Data legislation and regulation

Key legislation and regulation

The Dutch Personal Data Protection Act has been in place since 1 January 2016, and sets out the main laws for handling personal data.¹⁷⁷ The Dutch Data Protection Authority supervises the law’s implementation. The law stipulates that people should be informed in advance of data collection, and the purpose specified. In reality, this has not been uniformly implemented, as evidenced by *Guardian* research into smart cities where vast quantities of data is collected on individuals without their knowledge or explicit consent.¹⁷⁸

The government has recently increased penalties for noncompliance with personal data privacy laws. The Data Breach (Notification Obligation) Act (*Meldplicht Datalekken*) and the extension of the power to impose fines (as set under the Dutch Data Protection Act) came into force in January 2016, in anticipation of similar obligations under GDPR.

The duty of notification means that if a breach of security measures around personal data is discovered, the data controller must immediately report it to the Dutch Data Protection Authority. The data controller then has to report this information to affected individuals if their personal privacy is under threat. The maximum fine for non-compliance with the Act was also raised from €4,500 to

¹⁷³ Naafs, S. (2018) 'Living laboratories': the Dutch cities amassing data on oblivious residents. *The Guardian*

¹⁷⁴ Interview with Ton Zijlstra, European open data expert, 12 April 2018

¹⁷⁵ [Geonovum tool for local governments](#)

¹⁷⁶ Interview with Ton Zijlstra, European open data expert, 12 April 2018

¹⁷⁷ [deLex \(2016\) The Personal Data Protection Act](#)

¹⁷⁸ Naafs, S. (2018) 'Living laboratories': the Dutch cities amassing data on oblivious residents. *The Guardian*

€810,000; or 10 percent of the annual net turnover of a company, per violation.¹⁷⁹ This obligation will continue on top of GDPR. The Data Protection Law has already been used to investigate major companies such as Microsoft¹⁸⁰ and Airbnb.¹⁸¹ As GDPR approaches, the number of data leaks reported to the Data Protection Authority has greatly increased: in 2017, 10,000 were reported, up by 70% from 2016, which the authority interprets as a growth in public awareness.¹⁸²

Impact of GDPR and the European ePrivacy Regulation

The Netherlands are viewed by many other European countries as an interesting test case for the impacts of GDPR. This is due to the number of tech giants headquartered there who rely on customer data.¹⁸³ The country already has a good track record of creating national data protection laws (see previous section on key regulation). This means that implementing GDPR will, in theory, not be uncharted territory. On 13 December 2017 the Dutch government sent their GDPR Implementation Bill (the *Algemene Verordening Gegevensbescherming*, or AVG) to Parliament. The bill is designed to ensure that GDPR is implemented in a ‘policy-neutral manner’; i.e. that all existing legislation continues so long as it is permitted under GDPR.¹⁸⁴

The Personal Data Protection Data Act, which is to be replaced by GDPR, has broadly similar principles governing the use of personal data (lawfulness, fairness, transparency and accuracy), and generally similar obligations.¹⁸⁵ Key differences, common to most countries subject to GDPR, include changes for those who process personal data on a daily basis. For example, human resources departments will now have to comply with new employee rights such as the right to be forgotten and the right to data portability.

There is a lack of clarity over who will be responsible for overseeing ePrivacy laws. The European Parliament and EU would like this to be overseen by the Data Protection Authority, but ePrivacy is currently overseen by the Consumer and Market Authority (ACM).¹⁸⁶ The Minister of Justice and Security Sander Dekker issued a memorandum in December stating that it would be up to the respective bodies to handle the overlap in duties on a case-by-case basis.¹⁸⁷

¹⁷⁹ Kromann Reumert (2015) [The Netherlands: a new act introduces a notification duty for personal data breaches and higher fines](#)

¹⁸⁰ Autoriteit Persoonsgegevens (2017) [Dutch DPA: Microsoft breaches data protection law with Windows 10](#)

¹⁸¹ Autoriteit Persoonsgegevens (2017) [Dutch DPA: Airbnb ends processing of national identity numbers](#)

¹⁸² Autoriteit Persoonsgegevens (2018) [10,000 data leaks reported in 2017](#)

¹⁸³ Hofmans, T. (2018) [Dutch companies not ready for GDPR despite approaching deadline](#). Computer Weekly

¹⁸⁴ Terstegege, J. (2017) [Dutch government introduces GDPR Implementation Bill](#). International Association of Privacy Professionals

¹⁸⁵ Osborne Clarke (2017) [GDPR and HR - What will change in the Netherlands?](#)

¹⁸⁶ Hofmans, T. (2018) [Dutch companies not ready for GDPR despite approaching deadline](#). Computer Weekly

¹⁸⁷ [Explanatory memorandum for the GDPR Implementation Act](#)

PwC's June 2017 report *Privacy Governance*¹⁸⁸ reviewed 350 companies in the Netherlands and found that only around 12 percent were suitably prepared for the implementation of AVG. A large proportion of companies lacked rules to comply with the January 2016 national Data Breach Act. A later report from November 2017 still found that 80 percent of companies were not compliant with the new law.¹⁸⁹ This lack of preparedness for GDPR has led to a rise in companies helping to assist organisations and business leaders with AVG compliance.¹⁹⁰

High-level market analysis

Finance

The Dutch FinTech environment is growing quickly, reflecting the country's projected image as a digital innovation hub. There are approximately 430 companies currently active in the Dutch FinTech market, and this number grew by 100 over the last year alone.¹⁹¹ The government is supporting this growth. The 2017 coalition agreement states that it will establish a Dutch finance and development institution, InvestNL, and make €2.5 billion available in the budget for it.¹⁹²

This is intended to encourage investments in sectors where the country has not yet capitalised on all opportunities. The body is to act as a single point of contact for entrepreneurs seeking risk capital, guarantees, export credit insurance and international finance programmes. It will also help develop and invest in major public projects in the country and overseas, and support innovative businesses such as start-ups and scale-ups. In particular, InvestNL will focus on "high-risk activities within various transition areas" such as energy, mobility, and the digitisation of industry.

The coalition agreement also explicitly recognises the value of innovative financial technology (FinTech), stating that in order to encourage these companies to grow, the government will introduce less strict licensing requirements for banking and other services. Meanwhile, Commit2Data has run a programme to fund research into big data applications for banking and insurance. Major banks are collaborating with FinTechs, as well as offering their own FinTech initiatives such as PEAKS (Rabobank), Gappie (Nationale Nederlanden) and Kandoor (APG). Europe's largest FinTech event, Money 20/20, is to be held in Amsterdam this year.

However, according to the 2017 EY FinTech Adoption Index, only 27 percent of the digitally active population use FinTech services, which is below the EU average of 33 percent. Also, FinTech growth has not been without controversy. Dutch banking giant ING came under fire in 2014 when it announced a plan to sell its customers' payment data to other companies, to enable them to target advertising. Substantial negative backlash forced the bank to renege on its plans, and the

¹⁸⁸ PwC Nederland (2017) Privacy Governance

¹⁸⁹ Lemsom, M. (2017) Companies and governments are not ready for a new privacy law

¹⁹⁰ Hofmans, T. (2018) Dutch companies not ready for GDPR despite approaching deadline. Computer Weekly

¹⁹¹ Holland FinTech (2018) Dutch Fintech Infographic 4.0

¹⁹² Dutch Government (2017) Cabinet draws out investments by establishing Invest-NL

scandal ultimately restricted the development of big data in the country for a while.¹⁹³ The bank remains, however, a ‘big data proponent’, having invested millions in its data strategy and technologies.¹⁹⁴



Dutch FinTech market. Source: Holland FinTech¹⁹⁵

Transport

The 2017 coalition agreement stresses the need to take autonomous vehicles into account when designing infrastructure. It also states that, “wherever possible, government information on traffic and transport for vehicles, apps and journey and route planners will be provided as open data”.¹⁹⁶ To govern this, the agreement pledges to create rules on ownership and use of travel data. In 2017, a national agreement was signed between the Ministry of Transport, public transport concession holders, Translink Systems (who operate radio frequency identification travel cards), and the Provinces (who provide concessions for regional public transport), to make full trip data (including multimodal single trips, e.g. from train to bus to tram) available. The agreement was

¹⁹³ Bakker, J. (2016) Dutch mastering the art of big data analysis, Computer Weekly

¹⁹⁴ Monge, J. (2017) How ING engages customers with Big Data and the Internet of Things, Internet of Business

¹⁹⁵ Holland FinTech (2018) Dutch Fintech Infographic 4.0

¹⁹⁶ Coalition Agreement between VVD, CDA, D66 and the Christian Union (2017) Confidence in the Future

designed to mitigate the associated privacy issues whilst making this valuable data available for research.¹⁹⁷

The Digital Strategy also discusses the importance of big data for mobility in the Netherlands. A large part of this is provided by the national data warehouse for traffic data (NDW), which published real time sensor data on traffic density, number of vehicles and speed, and the national department for traffic (RDW), which publishes technical data and license plates.¹⁹⁸ The strategy outlines research into a new system for regulating the taxi market as part of a ‘future-proof legislation’ approach to quickly remove impediments to innovation. It also discusses government collaboration with research and academic institutes and the business sectors on programmes such as:

- The Better Use (*Beter Benutten*) [of existing travel infrastructure] programme. This is to provide €1.1 billion of public funding for 250 measures across ten regions, and includes improving real-time travel data to help reduce traffic jams¹⁹⁹;
- The Declaration of Amsterdam on connected and automated driving. This is an agreement between the European Commission and the private sector on joint goals and actions for introducing automated cars to Europe’s roads;²⁰⁰
- The European Truck Platooning Challenge, organised by the Netherlands to promote convoys of semi-automated trucks across Europe.²⁰¹

The Digital Strategy also discusses the need to change the way that data is shared in the mobility and logistics sector, with an emphasis on standardisation. The government is developing a single portal for trade and transport to optimise this.

In the private sector, Uber’s European headquarters is based in Amsterdam. They plan to double the number of staff members working there to 1,000 over the next decade. The company processes revenue from rides elsewhere in Europe in the Netherlands, due to lower corporate tax rates (25 percent, compared to 33 percent in France, 30 percent in Germany and 29 percent in Belgium). This has attracted substantial criticism from the London Private Hire Car Association, who called it ‘tax avoidance on an industrial scale’.²⁰² The company has previously run into trouble with Dutch regulators, who twice raided the offices in 2015 over the low-cost UberPOP service, which they suspected of operating without sufficient licensing. This service was discontinued in the same year.²⁰³

¹⁹⁷ Interview with Ton Zijlstra, European open data expert, 12 April 2018

¹⁹⁸ *ibid.*

¹⁹⁹ [Dutch government. Improving utilization of infrastructure](#)

²⁰⁰ [Dutch government. What is the Declaration of Amsterdam on selfdriving and connected vehicles?](#)

²⁰¹ [European Automobile Manufacturers Association \(2016\) What is the European Truck Platooning Challenge?](#)

²⁰² [Williams-Grut, O. \(2015\) EXCLUSIVE: Uber's rival says it uses 'tax avoidance on an industrial scale,' and wants Europe to investigate. Business Insider UK](#)

²⁰³ [Cook, J. \(2017\) Uber is planning to double the size of its international HQ in Amsterdam. Business Insider UK](#)

Major Dutch navigation player TomTom recently acquired German self-driving car startup Autonomous, signalling a move for the company into the field of autonomous vehicles.²⁰⁴

Artificial intelligence

According to Asgard research, Amsterdam is the sixth biggest AI hub (in terms of number of AI companies) in Europe, after London, Berlin, Paris, Madrid and Stockholm. The city recently launched a new AI training programme called Artificial Intelligence for Growth to teach people from non-technical backgrounds about AI.²⁰⁵ The programme is run by the Growth Tribe Academy, with partners including Startup Amsterdam, Microsoft and the Dataiku data science platform. There is significant multidisciplinary collaboration in Amsterdam between academia and industry, with labs such as Qualcomm-QUVA Lab (researching deep vision), UvA-Bosch DELTA Lab (researching applications of deep learning to automotive and computer vision), AMLAB (for machine learning), Intelligent Sensory Information Systems (for computer vision) and ILPS (for information retrieval). Many of these are based at the Amsterdam Science Park, which is a key site for dialogue and shared research between science and industry.²⁰⁶

The city, which received the 2016 European Capital of Innovation Award,²⁰⁷ also hosted the World Summit for AI, the world's biggest applied AI conference, in October 2017. Europe's first AI accelerator, Rockstart, was launched in 2017 in the city, initially to fund ten startups.²⁰⁸ The city's two major universities also have joint AI masters programmes to help grow local talent. Some notable local AI companies are Sightcorp,²⁰⁹ who helped pioneer real-time measurement of facial expressions, EclecticIQ²¹⁰ who work on threat intelligence and Elastic,²¹¹ who work on a range of data problems.

Healthcare

The Digital Strategy recognises the digitisation of healthcare as a major priority area, and notes the role of big data in helping to diagnose diseases such as Parkinsons and Alzheimers. Big data can also allow for greater transparency in the sector, as the paper states: "[d]igital operations and standardised data exchange boost the healthcare sector and must therefore become the standard".²¹²

The 2017 coalition agreement pledges to set aside a total of €40 million for the administration's term in office, and €5 million a year thereafter, for promoting digitally assisted care delivery and

²⁰⁴ [Nickman, S. \(2017\) Artificial Intelligence in Amsterdam, the City of Freedom, Medium](#)

²⁰⁵ [Amsterdam \(2017\) Artificial Intelligence for growth](#)

²⁰⁶ [Amsterdam Science Park website](#)

²⁰⁷ [European Commission \(2016\) Amsterdam is the European Capital of Innovation 2016](#)

²⁰⁸ [Amsterdam \(2017\) Amsterdam startup scene embracing AI](#)

²⁰⁹ [Sightcorp website](#)

²¹⁰ [Eclectic IQ website](#)

²¹¹ [Elastic website](#)

²¹² [The Ministry of Economic Affairs \(2016\) Digital Agenda for the Netherlands](#): 37

more widespread use of innovative working methods.²¹³ Key government goals for eHealth include:
²¹⁴

- Access to medical records - by 2019, 80 percent of the chronically ill population and 40 percent of the general population should have direct access to their own medical records (note that a 2011 government initiative for a national centralised system for patient files failed, and since then there has been an opt-in ‘national switchboard’ where data is shared by care providers with a patient’s consent - although patients do not know what specifically is shared or who can access it)²¹⁵;
- Health monitoring - by 2019, 75 percent of chronically ill and elderly people should be able to monitor their own healthcare data and share this with their health provider;
- Online contact with care provider - those receiving care and support at home should be able to communicate with their provider at any time via a screen.

While an ongoing healthcare modernisation programme exists (*Innovatie en Zorgvernieuwing*), the Digital Strategy states that large-scale applications of eHealth initiatives are often lacking. This is due in part to a lack of resources for highly reliable verification of users and standards for logging on to systems. Steps taken so far have included:²¹⁶

- The first ‘Health Deal’ was signed in 2016 by a combination of public and private companies in the IT and healthcare sectors to try to scale up innovations in healthcare;
- The government has set up an online support platform²¹⁷ for healthcare innovators, including funding tips;
- Making digital data-sharing easier - the government is consulting healthcare administrators on standards to facilitate data sharing, and talking to IT suppliers;
- Bringing together healthcare innovators and other parties to share knowledge and help advance innovations;
- Overseeing collaboration between various parties in the healthcare sector on a programme to agree standards and requirements for personal digital healthcare environments.

Health Valley is a unifying network to encourage and support technological innovations in healthcare. It is a public-private partnership funded by contributions from the government and partners from the network. It provides a platform to connect universities, care institutions, companies and government authorities to exchange information and work on innovations in healthcare.

It is important to note, however, that despite all the government rhetoric around eHealth initiatives, the basic data and operations of the healthcare system remain very opaque.²¹⁸ There is generally no available data on, for example, the costs of treatments and the quality of care providers. Even

²¹³ [Coalition Agreement between VVD, CDA, D66 and the Christian Union \(2017\) Confidence in the Future](#)

²¹⁴ [Dutch government. Government encouraging use of eHealth](#)

²¹⁵ Interview with Ton Zijlstra, European open data expert, 12 April 2018

²¹⁶ [Dutch government. Government encouraging use of eHealth](#)

²¹⁷ [Zorg voor innoveren website](#)

²¹⁸ Interview with Ton Zijlstra, European open data expert, 12 April 2018

the Ministry of Health only receives healthcare data after a three year lag. The public national care authority (NZA) dropped ‘providing transparency of costs’ as one of its stated goals after receiving a freedom of information request for this data, which they successfully fought in the highest court. Insurers and care providers have, however, been fighting for greater transparency. Furthermore, in 2015 the financial responsibility for youth care, chronic care provision and care for the elderly was devolved to local governments, which has led to a fragmentation of data and policy.²¹⁹

Energy and utilities

Since the Energy Agreement for Sustainable Growth (2013),²²⁰ the Netherlands has been pursuing a transition away from non-renewables, aided by IT. The Digital Agenda emphasises energy and utilities, and focuses on the development of smart networks and smart grids. Key ideas in the document for applications of big data in energy include:²²¹

- Maps to display energy consumptions of regions, districts and buildings to help manage the infrastructure, develop spatial policy, and offer energy conservation products and services;
- Improving weather forecasts using data from windmills and solar panels;
- Linking data from generators and consumers of energy through digital platforms.

The national transition away from non-renewables (to be completed by 2050) remains a major focus point of the Coalition Agreement and substantial government funds (around €4 billion a year) are allocated to the various associated budget items, with an additional set of funding for innovation policy.

Commit2Data are researching how big data can assist this transition. They are seeking to achieve change in this domain through the use of PPPs, with projects starting in this sphere in early 2018.²²² Big data is recognised as a key enabler in coordinating the transition through smart meters and sensors. Through Commit2Data, the Netherlands Organisation for Scientific Research (NWO) awarded grants worth €3.85 million to six projects, to be combined with private sector funding, including ‘intranets for energy’ and ‘peer-to-peer energy grids’.²²³

Energy transporters (publicly owned private entities) already provide both open and shared data, but also turn down lots of data requests. Although they see the value of releasing data, for example to aid the energy transition, they are often forced to turn down requests for a number of reasons. These include privacy concerns (around data such as that from smart metres) and contractual confusion due to their position in charge of a data pool derived from both public, private, and individual sources who submit data under varying conditions.²²⁴

²¹⁹ *ibid.*

²²⁰ [Social and Economic Council \(2013\) The Agreement on Energy for Sustainable Growth: a policy in practice](#)

²²¹ [The Ministry of Economic Affairs \(2016\) Digital Agenda for the Netherlands](#): 40

²²² [Dutch Digital Delta, Energy](#)

²²³ [NWO \(2018\) Grants awarded for Energy System Integration & Big Data](#)

²²⁴ Interview with Ton Zijlstra, European open data expert, 12 April 2018

Belgium

Mapping the data economy

Belgium is the 9th largest economy in the EU and 25th in the world.²²⁵ With a growth rate of 1.6 percent in 2017, its economy is described as ‘well-diversified’, ranging from manufacturing to services and technology, and based on extensive transport infrastructure.²²⁶ Belgium has a large tech industry in relation to its small population of 11 million citizens: it has 22 companies in Deloitte's Fast 500 list for 2016.²²⁷

Belgium is ranked 22nd in the global Open Data Index²²⁸ and 6th out of 28 EU countries in the 2016 Digital Economy and Society Index (DESI). It therefore forms part of a cluster of high-performing countries when measured on its digital infrastructure, confidence and security, skills and jobs, economy, and government.²²⁹

However, Belgium's DESI ranking of 6th in 2016 represents a fall from its 5th place in 2015. Equally, the 2016 BCG e-Intensity Index, which measures the extent to which a country embraces the internet, ranks Belgium 19 out of 85 countries. It therefore sits behind many of its European peers. Belgium also ranked 17th in European countries on the 2017 Global Innovation Index, behind comparable nations such as Sweden (2nd), the Netherlands (3rd), and Denmark (6th).²³⁰

These rankings suggest that Belgium risks being out-performed by its European neighbours, yet also possesses a well-developed baseline and potential for significant growth in its digital economy. Indeed, it is estimated that a fully operational digital market embracing digital technology and startups in Belgium could double the GDP growth rate by 2020. Potentially, this could translate into 300,000 full-time jobs across the digital sector and wider economy.²³¹

Belgium possesses one of the most devolved government structures in the world, and both its federal and regional governments have recently sought to end any apparent digital complacency. At present, the country has ‘crossroads’ databases at both the federal and regional level, where multiple government stakeholders pool data. In a similar model to the Netherlands (and Denmark), some of these datasets are open. However in Belgium (unlike the Netherlands and Denmark),

²²⁵ Eurostat (2017) Share of Member States in EU GDP

²²⁶ Index Mundi (2018) Belgium Economy Profile 2018

²²⁷ Hot Topics, A comparison of the world's leading fintech hubs: Belgium

²²⁸ Global Open Data Index (2017)

²²⁹ European Commission (2017) Digital Single Market: Belgium

²³⁰ BCG (2016) Digitising Belgium

²³¹ *ibid.*

largely due to complicated government structures, these ‘crossroads’ databases are not connected in a single unified system.²³²

In 2015, Deputy Prime Minister and Minister for the Digital Agenda Alexander de Croo launched new federal open data strategy, Digital Belgium. This is a five point plan to put Belgium ‘firmly on the digital map’. At its centre is a commitment to transition all government data to ‘digital by default’, available for use by non-profit and commercial applications without attribution.²³³ Aiming to create 1,000 new startups and 50,000 jobs, and grant internet users access to 1Gbps connectivity by 2020, this agenda contains an explicit commitment to place Belgium 3rd in the DESI by 2020. It has received strong support from organisations such as Open Knowledge Belgium.²³⁴

These ambitious agendas are currently at the early stages of enactment, meaning that Belgium is yet to realise their full potential. Nevertheless, the government’s actions are promising. There is a clear recognition that new companies and organisations will shape Belgium’s new digital economy meaning, and this creates a window of opportunity for young and emerging actors. This is particularly so in FinTech. Following Britain’s decision to leave the European Union, Belgian Finance Minister Johan van Overtveldt has sought to build new links between the two countries with the launch of a new Brussels-based hub to support financial technology startups.²³⁵

Data legislation and regulation

Key legislation and regulation

The 2015 Digital Belgium strategy is the centerpiece driving the federal government’s digital policy agenda. Not only does it make all government data sets open-by-default when requested, but it is required for the data to be published in easy-to-access, and machine-readable formats (useful for researchers and app developers alike). It is the government’s intention that by 2020, all government data will be proactively published without requiring citation through the use of CC0 (licenses without restriction - often the best form of open data licenses).²³⁶ To make this happen, every government department must develop an open data strategy that includes appointing a responsible Open Data Champion to put the initiative into practice. This is overseen by the creation in 2016 of the Digital Transformation Office - a centre of excellence and innovation in the intersection of new technologies and data.²³⁷ The federal government also launched a new government cloud (“G-Cloud”) providing a single platform for the integration of federal services and ministries. The strategy represents a clear embrace of digital governance where exceptions for privacy and security - rather than openness - have to be justified. Privacy is still taken seriously (as

²³² Interview with Ton Zijlstra, European open data expert, 12 April 2018

²³³ [Digital Belgium website](#)

²³⁴ [Colpaert, P. \(2015\) Green light for the Belgian federal Open Data strategy](#)

²³⁵ [Finextra \(2017\) Belgium builds fintech bridge to London](#)

²³⁶ [Belgian Government \(2015\) Green light for federal open data strategy: government data is now freely available](#)

²³⁷ [European Commission \(2017\) Digital Single Market: Belgium](#)

the GDPR section will illustrate), with the strategy ensuring that all personal information is anonymised, with an open data committee within the Privacy Commission overseeing this.²³⁸

The federal government's strategy is rightly ambitious, aiming to place it 3rd in the DESI rankings by 2020 with a five-point plan closely aligned to the key measures behind the index.²³⁹ Beyond open data, the strategy contains commitments to improve digital infrastructure (1 Gbps fibre broadband by 2020), ease of doing business (electronic invoicing is now an obligation for all government suppliers), and simplifying regulation for startups. Recognising that more and more people provide services to others as 'mini-entrepreneurs' through apps and other digital platforms (in what is known as the collaborative economy), the federal government introduced a new innovative legal framework in 2017 clarifying and streamlining taxes for these services. Under an income of €5,000, such services will be taxed at a straightforward, reduced rate of 10 percent (deducted at source) to prevent fraud and unfair competition with other small businesses - a vast improvement on the previous 33 percent rate that was applied ad hoc and required individuals to self-report income to tax authorities.²⁴⁰ This is complemented by the doubling of investments in startups each year since 2015, with Belgium having long lagged behind its European peers in startup funding.²⁴¹

BCG highlights that this has amounted to a significant increase in regulation in recent years, particularly in terms of fiscal and social legislation for the sharing economy. However, there are still important focus areas for improvement. Europe's 2017 Digital Progress Report for Belgium highlights that 68 percent of Belgians reported having at least basic digital skills (the EU average is 56 percent), and though there is high enrollment in tertiary education, there is a distinct shortage in graduates of STEM subjects necessary for growth and innovation, particularly in digital technology. The BCG report highlights this and labour market flexibility as key weaknesses of the government's approach thus far.²⁴² Despite these shortcomings, the government has launched a Digital Champions scheme ('to make every child in Belgium a digital champion'),²⁴³ and plan to bring IT professionals into schools. Perhaps the most significant move by the government is the announcement of an €18 million digital skills fund to advance coding and digital skills training courses for young people over the next three years.²⁴⁴

The legislative situation in Belgium is complicated by its heavily devolved governance between the Flemish, Walloon, and Brussels regional parliaments and executives. Indeed, Open Knowledge Belgium has claimed that this results in Belgium's digital performance being understated in several international indices such as the EU Digital Economy and Society Index which is based primarily on federal-level measures.²⁴⁵ What is happening at the regional legislative level is therefore highly

²³⁸ [Open Access Belgium, Open Data](#)

²³⁹ [Digital Belgium website](#)

²⁴⁰ [European Commission \(2017\) Digital Single Market: Belgium](#)

²⁴¹ [Ernst and Young \(2016\) Belgium: an unexpected ideal hub for FinTech?](#)

²⁴² [BCG \(2016\) Digitising Belgium](#)

²⁴³ [Digital Champions website](#)

²⁴⁴ [European Commission \(2017\) Digital Single Market: Belgium](#)

²⁴⁵ [Open Knowledge Belgium, Open Data in Belgium](#)

consequential and should not be ignored. Flanders thus far has been at the forefront of open data in Belgium with open standards set for its regional government as early as 2014. Numerous events and initiatives such as hackathons are well established across Flemish cities and supported by the Flemish Open Data Forum.²⁴⁶ There is now also a Smart Cities Flanders program, which is a broad stakeholder network with Flemish government and EU funding.²⁴⁷ Likewise, Wallonia has sought to catch up by launching Digital Wallonia, a platform for IT initiatives which provides an open data portal for the region as a whole.²⁴⁸ Key to these regional initiatives is the idea of not only improving citizens' lives, but ensuring data is readily available for research purposes, a key principle behind the opening up of datasets on Brussel's new City Portal.²⁴⁹

Finally, Belgium is in the process of radically reforming its Data Protection Agency by investing an extra €150 million euros into its annual budget. The goal is to ensure 'state of the art standards' that treat GDPR as a 'business opportunity'.^{250 251}

Impact of GDPR and the European ePrivacy Regulation

Ensuring both public and private organisations are ready for the GDPR is being taken extremely seriously by both federal and regional governments with practical advice to firms issued by the national Privacy Commission (in the form of a 13 step plan)²⁵² and through Digital Wallonia.²⁵³ The GDPR has prompted the federal government to radically overhaul its Data Protection Authority, with the national Parliament approving an extra €1.7 million for its annual budget to secure a 'state of the art' agency to operate on a par with the biggest data protection authorities around the world.²⁵⁴ The outgoing President of the Belgian Commission for the Protection of Privacy, Willem Debeuckelaere, is frank in stating that despite significant investment and efforts, "[e]ven the Belgian DPA will not be 100 percent compliant with the GDPR on May 25...[but] don't worry, we won't be the only ones".²⁵⁵

Belgium's Secretary of State for Privacy, Philippe De Backer, views this as a 'business opportunity' to create a level playing field between the public and private sectors to enable data exchange.²⁵⁶ He emphasises that the new Data Protection Agency's approach, (when it comes online in May 2018) is not simply to sanction, but 'provide guidelines for businesses and create legal certainty'. As part of this, sanctioning mechanisms have been written into law to avoid ambiguity and in

²⁴⁶ *ibid.*

²⁴⁷ [Smart Cities Flanders website](#)

²⁴⁸ [Digital Wallonia website](#)

²⁴⁹ [Open Data Brussels website](#)

²⁵⁰ Pfeifle, S. (2018) How Belgium is gearing up for GDPR. [The Privacy Advisor](#)

²⁵¹ Ashford, W. (2017) GDPR is a business opportunity, says Belgian minister. [Computer Weekly](#)

²⁵² DLA Piper (2016) BELGIUM: Belgian Privacy Commission issues a 13 step plan for companies preparing for GDPR compliance

²⁵³ De Doncker, O. (2018) GDPR, quel impact pour les prestataires de services digitaux?

²⁵⁴ Pfeifle, S. (2018) How Belgium is gearing up for GDPR. [The Privacy Advisor](#)

²⁵⁵ *ibid.*

²⁵⁶ Ashford, W. (2017) GDPR is a business opportunity, says Belgian minister. [Computer Weekly](#)

transposing EU legislation to national law, they also seek to make exceptions for archiving statistics and scientific research to allow as much room for innovation as possible.²⁵⁷

High-level market analysis

Finance

Belgium is being touted as a surprisingly good platform for FinTech startup and development, despite its present low adoption rate of 13 percent amongst consumers (below a global average of 33 percent).²⁵⁸ Though an early pioneer in the standardisation of payments between banks, Belgium's small market and population size, alongside a comparative decline in startup investment have not made Belgium an obvious choice for FinTech innovation recently. However, this has the potential to rapidly change over the next few years. The industry's roots in payments systems gives Belgium a clear potential focus area within the sector, with one survey showing that almost all FinTech usage in Belgium originates from digital payments, facilitated by the rise of e-commerce in the last decade.²⁵⁹

Generally, Belgium is unusual in that three quarters of its startups are business-to-business focused, a trend very much in evidence in its FinTech firms with companies like Xpenditure offering services for businesses over consumers and Clear2Pay focusing on helping financial institutions to improve internal payments processes. Belgium has long been at the forefront of applying innovative technologies in the financial system, with firms such as Clear2Pay having raised \$127 million over its 16-year lifetime.²⁶⁰

Despite Belgium hosting big players in FinTech, investments tend to be concentrated in early-stage startups, with more than 60 percent of the country's 56 funding rounds awarded for less than €5 million in 2016. Not only is startup funding increasing, but the government launched a 'Startup Plan 2015' to create a tax shelter for tech companies, reducing tax bills by anywhere from 30-45 percent.²⁶¹ Though Belgium's small market means FinTech firms have to build an outward-facing business, the country's comparatively developed market makes it an ideal innovation base prior to rolling out products to wider markets. This is being reinforced by the Finance Minister Johan van Overtveldt's approach to Brexit, in which he has deliberately sought to build mutually beneficial bridges with UK FinTech firms to continue to keep international markets open for Belgian firms that rely on them.²⁶²

²⁵⁷ *ibid.*

²⁵⁸ [Ernst and Young \(2017\) EY FinTech Adoption Index 2017](#) [NB: this figure also includes Luxembourg]

²⁵⁹ [Ernst and Young \(2016\) Belgium: an unexpected ideal hub for FinTech?](#)

²⁶⁰ [Hot Topics, A comparison of the world's leading fintech hubs: Belgium](#)

²⁶¹ *ibid.*

²⁶² [Finextra \(2017\) Belgium builds fintech bridge to London](#)

Transport

Belgium has one of the most developed transport networks in the world, which is also highly integrated into the European transport system. The European project ‘Open Transport Net’, launched in 2014, includes two hub cities in Belgium - Antwerp and Ghent. The project’s aim is to create virtual hubs aggregating, harmonising, and visualising transport-related data to make it easier for innovators to create new services and opportunities.²⁶³ In 2013, Brussels Mobility and the Brussels Regional Informatics Centre jointly designed an Open Data license that currently only applies only to their own data sets and specifically to the Brussels UrbIS geodata. It is this intelligent data-lead approach to managing transport data and communicating it to relevant stakeholders that is gaining an increased foothold, though at the moment still lags behind nearby large cities such as London, Paris and Amsterdam.

Belgium, like Germany, France, and the Netherlands, is a beneficiary of the C-Roads project supported by a combined €55 million grant from the EU, to implement technologies that enable vehicles to ‘talk’ to each other in moving towards a smart road network.²⁶⁴ External organisations such as ITS.be (Intelligent Transport Systems), a public-private not-for-profit, have conducted extensive lobbying of federal and regional governments seeking to accelerate the transition to sustainable mobility across the country.²⁶⁵

Artificial intelligence

Brussels has new ambitions to be a centre for AI research and innovation.²⁶⁶ Recently, Innoviris (Brussels Institute for Scientific Research) unveiled an investment programme, Team UP, of €4 million, to support companies and higher education in developing solutions for image analysis, telemedicine, virtual reality, robotics, and financial analysis.²⁶⁷ One such beneficiary, ChatBot Plus, is already helping improve customer service using chatbot technology via Facebook.²⁶⁸ These developments present powerful opportunities for the application of AI in the Belgian retail industry. As a recent PWC report on the applicability of automation in the Belgian retail sector points out, AI could be used at almost every stage of retail from checkouts, sales forecasting, and in-store analysis, accompanied by robotic process automation (RPA) which can be used to carry out high-level repetitive tasks behind the scenes including populating tax returns with financial data, and automated invoicing.²⁶⁹ Though the Belgian retail sector needs to invest in business software and structured, centralised databases to realise this potential, these automatic processes represent opportunities applicable to the wider Belgian economy (beyond retail).

²⁶³ [Open Transport Net website](#)

²⁶⁴ [Traffic Technology Today \(2016\) C-Roads project reinforces EU's commitment to connected and cooperative mobility](#)

²⁶⁵ [Intelligent Transport Systems. About page](#)

²⁶⁶ [BNP Paribas \(2017\) Why Brussels is investing in artificial intelligence](#)

²⁶⁷ [Innoviris Brussels website. Missions](#)

²⁶⁸ [Chatbot Plus website](#)

²⁶⁹ [PWC \(2016\) Rethinking retail: Artificial intelligence and robotic process automation](#)

According to ‘The State of European Tech’ report 2016, Brussels and Antwerp are in the top 15 hubs of artificial intelligence talent in Europe (12th and 14th respectively).²⁷⁰ Likewise, KU Leuven and Ghent University are ranked in the top 100 worldwide by most-cited AI related research.²⁷¹ Though there are plenty of green shoots in regards to AI development in Belgium, there are currently no political frameworks to systematically advance, implement or discuss issues surrounding AI at the federal or regional level, and the issue is yet to reach the stage of salient national debate.²⁷²

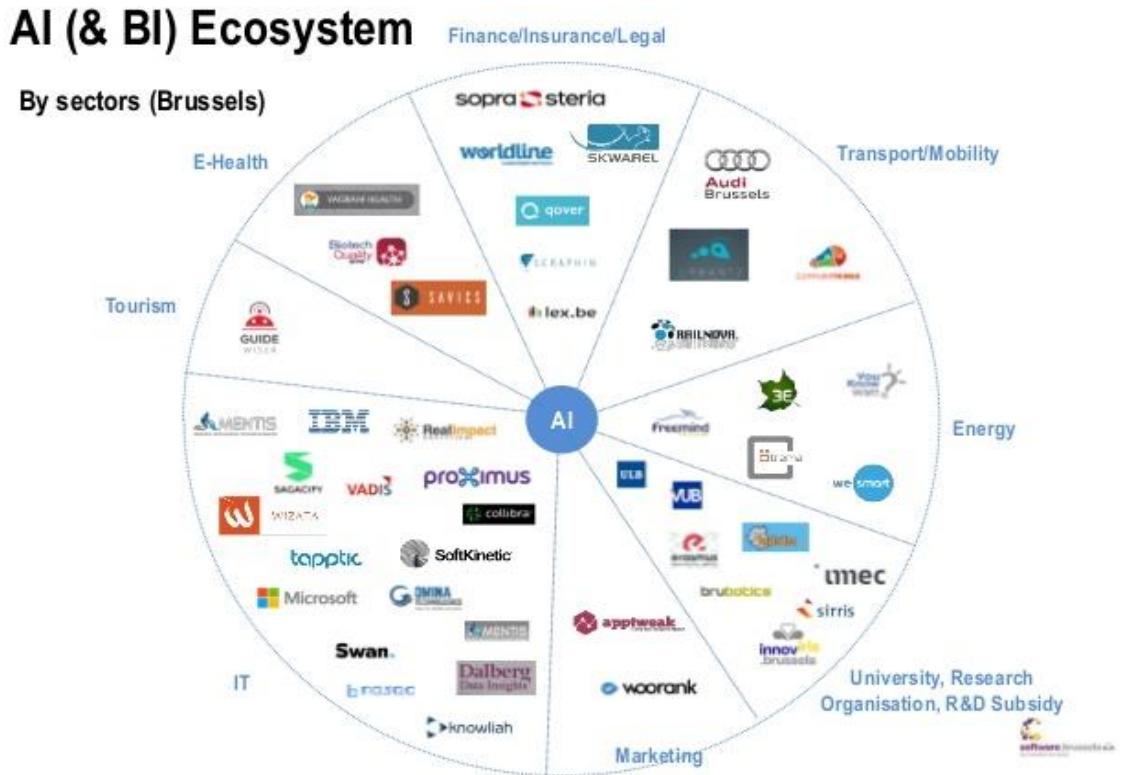


Diagram of the Brussels AI ecosystem. Source: impulse.brussels²⁷³

Healthcare

App-based medical provision and support is gaining traction in Belgium. In February 2018, the Minister for Social Affairs and Public Health, Maggie De Block, announced federal plans to establish

²⁷⁰ Tibau, F. (2016) Brussels and Antwerp in top 15 European AI hubs, startups.be

²⁷¹ State of European Tech (2017) Europe is home to the world's leading AI research community

²⁷² El Ghabri, M. (2017) Belgium, in Green Observatory: Robotics and Artificial Intelligence, Green European Journal

²⁷³ impulse.brussels (2017) Artificial Intelligence Overview

a three-tier regulatory framework to ensure the responsible growth of this exciting sector which deals with sensitive information:²⁷⁴

- Tier 1 - minimum privacy, security, and purpose requirements every app should satisfy;
- Tier 2 - ensure the interoperability of medical apps with official e-health applications;
- Tier 3 - funding to reimburse apps generating added value to the health economy.

Launched in 2015, Recip-e, a "non-addressed" prescription messaging service (the prescriber does not know which provider the patient will turn to, when the prescription is produced), is a prime example of an expanding e-health domain.²⁷⁵ Since roll-out, 90 percent of generalists in Belgian healthcare are equipped with Recip-e.²⁷⁶

Appropriate regulation of the e-health sector in Belgium is set to be addressed as Maggie De Block, alongside Alexander De Croo (Deputy Prime Minister and Minister responsible for the Digital Agenda) plan to create a 'Digital Health Valley'.²⁷⁷ The plans to develop an ecosystem of firms involved in all aspects of the e-health economy have already served as a platform for the launch of HealthTech.Belgium, a collaborative effort bringing together key actors in the sector to make Belgium the world's starting base for innovation in health technologies.²⁷⁸ Grassroots innovation in Belgium appears to have prompted a government vision and support which lays promising ground for the growth of its e-health economy.

Energy and utilities

The energy market is currently in the process of remarkable change in Belgium. A new federal clearing house (ATRIAS) and the implementation of a new energy market process model, MIG6.0, will greatly simplify the data exchange between energy market stakeholders in a liberalised market, and incorporate the latest technologies (such as smart meters and decentralised energy production) respectively.²⁷⁹ With technology enabling the production and use of data in a liberalised energy market with decentralised producers, the Belgian energy market was in need of a simplified, transparent, and efficient model to handle increasing data and exchange. Crucial to this is the creation of a federal, standardised, central communication platform to simplify information exchange between market players.

There is much pressure across Europe to adopt new market practices and restructure energy data management with the mass roll-out of smart-meters (up to 80 percent coverage by 2020) increasing the amount and frequency of energy data. This new data also brings with it the need to properly legislate protections of customer data. Belgium's energy market also faces long-term

²⁷⁴ VBB (2018) Belgium - Minister De Block Unveils Plan for Medical Apps and Digital Health Valley

²⁷⁵ Recip-e website

²⁷⁶ *ibid.*

²⁷⁷ VBB (2018) Belgium - Minister De Block Unveils Plan for Medical Apps and Digital Health Valley

²⁷⁸ Agoria (2018) Launch of HealthTech.Belgium: "Let's make Belgium THE world's test country for Health Tech innovation"

²⁷⁹ Energy Outlook (2016) Atrias and MIG6.0: Towards a new energy market model in Belgium

challenges from government policy to phase out its nuclear reactors until 2025.²⁸⁰ As PwC highlights, this poses significant challenges to the country's ability to meet its climate change goals.²⁸¹ The restructuring of Belgium's energy market and the challenges faced by its long-term energy sustainability invite a significant role for digital technologies in the future.

²⁸⁰ [World Nuclear Association \(2017\) Nuclear Power in Belgium](#)

²⁸¹ [Forum Nucleaire, The role of nuclear power and renewables in the energy transition](#)

Appendix 1: methodology

We conducted desk-based research over a period of six weeks, to map out the data economies of Germany, the Netherlands, France and Belgium. We consulted a wide range of online resources, from public sector documents and policy statements to reports produced by private companies and consultancy firms. Given time and resource constraints, we have attempted to summarise as much salient information as possible for each country from the wide potential range of information and resources to consider. It is important to note, therefore, that this work is non-exhaustive and may contain omissions.