

The Digital Economy in Germany

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Germany has set itself the goal of becoming the number one country in Europe in terms of digital growth. Technological advances in IT and software, robotics and sensor technology, and intelligent networks in the Internet of Things are driving the global digital transformation. Germany's information and communication technologies (ICT) market is one of the largest in the world. ICT plays an essential role in consolidating Germany's industrial production strength and export nation leadership on the way to a truly connected economy.

ICT in Germany

Germany recorded ICT market turnover of EUR 160 billion in 2017, making it the fifth biggest ICT market in the world. The country's IT sector is the main driver of growth, with turnover of more than EUR 85 billion (3.4 percent growth). According to the European IT Observatory (EITO), domestic spending on IT equipment, services and software helped the market grow faster than the GDP in 2016, with a year-on-year increase of 3.3 percent. The trend is set to continue in 2017, with IT spending expected to rise by 3.1 percent over the year. Germany consolidated its position as the largest software market in western Europe, with turnover of more than EUR 23 billion and year-on-year growth of 6.3 percent in 2017. With an almost one million strong ICT sector workforce (and a further 370 thousand ICT professionals active in other sectors), Germany has a massive pool of highly qualified professionals.

Digital Transformation

The world is in a state of radical digital transformation. In 2015, around 20 billion devices and machines around the world were connected online. By 2030, that figure is expected to be around half a trillion. According to McKinsey, the Internet of Things (IoT) will create up to USD 11 trillion in value added in 2025.

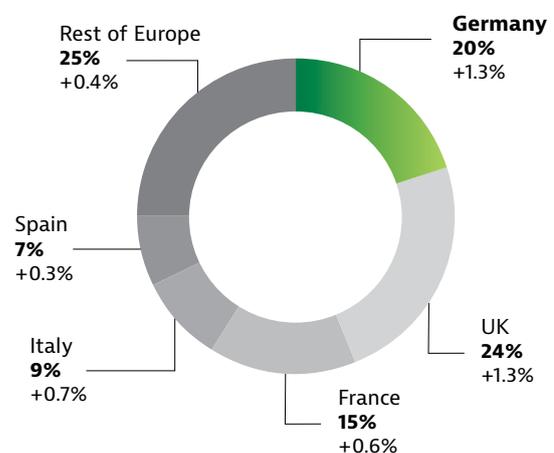
The digitalization of industry is not only transforming value-creation processes but also creating new market opportunities. This is particularly true for innovative start-up and SME service

providers of artificial intelligence, big data, blockchain, and cloud computing services.

Within Germany, eighty-three percent of companies believe that their value chains will be marked by a high level of digitalization by 2020. One in four companies already consider themselves to be "highly digitalized." The central findings of a recent PwC study show that value chain digitalization levels will reach 80 percent, with an overall efficiency increase of 18 percent. Twenty percent of companies in the automotive sector already use self-controlling production facilities.

The rapid pace of digital transformation is also having a major impact on Germany's traditionally strong manufacturing sector, with the country having already established itself as the world's leading Industrie 4.0 nation.

European ICT Market 2017 and Predicted Growth Rates 2018



Source: EITO 2017

Digital Economy Markets

The products and services of the new digital economy give rise to delivery models (Ad Tech and FinTech) that rely on innovative web-based data management solutions (Big Data and Cloud Computing) capable of successfully analyzing huge quantities of data while successfully navigating increased risks and threats online (Cybersecurity). The implementation of applications, data analytics and sensor systems to transform conventional value chain models is perhaps best exemplified by advances made in manufacturing (Industrie 4.0).

Ad Tech

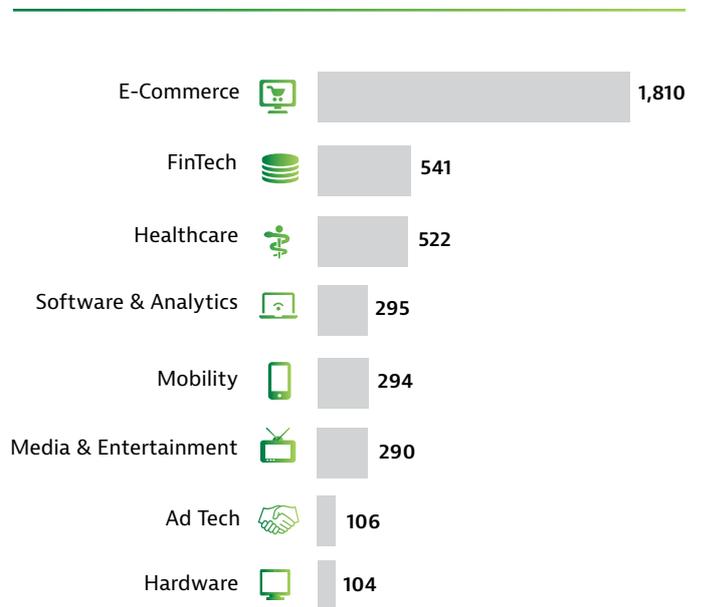
The increasing digitalization of modern life has had a significant transformative effect on advertising delivery models and media platforms used. Around 81 percent of Germany's population regularly uses the internet, spending around 149 minutes online each day in 2017. Sixty-four percent are smartphone users, reflecting the move away from stationary to mobile internet usage. The broadcast and print media models of the analogue world are slowly being superseded by the digital world's emphasis on online and mobile delivery platforms, with the domestic market set to continue growing. In 2016, net advertising investment in digital (display and search engine marketing) overtook television advertising spending, making the internet the strongest medium in the media mix for the very first time. Online and mobile advertising volume for the year 2017 is expected to be EUR 1.9 billion according to market projections made on behalf of the Circle of Online Marketers (OVK) within the German Association for the Digital Economy (BVDW). Forty-five percent of this volume is spent via programmatic advertising, with continued growth predicted for the foreseeable future. The advent of sell-side platforms and demand-side platforms, allied to an array of new formats, multi-screen concepts, and targeting options help digital campaigns to reach a hard-to-reach target audience.

FinTech

Germany is an important FinTech market in Europe and the fourth largest in the world. A recent study found around 700 companies in the sector, half of which were established during the last three years alone. The cities of Berlin and Frankfurt are home to one FinTech hub respectively and the cities of Cologne and Munich each have an InsurTech hub. Most German FinTech companies are located in Berlin (228 companies as of September 2017), followed by Frankfurt and Munich (84 respectively), Hamburg (67), and major cities in North Rhine-Westphalia (53). Banks, insurance companies and other players initiate corporate start-up programs and establish accelerator and incubator offices in order to establish new FinTech companies in the market. Some company builders are also focusing their activities in FinTech. A recent survey shows that more than half of the German population is open

to using digital financial solutions provided by third parties in preference to those provided by their own house bank. Financing investment in FinTech start-ups in Germany reached EUR 541 million in 2017, putting FinTech in second place behind the e-commerce start-up sector.

Investment in German Start-ups 2017
in EUR million



Source: Ernst & Young Start-up-Barometer 2018

Digital Hub Initiative

The Digital Hub Initiative, developed by the Federal Ministry for Economic Affairs and Energy, seeks to support the establishment of digital hubs in Germany. The underlying idea of establishing 12 digital hubs across the country is that cooperation between companies and business start-ups within a confined area will boost innovation in the digital age. An individual hub focus on a specific industry will promote the emergence of clusters, thereby allowing other industries to contribute their expertise.

www.de.digital

Big Data

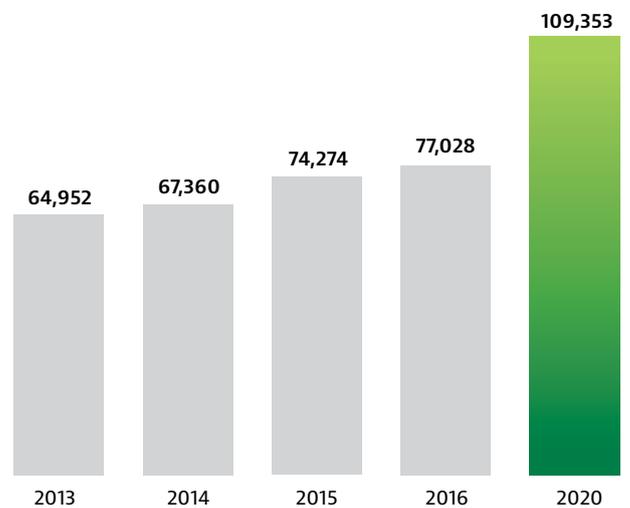
Information is the most valuable commodity of the digital age. The rise of cloud computing solutions and the digital transformation of nearly all industry sectors make the efficient, real-time management of huge volumes of data a modern business imperative. According to an IDC study conducted for the European Commission, European Union (EU) data economy value is forecast to grow to EUR 430 billion in 2020 – with Germany accounting for more than one quarter of market volume. According to this baseline scenario, German data market share of total ICT spending will grow from 10.8 percent share in 2016 to at least 13.3 percent. Germany counts as a global leader in the adoption of data technologies, with big data solutions finding application in numerous industry sectors including the health economy, autonomous vehicle production, intelligent power grids, and future transport systems. According to the IDC European data market report, big data is one of the enablers of most of the innovative applications and services currently being developed. One in five German companies currently makes use of big data solutions. According to Bitkom, data management is increasingly being outsourced, with third party providers being entrusted with up to 69 percent share of data design and organization. Data processing power and storage limitations are also seeing more businesses make use of cloud computing solutions to host and process their data as well as for data analytics purposes. Real opportunities exist for business models that tap into the data protection, security and compliance concerns of German companies active in the data economy.

Cloud Services

According to IDC, German company public cloud spending is expected to increase from a 2015 level of EUR 2.8 billion to EUR 9 billion in 2020, making cloud computing the architectural basis for the digital transformation. Growing demand for cloud services is intrinsically linked to the country's digital transformation, with two out of three companies having implemented cloud services in 2016 according to Bitkom. Cloud computing now counts alongside big data and IoT as a key enabling digitalization technology, with the interaction between the three proving highly effective for digital transformation in the business environment. Forty-four percent of companies use private cloud computing solutions, with a growing tendency to outsource private cloud operation to external IT service providers. Twenty-nine percent of respondents made use of public cloud computing solutions during the same time, with the strongest growth being in the Security as a Service sector after conventional office software applications. The whole hardware, software and services market is becoming more and more cloud-based. SaaS, BPaaS, PaaS, IaaS and new cloud services merge into XaaS – "Anything as a Service."

Together with big data and IoT, cloud computing is the driving force behind a number of digital platforms including block-chain, connected cars, Industrie 4.0, and smart services. Conventional software segments including enterprise resource planning are also increasingly moving to the cloud.

The German Data Economy 2013-2020 turnover in EUR million



Source: IDC/European Commission 2017

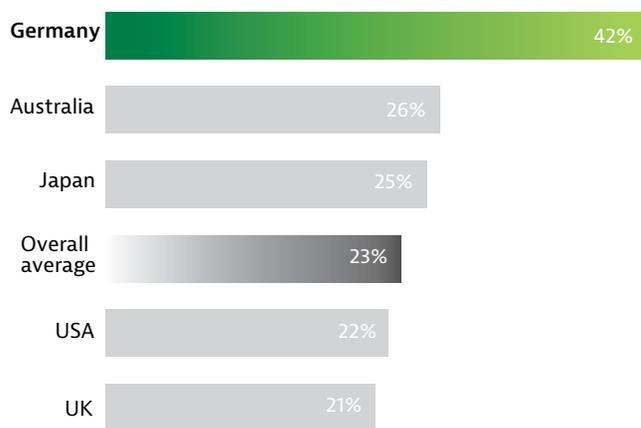
Cybersecurity

Tightened regulations, increased awareness of emerging threats and the move to digital business strategies are driving forecast increases in international enterprise security spending. According to Gartner, global security spending will rise to USD 96 billion in 2018. A spate of high profile cyberattacks has also positively impacted on enterprise security budgets. According to Accenture, cybercrime cost German companies 42 percent more in 2017 than the previous year – putting Germany behind only the USA in terms of cybercrime related costs. The European IT Observatory reports that German IT leaders are adopting a safety-first approach as architecture is restructured to meet the demands of increased mobility, platform-based business models, and the implementation of big data and other analytics tools. The ongoing digitalization of German industry, smart and autonomous driving concepts, and the secure management of data online are also driving security demand. International data privacy and regulatory compliance considerations have also translated into increased spending in the areas of data security tools, privileged access management and security information and event management. Europe’s General Data Protection Regulation – enforceable in all European Union member states – is set to come into effect in May 2018. Germany’s cybersecurity market should benefit directly from this development, with increased demand arising both domestically and internationally. Cloud security now enjoys broad acceptance in Germany, with SMEs turning to cloud solutions to increase employee mobility and reduce total cost of ownership.

Artificial Intelligence

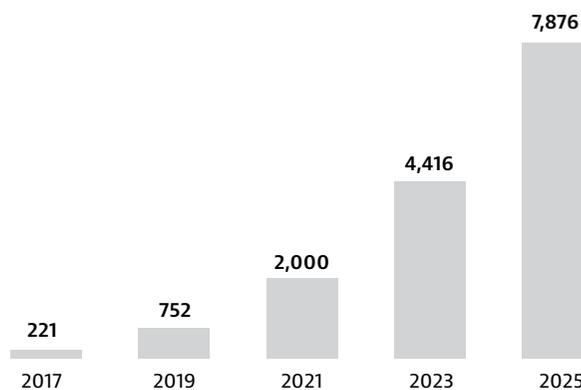
Artificial intelligence (AI) and digital technology developments have already transformed the way humans interact with machines. The collaboration between man and machine will become more sophisticated with the advent of next generation devices and machines. According to McKinsey, the world market for AI-based services, software and hardware is forecast to grow at between 15 percent and 25 percent per year and reach USD 130 billion by 2025. McKinsey reports that AI will become the growth motor for the German industry, with a potential GDP increase of up to four percent possible through the deployment of intelligent robots by 2030. Future human-machine interfaces are adaptive systems with cognitive capabilities. They will increasingly make use of neuroscience research methods, with optical and photonic technologies already offering virtual reality (VR) and augmented reality (AR) approaches to be deployed – allowing new interaction possibilities to come into play. Major future application areas include autonomous vehicles, AI-enhanced predictive maintenance, collaborative and context-aware robots, and yield enhancement in manufacturing. These are characterized by increasing digitalization and big data applications and are also shaping trends in speech recognition and optical technologies. Examples include conversational user interfaces, computer-aided image processing, processing large datasets in optics, obtaining information from data, visualization for augmented and virtual reality scenarios (AR/VR) as well as computer vision and machine learning.

Increase of Cyber Crime Costs 2016-2017



Source: Accenture 2017

Artificial Intelligence Market Revenue in Europe in USD million



Source: statista.de 2018

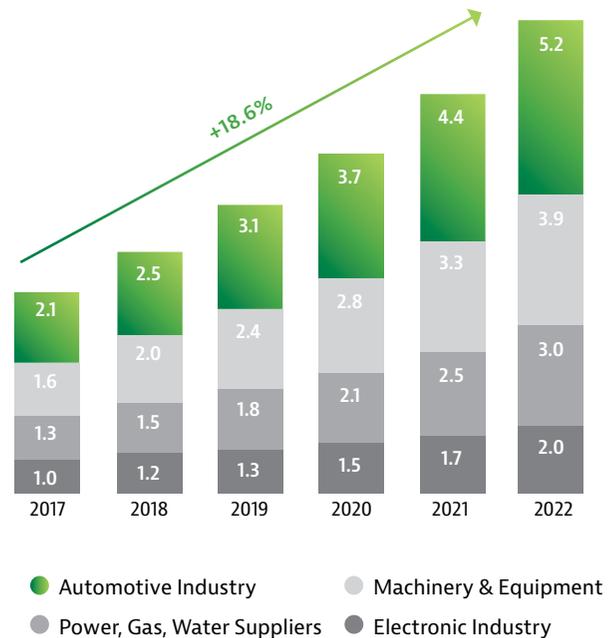
MARKET OPPORTUNITIES

Industrie 4.0

Germany's technological leadership in the fields of manufacturing, automation and software-based embedded systems forms the cornerstone for the long-term success of the Industrie 4.0 project. Objects and devices in the physical world communicate independently and exchange information online thanks to increased programmability, memory storage capacity, and sensor-based capabilities. Cyber-physical systems provide the basis for the creation of an Internet of Things – in which objects, devices and machines are connected – that makes automation and intelligent production possible. Within Germany, IoT-generated turnover is expected to double in just two years from a forecast level of EUR 24.5 billion in 2018 to more than EUR 50 billion in 2020 according to Deloitte. Technological advances made in fifth generation (5G) mobile communication networks and applications will lead to the creation of the "tactile internet." This promises to unleash the full potential of IoT in Industrie 4.0, providing as it does the basis for the highest level of reliability and real-time communication required for networked production. Modern electronic and microelectronic components and systems are an important prerequisite in making Industrie 4.0 objectives a reality. New microelectromechanical system building blocks – particularly for 3D motion tracking and technical monitoring systems – need to be developed for deployment in future cyber-physical production systems. German industry plans to invest in the region of EUR 40 billion annually in Industrie 4.0 applications through to 2020, with Industrie 4.0-related growth of EUR 153 billion expected over the same period.

German Industrial IoT Turnover

in EUR billion



Source: Eco/Arthur D. Little 2017

Digital & Service Industries: Our Services

Germany Trade & Invest's Digital & Service Industries team has a proven track record in helping international companies set up their business operations in Germany. The individual members of the team are experts in their respective digital economy fields (ad tech, fintech, big data, cybersecurity, artificial intelligence, and Industrie 4.0.). They provide a range of project-related services and contacts to relevant supporting organizations and institutions across Germany.



For questions on how to establish your business in Germany, please contact Marc Rohr, Director, Digital & Service Industries: marc.rohr@gtai.com



For more information about the digital economy in Germany, please visit our website: www.gtai.com/industries

OUR SERVICES

About Us

Germany Trade & Invest (GTAI) is the foreign trade and inward investment agency of the Federal Republic of Germany. The organization advises and supports foreign companies planning to expand into the German market and assists German companies seeking to enter foreign markets.

Investment Location Germany

GTAI provides close-to-market information to international companies looking to enter German markets. Our specialist industry teams prepare all of the relevant information essential to business success in Germany. GTAI's comprehensive range of information services includes:

- Market and industry reports
- Market entry analyses
- Business and tax law information
- Business and labor law information
- Funding and financing information

Business Location Services

GTAI supports international companies from market entry to business start-up in Germany. Expert project teams advise and assist in the business establishment phase. GTAI's range of free services includes:

- Legal and tax-related project support
- Funding and financing advisory services
- Site visit organization
- Local partner and network matchmaking
- Public and private partner coordination

All investment-related services are provided entirely free of charge. Our specialist industry teams have hands-on experience in their respective industries and treat all investor enquiries with the utmost confidentiality.

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