



# COMMUNICATION AT ITS BEST

Information and communications technology  
in North Rhine-Westphalia  
Facts. Figures.

## Information and communications technology in North Rhine-Westphalia

### Facts & figures

In North Rhine-Westphalia (NRW), information and communications technologies (ICT) are driving the digital transformation of the entire economy. This is where entrepreneurs, researchers and investors, for example, find the ICT know-how to help shape the development of Industry 4.0. With its innovations, the North Rhine-Westphalian ICT sector provides new opportunities for value creation and employment and is itself an economic heavyweight. No other German state possesses anything like as high a density of companies from this sector as NRW, ranging from medium-sized IT companies through software startups to telecommunications giants.

The nearly 23,700 ICT companies in the state employ more than 210,400 people and generate sales of 102.88 billion euros (2015). This corresponds to almost 16 percent of NRW's gross domestic product. The IT sector alone, with over 21,000 companies and almost 177,000 employees, has sales of over 45 billion euros.

The state's IT companies include international market leaders such as adesso, Atos, Computacenter, Diebold Nixdorf, G Data, Itelligence, Materna and Toshiba. NRW is also the top telecommunications industry location in Germany. Four big players in the telecoms industry – Deutsche Telekom, Ericsson, Huawei Technologies and Vodafone – are based along the Rhine. In 2015, the telecoms sector in NRW generated more than 57 billion euros in sales with a workforce of over 32,000 employees.

In order to ensure that the state remains a competitive location in the future, the integration of ICT and intelligent products as well as production and service processes is being promoted – "**Cyber Physical Systems**" (CPS). Through the coupling of information and communication technologies as well as embedded systems in CPS, hitherto separate industries, disciplines and social areas are networked with each other. These processes and developments offer immense growth potential for NRW as a location with its great strengths in ICT-based technologies and economically strong industrial sectors.

- The market for **Industry 4.0** has great future potential for NRW. By 2025, the use of such applications could generate approx. 15.6 billion euros in gross value added alone in the core industries of the state.
- **Big Data** or the next level, **Smart Data**, offers great growth potential for the state. By 2020, sales of hardware, software and services relating to the cognitive computing and machine learning technologies required for smart data

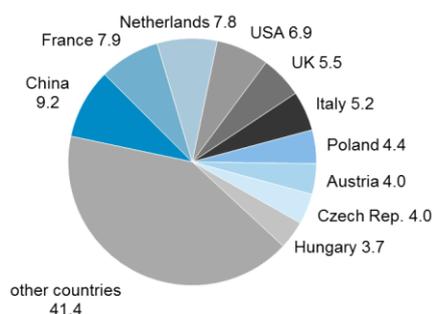
analysis are expected to increase to 21.2 billion euros. If they are used consistently and at an early stage, by 2030 Germany's GDP could be up to four percent, i.e. EUR 160 billion higher than without these technologies.

- Small and medium-sized enterprises (SMEs) and startups in particular can benefit from digitization. The concept of **cloud computing** plays an important role here: By providing IT services via the Internet, tailor-made software systems and IT resources can also be made affordable for SMEs, and the use of computer capacity and services can be adapted to the user's needs.
- NRW is one of the hotspots for **IT security** in Germany. Almost nowhere else are there so many companies and research institutes active in IT security. In total, there are more than 700 researchers in the field of IT security, spread over around 20 universities and more than 400 IT security companies. Many young startups in the field of IT security complete this picture and enrich this innovative, dynamic environment.
- NRW is the nationwide leader in **broadband availability**: over 82 percent of households are supplied with bandwidths of more than 50 Mbit/s, and in urban areas up to 98 percent (e.g. Bonn, Cologne, Leverkusen). Only the city states of Hamburg, Berlin and Bremen perform better. An interactive map of the status of urban and regional expansion can be found at [www.breitband.nrw.de](http://www.breitband.nrw.de).
- The same applies to the **wireless communication standard LTE** (Long Term Evolution = 4G). At 98.6 percent, the supply is almost universal and ranks fourth in a nationwide comparison behind the city states of Berlin, Bremen and Hamburg. The next development stage is called **5G**. Huawei is one of the leading companies in this field, but numerous other players from science and industry in NRW have also recognized the relevance and potential of this new mobile standard.

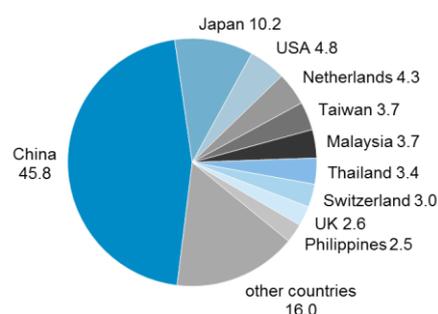
## Foreign trade

In 2016, nearly half of the 20.4 billion euros in ICT imports to NRW came from China. The nationwide import share was 19.5 percent. In 2016, ICT exports throughout Germany also continued to increase compared to the prior year and amounted to around 100 billion euros, with NRW's share of ICT exports again at around 8 percent. The main customer countries were China, which continues to distance itself clearly from France and the Netherlands in 2<sup>nd</sup> and 3<sup>rd</sup> place respectively.

### Customers (in %)



### Suppliers (in %)



Source: IT.NRW, foreign trade statistics for North Rhine-Westphalia; position as at: 2016

## Regional concentration



### Aachen Region

- IT and cloud computing for efficient business processes
- Mobile computing and embedded systems
- Big data and energy industry informatics

### Bergisches Staedtedreieck

- Quality assurance and quality management systems
- ICT for smart vehicles and energy grids

### Muensterland

- IT applications and infrastructure for the strong regional insurance and finance sector
- Center of competence for geoinformatics
- E-health
- E-business process and enterprise content management

### Lower Rhine

- Microelectronics and microsystems technology for networked systems
- Cross-innovative ICT research and development

### Ostwestfalen-Lippe

- Intelligent technical systems
- Cloud computing, virtualization and social media for digital companies

### Düsseldorf and Cologne/Bonn Region

- Telecommunications & mobile
- Internet economy, cloud computing, big data
- Strong ICT startup scene

**Ruhr Metropolis**

- IT services from security to eCommerce
- Software engineering
- Games

**Südwestfalen**

- ICT for the manufacturing industry

**Companies****Information technology (selection)**

- **Atos Information Technology GmbH, Essen**

Established: 1995; sales: €12 billion (worldwide); employees: 12,000 (Germany-wide)

Atos is a leading provider of digital services with seven locations in NRW. Atos supports companies worldwide with consulting services and systems integration, managed services & business process outsourcing (BPO) as well as cloud, big data and security solutions.



- **Computacenter AG & Co. oHG, Kerpen**

Established: 1984; sales: €1.7 billion; employees: 5,100 (Germany-wide)

The German subsidiary of Computacenter plc/England is a service provider for Internet and information technology for large corporations. Computacenter advises companies and other organizations on their IT strategy and delivers complete customer-specific computer networks including hardware.



- **Itelligence AG, Bielefeld**

Established: 2000; sales: €180 million; employees: 1,000

As a leading full-service IT provider, the company is one of the most successful SAP consulting firms worldwide. The range of services extends from SAP strategy consulting and licensing to proprietary SAP industry solutions and application management and hosting services.



- **Materna GmbH, Dortmund**

Established: 1980; sales: €130 million; employees: 1,300

Materna is a pan-European company in the field of IT services and covers the entire spectrum of services offered by a full-service provider in the premium segment, from consulting to implementation and operation.


**Telecommunications (selection)**

- **Deutsche Telekom AG, Bonn**

Established: 1995; sales: €73.1 billion; employees: 221,000 (worldwide)

Deutsche Telekom is one of the world's leading integrated telecommunications companies with more than 165 million mobile customers worldwide (over 42 million of them in Germany), 29 million fixed-network lines and over 18 million broadband lines.



- **Ericsson GmbH, Düsseldorf**

Established: 1991; sales: €700 million; employees: 1,400

The company is a leading supplier of mobile and fixed network systems and corporate networks. In addition, it operates an extensive research center in Herzogenrath near Aachen ("Eurolab") with around 550 employees, specializing in modern mobile and fixed network systems.



- **Huawei Technologies Deutschland GmbH, Düsseldorf**

Established: 2001; sales: €1.4 billion; employees: 830

Huawei is a leading global provider of telecommunications solutions. The portfolio includes network infrastructure, software, as well as mobile devices such as smartphones or tablet PCs. The European headquarters is located in Düsseldorf.



- **Vodafone GmbH, Düsseldorf**

Established: 1999; sales: €8.6 billion; employees: 9,400

Vodafone Deutschland is the first fully integrated communications group in Germany. The company provides consumer and business customers with products and services in the areas of mobile communications, fixed-network, data services and broadband Internet and supplies just under 42 million mobile communications and 6 million fixed-network customers.



## University & research landscape

### Universities (selection)

In the winter semester 2016/2017, around 85,000 students were enrolled in computer science, electrical engineering and information technology.

- **RWTH Aachen University**

Established: 1870; students: 44,400 (of which computer science: 3,000); courses: 164

With approx. 30 chairs and institutes, the Computer Science Department offers a very wide range of courses ranging from IT security and computer-aided learning to software engineering. First place in the CHE University Ranking 2016/17 as the best state university in the field of computer science.

- **Technical University Dortmund**

Established: 1968; students: 33,500 (of which computer science: 3,800); courses: 225

The Faculty of Computer Science in Dortmund was one of the first university computer science institutions in Germany. Today, it is one of the largest computer science faculties in Germany and offers a wide range of subjects. The In-

formatik Centrum Dortmund e.V. (ICD) is available to companies from all economic sectors.

- **Heinrich Heine University Düsseldorf**

Established: 1965; students: 33,500 (of which computer science: 4,500); courses: 78

Established in 2002, the subject computer science at the Faculty of Mathematics and Natural Sciences is well networked with its focus on bioinformatics in the central research area "Life and Biosciences" of the university. Düsseldorf's computer science is characterized by its special activities in the field of research – with participation in various European and German research networks.

- **University of Hagen**

Established: 1974; students: 64,800 (of which computer science: 6,200); courses: 29

The Faculties of Mathematics and Computer Science as well as Economics offer distance students degrees in Computer Science and Business Informatics.

- **University of Paderborn**

Established: 1972; students: 20,200 (of which computer science: 1,300); courses: 217

At the "University of the Information Society" more than 15 computer science chairs offer a wide range of specialization options for Bachelor's and Master's degree courses – from didactics in computer science to computer networks, codes and cryptography.

### Courses (selection)

University	Course
RWTH Aachen University	<ul style="list-style-type: none"> <li>• Computer Science, B.Sc., M.Sc.</li> <li>• Electrical Engineering, Information Technology and Computer Engineering, B.Sc., M.Sc.</li> </ul>
Technical University Dortmund	<ul style="list-style-type: none"> <li>• Computer Science, B.Sc., M.Sc.</li> <li>• Applied Computer Science, B.Sc., M.Sc.</li> <li>• Teaching Computer Science, B.Sc., M.Sc.</li> <li>• Data Analysis, Data Science, B.Sc., M.Sc.</li> </ul>
Heinrich Heine University Düsseldorf	<ul style="list-style-type: none"> <li>• Information Science, B.A., M.A.</li> <li>• Computer Science, B.Sc., M.Sc.</li> </ul>
University of Hagen	<ul style="list-style-type: none"> <li>• Computer Science, B.Sc., M.Sc.</li> <li>• Business Informatics, B.Sc. M.Sc..</li> </ul>
University of Paderborn	<ul style="list-style-type: none"> <li>• Computer Science, B.Sc., M.Sc.</li> <li>• Business Informatics, B.Sc., M.Sc.</li> <li>• Teaching Computer Science, B.S., M.Sc..</li> </ul>

### Research institutes (selection)

Eight Fraunhofer Institutes based in NRW conduct research in the ICT sector. One focus of ICT research is in Sankt Augustin. The Fraunhofer Institutes there analyze, research and develop user-oriented information cooperation and simulation systems:



- **Fraunhofer Institute for Applied Information Technology FIT**  
Established: 1968; employees: 160; [www.fit.fraunhofer.de](http://www.fit.fraunhofer.de)
- **Fraunhofer Institute for Intelligent Analysis and Information Systems IAIS**  
Established: 2006; employees: 200; [www.iais.fraunhofer.de](http://www.iais.fraunhofer.de)
- **Fraunhofer Institute for Algorithms and Scientific Computing SCAI**  
Established: 1992; employees: 140; [www.scai.fraunhofer.de](http://www.scai.fraunhofer.de).

There are two more Fraunhofer Institutes operating in Dortmund:

- **Fraunhofer Institute for Software and Systems Engineering ISST**  
Established: 1992; employees: 70; [www.isst.fraunhofer.de](http://www.isst.fraunhofer.de)  
Develops standards, architectures and concepts for the establishment of long-term stable and complex systems.
- **Fraunhofer Institute for Material Flow and Logistic IML**  
Established: 1981; employees: 500; [www.iml.fraunhofer.de](http://www.iml.fraunhofer.de)  
Regarded as the first address for all questions concerning holistic logistics.

The Fraunhofer Institutes in Aachen, Bonn and Duisburg research and develop pilot products for users from all areas of commerce, industry and administration:

- **Fraunhofer Institute for Production Technology IPT, Aachen**  
Established: 1980; employees: 450; [www.ipt.fraunhofer.de](http://www.ipt.fraunhofer.de)
- **Fraunhofer Institute for Communication, Information Processing and Ergonomics FKIE, Bonn**  
Established: 1963; employees: 410; [www.fkie.fraunhofer.de](http://www.fkie.fraunhofer.de)
- **Fraunhofer Institute for Microelectronic Circuits and Systems IMS, Duisburg**  
Established: 1984; employees: 245; [www.ims.fraunhofer.de](http://www.ims.fraunhofer.de)

The Paderborn Fraunhofer Institute researches the development of intelligent products, production systems and services for Industry 4.0:

- **Fraunhofer Institute for Mechatronic Systems Design IEM**  
Established: 2011; employees: 100; [www.iem.fraunhofer.de](http://www.iem.fraunhofer.de)

## Clusters & networks (selection)

- **CPS.HUB NRW**, [www.cps-hub-nrw.de](http://www.cps-hub-nrw.de)  
The Competence Center for Cyber Physical Systems bundles the competencies and knowledge of all disciplines that contribute to the development of Cyber Physical Systems, of all industries that use CPS, and of all regions in NRW. This creates a dynamic, innovative ecosystem in which knowledge is constantly evolving.
- **BITKOM Network North Rhine-Westphalia**, [www.bitkom.org](http://www.bitkom.org)  
Germany's largest high-tech network and the state of North Rhine-Westphalia are working together to promote the further development of forward-looking ICT topics in NRW. Complex networked ICT systems, Cyber Physical Systems and their deployment, e.g. in Industry 4.0 and the Smart Grid, are the focal points of the joint activities. The network has around 300 members.
- **DWNRW-Hubs**, [www.digitalewirtschaft.nrw.de](http://www.digitalewirtschaft.nrw.de)  
The DWNRW hubs in Aachen, Bonn, Düsseldorf/Rhineland, Cologne, Münsterland and the Ruhr Area support local activities with regard to the local establishment of incubators for the digital economy and their supraregional networking and cooperation. They serve as a central point of contact for startups in order to provide these facilities for settlement with startup financing and access to a relevant network, as well as the necessary (human) resources and industrial contacts.
- **eco – Association of the Internet Industry**, [www.eco.de](http://www.eco.de)  
With more than 900 member companies, eco is the largest association of the Internet industry in Europe. Since 1995, the association, headquartered in Cologne, has been helping to shape the development of the Internet in Germany, promoting new technologies, infrastructures and markets and determining framework conditions.
- **it's OWL – Intelligent Technical Systems OstWestfalenLippe**, [www.its-owl.de](http://www.its-owl.de)  
More than 180 companies, universities and other partners have joined forces in the technology network. Named a leading-edge cluster by the Federal Ministry of Education and Research, 47 research projects are developing intelligent technical systems and Industry 4.0 is becoming reality.
- **networker NRW**, [www.networker-nrw.de](http://www.networker-nrw.de)  
The association, founded in 2000, provides a network of personal contacts for entrepreneurs from the IT and media sectors and stands for information, cooperation and partnership; it has 180 members.
- **nrw.uniTS**, [www.nrw-units.de](http://www.nrw-units.de)  
In order to promote the protection of company secrets, privacy and infrastructures and to strengthen IT security as a whole, nrw.uniTS has set itself the task of optimally networking the still young IT security sector in NRW, uncovering synergy potentials and then using them. nrw.uniTS offers a platform for all IT security actors in NRW.



## Trade fairs & events (selection)

- **ANGA COM, Cologne;** *www.angacom.de; next dates: June 12-14, 2018; frequency: annual*

For more than 16 years, ANGA COM has been Europe's leading trade fair for cable, broadband & satellite. The trade fair and congress are aimed at network operators, manufacturers, service providers, program providers, consulting companies, authorities and other institutions in the telecommunications and media sectors.
- **dmexco, Cologne;** *www.dmexco.de; next dates: September 12-13, 2018; frequency: annual*

dmexco is the world's leading trade fair and conference for the digital economy. A unique combination of trade fair and conference, it stands for innovative and forward-looking developments and trends. It offers the largest selection of current economic trends, growth strategies, product innovations and creative diversity in a variety of formats every year.
- **EuroCIS, Düsseldorf;** *www.eurocis.com; next dates: February 27–March 1, 2018; frequency: annual*

EuroCIS is the international trade fair for information technology and security in the retail trade. More than 400 exhibitors from almost 30 countries present their latest retail-specific solutions and the latest state of the IT future.
- **IT Security Day NRW, Essen;** *www.it-sicherheitstag-nrw.de; next dates: December 5, 2017; frequency: annual*

The IT Security Day is a specialist congress focusing on data, information and IT security. It is organized by the chambers of industry and commerce in NRW. It is aimed specifically at small and medium-sized companies.
- **M2M Summit, Cologne;** *www.m2m-summit.com; next dates: autumn 2018; frequency: annual*

The M2M Summit is a congress trade fair for the intelligent networking of systems and devices. Around 60 exhibitors will present their latest trends and technical innovations in machine-to-machine communication at the M2M Summit in Cologne. In addition, particularly interesting solutions will be presented to visitors on topical guided tours through the exhibition.



## Imprint



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