Our central research and development unit

Siemens Corporate Technology | July 2015
# Corporate Technology
Central research and development

| 1 | Our innovative power |
| 2 | Our mission |
| 3 | Our areas of activity |
| 4 | Our work – concrete examples |
| 5 | Our organization |
| 6 | CT as an employer |
For nearly 170 years, pioneering technologies and the business models developed from them have been the foundation of Siemens’ success. Our central research and development unit – Corporate Technology (CT) – plays an important role in this.
Our milestones
across 170 years of history

- 1847: Werner von Siemens founds the company
- 1847: Telegraph
- 1850: Dynamo
- 1859: Electric streetcar
- 1879: Electric train
- 1881: Telephone switchboard
- 1881: Electron microscope
- 1939: Electron microscope
- 1953: Thyristors for energy transmission
- 1959: Simatic (electronic automation)
- 1962: High-purity silicon
- 1974: Computer tomograph
- 1958: Heart pacemaker
- 1953: Coaxial cable
- 1965: Megabit chip
- 1965: Integrated circuit
- 1985: Siemens – top speed 300 km/h
- 2000: Syngo user interface
- 2000: Wind turbine rotor blades in one cast
- 2009: Most efficient gas turbine, 370 MW
- 2013: PLM Software
- 2010: Biograph mMR
- 2015: Somatom Force

Our innovative power in figures
Siemens as a whole and Corporate Technology

Expenditures for research and development – our greatest strength

€4.4 billion
Expenditures for R&D – €400 million more than in fiscal 2014

Inventions and patents – securing our future

8,600 inventions¹
4,300 patent applications

University cooperations – our knowledge edge

28,800 R&D employees¹

Corporate Technology – our competence center for innovation and business excellence²

7,800 employees worldwide
5,100 software developers

1,600 researchers
400 patent experts

1 In fiscal 2014
2 Employee figures: status May 2015
Our global presence
Partner to customers all over the world
Our mission

Shaping the future with a passion for research, technology and innovation: this is the mission of Corporate Technology (CT).
Our mission and our roles
Shaping the future of Siemens with passion

As a **guidance provider**, CT shapes Siemens’ technology and innovation strategy, fosters business excellence at the Company, monitors the operating units’ innovative power and assesses disruptive changes in our core markets – in the spirit of Joseph Schumpeter\(^1\).

As a **partner at eyes’ level**, CT cooperates closely with leading universities and innovative start-ups and makes new technologies, cross-domain platforms and product modules available.

As an **internal service provider**, CT supports the Siemens units with research and development services, protects intellectual property rights and offers advice on improving processes and business practices.

\(^1\) Joseph Schumpeter, Austrian economist and politician, coined the term “creative destruction” as a consequence of innovations for established business models.
Our areas of activity

Corporate Technology contributes to the Company’s success in many functions, including technology and innovation strategy, research and development, cooperation with universities and start-ups, patents and business excellence.
## Our areas of activity
A short overview of important fields of activity

<table>
<thead>
<tr>
<th>Innovation strategy</th>
<th>Technology and research</th>
<th>Innovation projects</th>
<th>Research cooperations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Shaping Siemens’ technology and innovation agenda</td>
<td>Securing and extending our technology leadership</td>
<td>Tapping the business potential of new technologies</td>
<td>Overcoming the silo mentality and absorbing new technologies</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Cooperations with start-ups</th>
<th>Excellence in development</th>
<th>Patent and trademark protection</th>
<th>Business excellence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Making the innovative power of start-ups usable for Siemens</td>
<td>Providing top-quality development services</td>
<td>Protecting inventions and defending IP rights</td>
<td>Becoming faster, more efficient and more agile</td>
</tr>
</tbody>
</table>
We pick up trends and technologies and, from these, we develop long-term scenarios for our core markets and make recommendations for action for the Company’s innovation and technology agenda.

We regularly assess Siemens’ innovative power and the impact of disruptive changes in the spirit of Joseph Schumpeter.

We elaborate and represent the Company’s position in matters of research policy.

We look after Siemens’ standardization activities in all Divisions and regions.

We provide the Company with publications relating to research and development.
Our areas of activity: Technology and research
Securing and extending our technology leadership

- Some 1,600 researchers worldwide work on technologies with a broad impact for the Business Units.
- Our research focuses on electrification, automation and digitalization in line with our structure.
- We help the operating units to turn inventions into successful innovations in the market.
- Our research fields range from electronics and material development to reliable energy supply.
- We place particular emphasis on digitalization with our activities in the areas of handling forecast data and paradigm shifts such as Future Automation.
Our areas of activity: Innovation projects
Exploiting the business potential of disruptive technologies

Our topics

- Future energy supply
- Electrification of mobility
- Software replaces hardware

Our approach

- Understand the overall situation
- Develop / model future scenarios
- Develop long-term / interdisciplinary strategic research projects
- Derive development and business strategies

- We drive innovation projects with a long-term horizon and high strategic relevance for Siemens.
- In projects involving potential disruptions, we combine new technologies that are capable of generating growth to secure their business potential for Siemens and expand the company’s portfolio.
- Whether in the field of future energy supplies or tomorrow’s mobility solutions, we push topics with high market potential to the prototyping stage.
- Thus we create long-term, visionary yet mature solutions that we can integrate in Siemens’ business operations.
Our areas of activity: Research cooperations
Overcoming the silo mentality and tapping potential

- We network with leading universities and non-university research institutes around the world.
- With Open Innovation, we strengthen Siemens’ innovative power and tap the potential of a networked, open company.
- We link the industrial and academic worlds and thus promote intensive research and recruiting activities.
- Our cooperation with seven top universities and the “Centers of Knowledge Interchange” (CKIs) that we set up there are an excellent example of this.

Universities:
- UC Berkeley
- DTU Copenhagen
- RWTH Aachen
- FAU Erlangen-Nuremberg
- TU Munich
- TU Berlin
- Tsinghua University

7 CKI universities
17 principal partner universities
Our areas of activity: Cooperations with start-ups
Making the innovative power of start-ups usable for Siemens

- Our technology scouts look for promising start-ups and new technological trends.
- In this way, we tap radical, disruptive external innovations for Siemens.
- We found our own start-ups in business fields with high potential for our company.
- Through carve-outs, we commercialize developments that do not fit in with our portfolio.
Our areas of activity: Development partner
Providing top-quality development services

- Our portfolio ranges from product development in the areas of software, firmware, hardware and engineering to IT automation solutions and consulting services to services for applications.
- We are the competence center for the entire lifecycle – from consulting to design to commissioning, training and operator management.
- We employ some 5,100 software developers\(^1\) worldwide who look after more than 20% of Siemens’ software developments.
Our areas of activity: Patent and trademark protection
Protecting inventions and defending IP rights

- Ideas are turned into inventions that give Siemens a competitive edge in the market.
- We ensure that these inventions get a high level of patent protection.
- We have around 400 experts[^1] who manage Siemens’ intellectual property: they register, establish and market trademark rights.

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56,100
patents held in fiscal 2014

8,600
invention disclosures in fiscal 2014 – 39 per working day

4,300
patent applications in fiscal 2014 – 20 per working day

400
intellectual property experts worldwide[^1]

[^1]: Status May 2015
Our areas of activity: Business excellence
Becoming faster, more efficient and more agile

- Excellent business practices make Siemens faster, more agile and more efficient.
- For this purpose, we improve the value chain in all types of business – from the manufacturing of products to project business and services.
- This requires a willingness to change and the courage to consistently implement the changes that have been identified as necessary.
Concrete examples of our work

With our innovations and technologies, we set standards for existing and future markets, so that Siemens remains successful over the long term. Concrete examples show how Corporate Technology contributes to this.
Concrete examples of our work
Electricity from smart grids and electrically powered flight

Smart grids for the city of the future
In the Seestadt Aspern district of Vienna, experts from Corporate Technology are investigating how the interplay between buildings, renewable energy sources and power distribution grids can be optimized in order to maximize their efficiency and improve the overall system.

Further information is available here: Pictures of the Future

World-record motor for aircraft
Flight with hybrid-electric drives uses 25 percent less fuel and significantly reduces CO₂ emissions and aircraft noise. That is why we have developed an electric motor with a weight of 50 kilograms and a continuous output of 260 kilowatts. The aim is for aircraft with hybrid-electric drives to fly 60-90 passengers by 2035 – a revolution in the aviation industry.

Further information is available here: Pictures of the Future
Concrete examples of our work
Planning aids from the future and apps for cars

Forecasting demand
Wind and solar power are stirring up the energy market: now, it’s not just consumption that fluctuates, but also the available energy. Corporate Technology’s forecasting software on the basis of neural networks makes these fluctuations and therefore tomorrow’s power market more manageable.

Further information is available here: Pictures of the Future

Plug & play – Revolution in the car
Today’s mid-range automobiles include around 70 different electronic control units, and the number is likely to increase even further. RACE replaces this complex control system with standard hardware – a kind of operating system for cars – or other technically sophisticated systems. This will make it possible to retrofit functions quickly and cut development times by half.

Further information is available here: Pictures of the Future
Concrete examples of our work
Spare parts you can print yourself and networked batteries

Printed burner tips for gas turbines
In the future, 3-D printers will enable spare parts for industrial installations to be produced where they are needed: right at the customer’s site. This reduces waiting times and allows warehouse space to be put to better use. Siemens, for example, prints burner tips for gas turbines and thus reduces repair times by up to 90 percent.

Further information is available here: Pictures of the Future

Intelligent storage of solar energy
Energy storage systems will be an important part of a sustainable energy network in the future. They are capable of storing electricity produced by solar panels. The start-up company Caterva, which was founded by CT, links the storage systems with intelligent control software and thus evens out fluctuations in the power grid – an important building block for the energy transition.

Further information is available here: Pictures of the Future
Our organization

We see ourselves as a partner to our Business Units. Our service areas are optimally geared to their requirements. With this strong structure, we contribute to Siemens’ success.
## Our organization

### Corporate Technology at a glance

<table>
<thead>
<tr>
<th>Corporate Technology (CT)</th>
<th>CTO – Prof. Dr. Siegfried Russwurm</th>
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<tbody>
<tr>
<td><strong>Business Excellence, Quality Management, top</strong></td>
<td><strong>Corporate Development Center</strong></td>
</tr>
<tr>
<td>▪ Business excellence</td>
<td>▪ Development partner in the areas of software, firmware and hardware as well as engineering</td>
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<tr>
<td>▪ Quality management</td>
<td></td>
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<tr>
<td>▪ Internal process and production consulting</td>
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<tr>
<td><strong>Corporate Intellectual Property</strong></td>
<td><strong>Innovative Ventures</strong></td>
</tr>
<tr>
<td>▪ Protection, use and defense of intellectual property</td>
<td>▪ Access to external innovations</td>
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<tr>
<td>▪ Patent and brand protection law</td>
<td>▪ Start-up foundation</td>
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<td></td>
<td>▪ Commercialization of innovations</td>
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<tr>
<td><strong>Research and Technology Center</strong></td>
<td><strong>Technology and Innovation Management</strong></td>
</tr>
<tr>
<td>▪ Development of technologies with a broad impact</td>
<td>▪ Siemens’ technology and innovation agenda</td>
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<tr>
<td>▪ Incubator for innovations of our portfolio</td>
<td>▪ Standardization, positioning regarding research policy</td>
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<td></td>
<td>▪ Provision of publications relating to R&amp;D</td>
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Page 24 July 2015

Corporate Technology
Those who work at Corporate Technology are more than just employees: they make an active contribution to improving peoples’ lives little by little every day. Experts from all over the world and from a wide range of disciplines value CT as an employer.
CT as an employer
Shaping the technological future with us

- Corporate Technology's global network of experts comprises more than 7,800 employees\(^1\), including 5,100 software developers, 1,600 researchers, 400 patent experts and 260 specialists who push business excellence within the company.
- Do you want to be a part of that? Then come and join us. You can expect a strong practical orientation and the opportunity to contribute your knowledge and visions to individual projects – on a global scale.
- Whether you’re involved in the development of marketable products for our operational business or interdisciplinary projects for the Business Units: at Corporate Technology, you’ll be working at the heart of Siemens’ technological research.
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