Industry 4.0 — Production landscape in upheaval

In brief

- Industry 4.0 stands for the vision of comprehensive digital production – chain networking – from the supplier to end consumers.
- Its implementation has a variety of effects on business operations, business sectors and society as a whole.
- Opportunities for improved competitiveness and the securing of social prosperity require a collaboration between enterprises, the state, interest groups and educational institutions, above all in the fields of qualification and security.

What is it about?

Industry 4.0 is the core topic of today's industry and innovation policies. The term was coined in Germany in 2011 and is closely related to concepts such as smart production or industrial internet in the English-speaking world. What is meant is a comprehensive digital networking of industrial value chains. The technical basis is the Internet of things or what are known as cyber-physical systems.

The vision: Intelligent machines and workpieces exchange information in real time and control themselves autonomously; physical and digital systems merge to create a continuous and flexible network. The implementation of Industry 4.0 is expected by its advocates above all to lead to an increase of productivity and competitiveness. It is thus a key to re-industrialisation that is the aim at EU level.

However, many questions remain still unanswered. These include the lack of interface standardisation for the problem-free exchange of information between different systems, enterprises and trade sectors, and the handling of security risks. In addition, the effects on work and employment are still unclear. Industry 4.0 demands new qualifications and can create new jobs, but the increased efficiency and automation can also be expected to lead to the loss of many, above all low-qualified jobs.

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Industry 4.0 pilot room at Infineon Austria in Villach

An entire bundle of technologies underpin processes of Industry 4.0. These include for instance the increase of processor, memory and sensor performance, the fitting of chips to all components and their networking. This will create largely self-controlled systems with adaptive industrial robots in which people, machines, sensors, workpieces and products communicate with each other, for instance by means of contact-free connection using radio waves (RFID). Big data methods allow new kinds of analysis, such as the autonomous triggering of machine maintenance. In addition, data can be accessed using new mobile interfaces and visual presentation of information. Virtual design and digital modelling of products and processes, further development of 3-D printing and other decentralised production technologies, will reduce the distance between design and finished products.

Basic data

Project title:	Industry 4.0
Project team:	G. Aichholzer, N. Gudowsky, F. Saurwein (with AIT Austrian Institute of Technology)
Duration:	02/2015 – 09/2015
Funded by:	Parliamentary Administration
Website:	oeaw.ac.at/ita/en/projects/industry-40/

Key results

The implementation of Industry 4.0 opens up new opportunities in many respects, but also involves risks and challenges for various sectors such as:

Effects on employment: It is still unclear whether Industry 4.0 will be able to stop or compensate for the loss of industrial jobs, or whether ultimately it will accelerate it.
Work organisation: Two poles limit the considerable scope of action – a highly automated and polarised configuration of tasks on the one side and maximum flexibility on the basis of medium-to-highly qualified employees on the other side.
Education and further training: New occupational profiles (for instance data scientist) and qualifications will be needed, such as greater ICT knowledge, interdisciplinary understanding or communication with networked systems. In addition, a willingness to learn, flexibility, problem-analysis and problem-solving skills as well as individual competence in complex and rapidly changing situations will be essential.

Digital security is a central critical problem, and as yet largely unsolved

Health: Easement on the physical side as a result of increased automation contrasts with the burden of new mental stresses.
Use of resources: How much staff will ultimately be needed? On this subject, there is great uncertainty. Savings tend to be expected in material consumption.
Economy and competition: Greater resource efficiency, flexibility and new business models promise business location benefits. The dark side is a loss of control in these new highly flexible value creation networks.
Technical standards are still largely to be created. They form the preconditions for the necessary networking and thus determine the implementation of Industry 4.0.
Regulation: Outstanding questions and the need for adjustment of the legal framework concern above all liability, data protection, employment and social law.

Basically, Austria enjoys favourable preconditions for implementing Industry 4.0 in a manner that will be commercially successful and socially compatible. However, it will require foresightful active support.

What to do?

The most urgent need for action for the implementation of Industry 4.0 is education and further training, and IT security. The most important measures are:

- *Creation of favourable framework conditions:* Provision of funding, initiation and coordination of cooperation activities, sensitisation in the educational sector and flanking regulations (employment law, data protection).
- *Specific reforms in the educational system and adjustment of the educational content:* The focus should be on the linking of branches of education, the increased combination of theoretical and practical education and the training of specialists above all in the middle educational sector. Basic digital skills would need to be adjusted, subject-specific and multidisciplinary qualifications (production, logistics, IT) as well as social and communicative skills would have to be expanded. An essential element is also the creation of awareness and the strengthening of IT security skills.
- *In businesses*: Further training, innovations and participation in technology projects should be encouraged and practical learning environments should support the internal transfer of knowledge.
- *Creation of national and international legal frameworks:* The aim is to strengthen acceptance, legal certainty and responsibility, and to clarify questions of liability and the protection of sensitive data.
- *Responses to security problems*: These include the development of scientific-technological skills, a high-capacity IT infrastructure and security architecture, exchange of cyberattack information, emergency and risk management plans, emergency response teams and exercises.

Further reading

Industry 4.0. Background Paper on the project “Industry 4.0. Foresight & Technology Assessment on the social dimension of the next industrial revolution”
epub.oeaw.ac.at/ita/ita-projektberichte/ITA-AIT-1en.pdf

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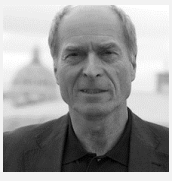

IMPRINT: Owner: Austrian Academy of Sciences; Legal person under public law (BGBl. 569/1921 i.d.F. BGBl. I 130/2003); Dr. Ignaz Seipel-Platz 2, A-1010 Vienna; Editor: Institute of Technology Assessment (ITA); Strohgasse 45/5, A-1030 Vienna; www.oeaw.ac.at/ita/en. | Frequency: The ITA-Dossiers are published irregularly and publish the research results of the ITA. The ITA-Dossiers are published in print in small numbers only and are made available open access to the public via the Internet portal “epub.oeaw”: epub.oeaw.ac.at/ita/ita-dossiers | ISSN: 2306-1960 |
ITA-Dossier no. 20en, April 2016 | epub.oeaw.ac.at/ita/ita-dossiers/ita-dossier020en.pdf |