Prof. Reimund Neugebauer *headed the Fraunhofer Institute for Machine Tools and Forming Technology (IWU) for over 20 years. He is one of the two chairpeople of the High-Tech Forum, an advisory body that gives guidance on the German federal government's high-tech strategy. He has been the President of the Fraunhofer Society since 2012.*

Champions of precision.

FRAUNHOFER RESEARCHERS HAVE PLAYED A VALUABLE ROLE IN HELPING MANY GERMAN COMPANIES TO BECOME WORLD LEADERS IN THEIR MARKETS. BUT IS GERMAN INDUSTRY INNOVATIVE ENOUGH TO KEEP UP IN THE DIGITAL TRANSFORMATION?

<Opinion Piece> *Prof. Reimund Neugebauer*

IT'S ALMOST A RITUAL BY NOW. First come the complaints that Germany lacks an innovative edge. Our mid-sized businesses are too slow and sluggish, so the criticisms go, to compete with British, American or Asian companies. Then, a counter-example: a flashy start-up from Silicon Valley that has turned an entire industry upside-down with brilliant innovations and disruptive business models. So is there any truth to these clichés? How far is Germany really lagging behind, especially in the digital transformation of its economy? I believe the reality is far more complex and much more positive for the German economy. In 2015, companies invested 157 billion euros in new product development – more than ever before. In 2017, the investment is expected to rise to 165.7 billion euros. Innovation expenses now amount to three percent of revenue. That's another record high. These figures, taken from a recent study by the Center for European Economic Research (ZEW), are testimony enough to Germany's innovativeness.

MISTAKING GLAMOUR FOR QUALITY

But why do people have such a myopic view of Germany when ZEW's data state the opposite? Primarily, it's because Germany's strengths lie in fields where quality matters more than glitz and glamour. In efficient high-end manufacturing, for example. Or in embedded systems, where our carmakers and other manufacturers play to their strengths. Germany's profound expertise in sensors, actuators and data acquisition provides an ideal springboard for Industry 4.0 – right up to self-organizing manfacturing that responds instantly and agilely to requested changes in production.

Transforming these kinds of visions into marketable solutions is Fraunhofer's mission. Our Institute for Production Systems and Design Technology (IPK), for example, has developed a technology that can visualize an entire real-life production plant in the virtual world. A host of sensors capture the machines' operating states and relay the data to the control center using standard industry-compatible formats and protocols. The result: a digital twin that operators can use to monitor the production process in essentially real time and take action if needed. It also allows companies to produce one-off and custom items without having to stop the entire production line.

However, this brand of Industry 4.0 application needs real high-speed Internet with low latency. That's why Fraunhofer is working on 5G mobile network technology, which will reach data speeds in excess of ten gigabits per second – more than 100 times faster than our current LTE networks. Even better, latency will fall to a millisecond or less. 5G will provide a valuable platform for real-time applications that will be absolutely essential for safely and reliably controlling processes in telemedicine, driverless vehicles, smart homes or digital factories. This is a complex endeavor in which multiple Fraunhofer institutes are working closely with companies such as Ericsson, Huawei, Alcatel-Lucant and Deutsche Telekom.

INDUSTRIAL DATA SPACE ENSURES DATA SOVEREIGNTY

If speed is important, security is doubly so, especially for data-heavy applications in business and manufacturing. This is where the Industrial Data Space project comes in. Fraunhofer, working with industry partners and support from the German federal government, aims to create a secure virtual space where companies and business partners can collaborate on projects and share data without ceding control over their data. This is done using software connectors that only exchange information between partners with certified identities. Companies can thus retain full data sovereignty. The lead institutions in the project are the Fraunhofer Institutes for Material Flow and Logistics (IML) and for Software and Systems Engineering (ISST). These are just a few examples of the enormous wealth of high-tech knowledge that German industry has at its command.

TOP PRIORITY FOR MACHINE LEARNING

That's not to say Germany has no weaknesses of its own to address. US companies have built up a sizeable lead in "smart data", i.e. the analysis and extraction of patterns from large sets of data. To catch up, we should prioritize the development of sophisticated algorithms for data analysis and methods for machine learning in general and deep learning in particular. That's one reason why 28 of our Fraunhofer institutes have come together in a big data alliance that not only explores new methods of machine learning (particularly deep learning), but also helps companies leverage big data solutions to optimize their business models. Another example for our many initiatives is the Fraunhofer Institute for Intelligent Analysis and Information Systems (IAIS), which offers specific training for data scientists and analysts.

Training, education and preparation are a field that may well be one of Germany's most important strengths: the ability to tackle technological challenges methodically and conscientiously. However, if this type of "German thoroughness" is misinterpreted as plodding stodginess, it's up to us to market ourselves better. The Fraunhofer Society will certainly do its part with its nearly 70 institutes, including 20 IT institutes, by maintaining a high standard of scientific excellence and collaborating closely with industry to develop technological innovations that will give rise to new digital business models. And, if we have our way, some of those innovations will soon find their way onto the road.

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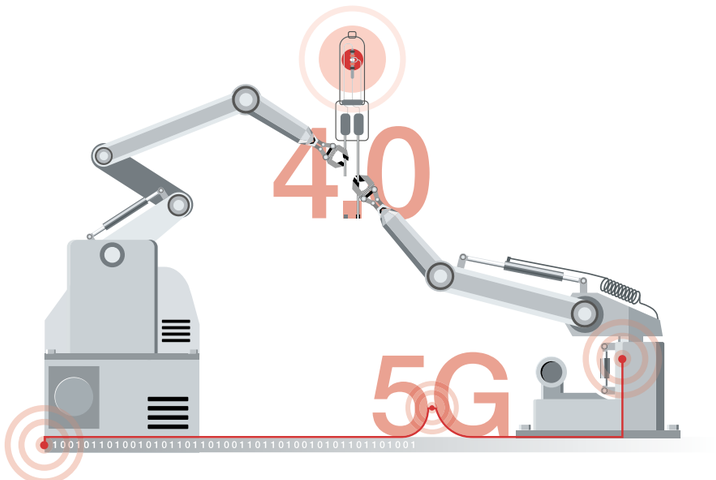

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