TRANSFORMING MANUFACTURING IN THE DIGITAL AGE

The German American Chamber of Commerce, Inc. (GACC NY) has continuously expanded its portfolio of valuable member services over the last years to include unique platforms for idea sharing that assist businesses in navigating today's rapidly evolving digital developments in manufacturing. One prime example of the GACC NY's role on this front is a recent forum: ***The Digital Transformation of Manufacturing Industries.***

In collaboration with acatech (The German National Academy of Science and Engineering) and MÜNCHNER KREIS, a leading independent platform providing orientation for decision makers in the digital world, the GACC NY hosted the event at the German Consulate in New York.

Jens Janik, Deputy Consul General of the German Consulate in New York, joined Dietmar Rieg, President & CEO of the GACC NY, in greeting more than 120 guests. Overall the conference represented a very good mix of German and American business leaders, along with academics in the fields of business innovation and technology. Several industry representatives traveled from Germany to participate in the conference's panel discussions, which included business experts from both sides of the Atlantic.

Digital manufacturing is evolving at a lightening pace. Nations around the world are scrambling to adapt, with various degrees of success. Boasting some of the most advanced manufacturing industries in the world, the US and Germany, in particular, stand to benefit greatly in this new digital manufacturing era. Both countries are at the forefront of the revolution and are intent on implementing high-tech manufacturing strategies to remain competitive.

To capture both the theoretical and practical implications, the forum was divided into two sessions: *The Future of Key Technologies* and *Future Business Models*.

Riding the Second Wave of Digitalization

Pro. Dr. Henning Kagermann, President of acatech and Global Representative and Advisor of the Plattform Industrie 4.0., set the forum in motion with a captivating presentation on the "second wave" of digitalization. The former CEO of SAP pointed out that almost every nation in the world is implementing its version of Industrie 4.0. "As we continue to move toward something between machines and human beings to create a situation of autonomous systems, we also will need to address the social, legal and ethical implications," Kagermann said. In highlighting the relevance of international cooperation, he stated that interoperability must remain a high priority and include transparent standards for industries. To be successful in the digital economy, individuals as well as companies must rethink outdated patterns of production processes, workplaces and business models, and they must confront social, legal and ethical implications.

Future Key Technologies: What's next?

Prof. Dr. Wolfgang Wahlster, Scientific Director and CEO of the German Research Center for Artificial Intelligence (DFKI), who helped shape the German future project Industrie 4.0, introduced the first session and reinforced Kagermann's presentation that the first wave of digitalization is over. Wahlster pointed out that machine-readable data is now developing into machine-understandable data, thanks to digitalization. "We are now in the second wave where there will be increasing human interaction with robots," Wahlster said. "That means being in an age of mass customization, which along with artificial intelligence, are enablers for advanced manufacturing in the Industrie 4.0 paradigm."

He also added that systems based on long-term autonomy and deep learning go beyond Industrie 4.0, enabling smart factories and autonomous cars to become the new standard. This all relies on one key requirement: understanding digital data.

Don't Underestimate the Need for Cybersecurity!

Dr. Nikhil Gupta, Associate Professor of Mechanical and Aerospace Engineering at NYU Tandon School of Engineering, reminded everyone of the disturbing reality that hacking is a major threat. In the manufacturing sector, stolen files can be used to easily create unauthorized production; namely, counterfeit parts, that are as good as the original parts. This can obviously have considerable implications, especially when we consider that worldwide revenues from additive manufacturing products were an estimated $2.67 billion in 2016, an increase of 12.9% over 2015. To ensure effective cybersecurity, new and innovative design thinking is required that integrates security into the product design and manufacturing process.

Different countries, Different approaches

The first of two panels examined the impact of new concept and product processes in engineering. In addition to Wahlster, who moderated this panel, the round of experts consisted of Dr. Gupta, Stephan Biller, Vice President at IBM – Watson Internet of Things Business Unit, Livio Dalloro, Head of Research Group and Director of R&D Engineering at Siemens Corp., Knudt Flor, President & CEO of BMW Manufacturing Co., LLC and Sean Monahan, Partner at A.T. Kearney, Inc. The panelists explored a broad range of key technologies in digital manufacturing from the internet of things to production design.

In comparing US and German manufacturing approaches, Flor pointed out that German manufacturers have traditionally focused on optimizing production. As for the US, Wahlster maintained that *singularity* seems to be a "religion," the belief that swift developments in digitalization and Artificial Intelligence will reach a point where economic growth will drastically advance. That, ultimately, will lead to even more breakthroughs in manufacturing.

The panel contemplated how the different digital technologies applied to manufacturing should be prioritized. Most panelists believe these decisions should occur on a case-by-case basis. Dalloro, Head of Research Group at Siemens, stressed there is, however, one key approach that must be pursued: connectivity in order to increase productivity.

Looking to where we'll be in 20 years, the panelists agreed that manufacturers increasingly will share services, and that means relying more on *the cloud*. Flor theorized that "dirty, heavy manufacturing", will disappear and be replaced by high-tech machinery and higher salaries. Wahlster added that factories will move into residential areas, both rural and suburban, eliminating the need for long commutes.

A Digital Race: How Future Business Models Develop

Among the issues discussed in the second session of the conference was the importance of continued interoperability in manufacturing, which must be integrated into business models to fully take advantage of the newest developments and trends in the industry. Prof. Dr. Michael Dowling, Professor for Innovation and Technology Management in the Faculty of Business and Economics at the University of Regensburg, Germany, introduced this session. He pointed out that interoperability and co-opetition will be more prevalent in manufacturing. Co-opetition is a business strategy that extends the traditional rules of competition and cooperation to combine the advantages of both; it's an practical way of leveraging business relationships.

Dowling, who is also a member of acatech and serves as the Chairman of the MÜNCHNER KREIS, said the success of Industrie 4.0 in Germany will depend in great part on the German *Mittelstand,* which is the backbone of the German economy. In the spirit of co-opetition, more partnerships will be required between larger, established companies and the Mittelstand. Dowling is confident that Industrie 4.0 will reap major benefits for manufacturers, but for that to happen large investment is required.

Limitless Possibilities through Knowledge Exchanges

Dowling also moderated the second panel discussion consisting of Dr. Hans Jörg Stotz, SVP and Head of IoT & Digital Supply Chain Global Strategy SAP SE and Member of the Steering Committee of the German Plattform Industrie 4.0, Jackson Bond, Co-Founder and Chief Industry Evangelist & New Business at Relayr GmbH Berlin, Andrew Campbell, President & Owner of Eastern Millwork, Inc., Marco Schnabl, CEO & Co-Founder of Automotive Mastermind, Inc. and Dr. Rahild Neuburger, Senior Lecturer at Ludwig Maximilian University of Munich.

"An important goal for companies needs to be sharing knowledge in order to successfully create an ecosystem," said Stotz, adding that "there's a shift from an ecosystem of data towards an ecosystem of services." According to Schnabl, those services need to be fully examined and revised when new ideas for selling products are being developed: "individual knowledge" is key.

Skilled and Flexible Workforce as a Vital Ingredient

Rahild Neuburger shed some attention on the socio-economic aspects of digitalization in manufacturing as applied to balancing tasks that involve humans and machines. She and the other panelists agreed that lifelong learning and flexible thinking is necessary for employees to ensure that their digital skills remain viable and contribute to the overall success of Industrie 4.0.

On a similar note, the panelists were quite concerned about the lack of skilled labor. Schnabl claimed that one of the biggest obstacles his business faces is securing qualified, skilled employees, especially data scientists. This "war for talent" is certainly intensifying and is playing a crucial role in how rapidly Industrie 4.0 will proceed. Bond said that every manufacturer should have well-trained data scientists, but that there is currently a dire shortage. The group of experts said that universities and businesses must collaborate more to ensure that students are taught the most up-to-date techniques and developments of the digital age.

In conclusion, our panel of experts remains confident that each new wave of digital transformation in manufacturing will propel businesses toward greater efficiencies and ultimately lead to robust economies throughout the world.

For our part, we at the GACC NY will continue to delve further into all aspects of digital technology, so that we can in turn provide the German American business community with the latest developments, guidance and unwavering support to bolster their commercial success.

Please **visit our event website** to view/download the presentations from the event.

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About acatech:

The GERMAN NATIONAL ACADEMY OF SCIENCE AND ENGINEERING represents the interests of the German scientific and technological communities, at home and abroad. As a working academy, acatech supports policy-makers and society, providing qualified technical evaluations and forward looking recommendations. Moreover, acatech is determined to support knowledge transfer between science and industry, and encourage the next generation of engineers. acatech works to promote sustainable growth through innovation.
Visit http://www.acatech.de/uk for more information.

About MÜNCHNER KREIS:

The mission of the MÜNCHNER KREIS is to provide an orientation for meeting the challenges of the digital transformation. It serves as an independent, interdisciplinary, and international platform for active and diverse discussions amongst key players from business, academia, and public policy. In its various activities, MÜNCHNER KREIS analyzes future developments, providing valuable impulses on the

technical, economic, political, and social challenges of the digital transformation. Visit https://www.muenchner-kreis.de/en/homepage.html for more information.