The Current State of Industry 4.0

Volume 2 Issue 5, May 2023

Our April 2023 newsletter described Intelligent Automation, an Industry 4.0 component and an important component of smart factories. In this newsletter, we will look at the current state of Industry 4.0 in the USA.

The Players

The firms who have a big stake in the Industry 4.0 market are the Swedish-Swiss company ASEA Brown Bowery (ABB) and the giant German firm Siemens. ABB's PLC automation tools and the industrial automation products offered by Siemens have been the forefront major technology solutions. These product lines have been augmented by other products such as the machine vision solutions by Cognex Corporation from the United States.

Other companies in the forefront of Industry 4.0 solutions as shown in Figure 1 include Bosch, Danaher, Emerson Electric, Fanuc, General Electric, Honeywell, Omron, Mitsubishi, Rockwell Automation, Schneider Electric, and Yokogawa.

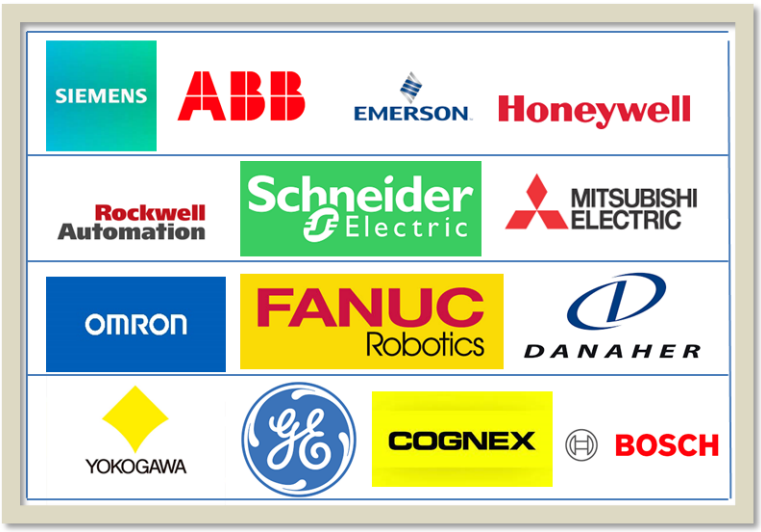

Figure 1. Industry 4.0 Global Product Providers

The Impact Technologies

A recent survey (Deloitte, 2020) asked several global business leaders to state what technologies would impact their organizations. 72% of the CXOs anticipated that the Internet of Things (IoT) would have the most impact on organizations. Figure 2 shows that the IoT is followed by AI and Cloud Infrastructure as the most impactful factors of Industry 4.0 according to the CXOs around the globe. These technologies work together to connect organizational resources, generate data, and drive intelligent operations in organizations. The CXOs are investing in Industry 4.0 to increase revenues and reduce costs, which is consistent with the previous annual surveys by Deloitte.

US Manufacturers have adopted Industry 4.0 and heavily invested in research and development activities of smart factories. Recent studies show that US manufacturers have invested over $45 billion in IoT technology alone. The Industry 4.0 Adoption Report shows that 3D Printing, 5G Mobile Network, Artificial Intelligence (AI), Augmented Reality (AR), and Automated Guided Vehicles (AGV) are the top technologies explored in the USA. Figure 3 shows the most explored technologies in the USA.

Tech Briefs

Digital Twinning

Digital twinning is a technology that makes a real difference to the design and manufacturing process. This technology is about businesses generating a virtual 3D model of a plant's processes in real-time and then manipulating the model to gain insights such as predicting problems ahead of time, without affecting the plant's performance.

A digital twin is a virtual representation of a product or a manufacturing system. The virtual model is updated with real-time data and functions using simulation, machine learning and logical reasoning.

Digital twinning saves valuable time and reduces operating costs by developing a product in the virtual world without raw material, tooling, or operations expense. The technology allows development teams located across the globe to collaborate easily at every stage of the product design process.

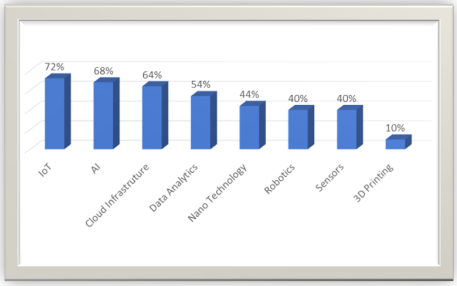

Fig 2. US CXOs on Technology Impacts

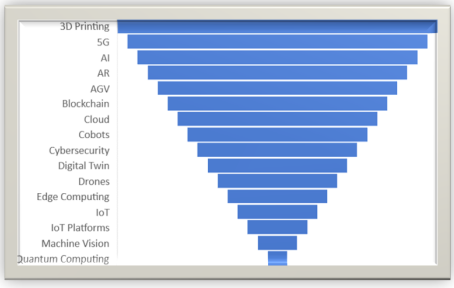

Fig 3. Most Explored technologies in the USA

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According to the EU Commission's digital transformation survey, fewer than 35% of respondents have adopted at least two of the nine key technologies as shown in the chart below. For example, there are more than 50 million small businesses using Facebook Pages to connect with their customers. European manufacturers have adopted cloud technologies and are using cloud for everything from Software as a Service (SaaS), online customer relationship management (CRM) systems, data analytics platforms, collaborative working, remote troubleshooting, and business continuity planning. Figure 4 shows the adoption of technologies in Europe.

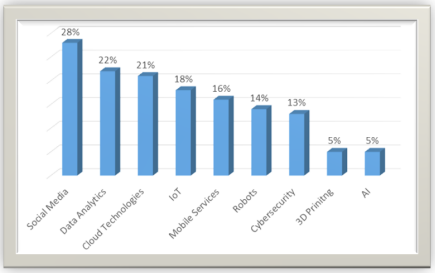

Fig 4. Adoption of technologies in Europe

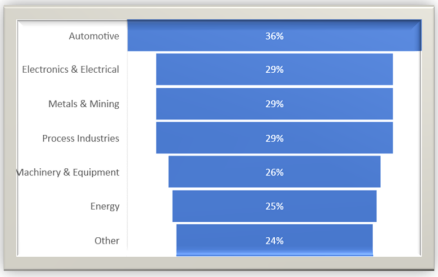

Fig 5. Industry 4.0 Adoption in the US

The Industry 4.0 & Smart Manufacturing Adoption survey has shown that the automotive industry is the leading adopter of Industry 4.0 in the USA as shown in the figure 5.

The gain of competitive edge has been the most impact factor to drive innovation in the automotive industry. As a result, automotive OEMs have been big adopters of both innovative technologies such as robotics and management practices such as Toyota Production Systems. Currently, the demand for customization and just-in-time (JIT) delivery as well as the need to manufacture non-combustion engines are forcing automotive companies and their suppliers to be flexible. These demands have propelled the automotive industry to take a lead in the adoption of Industry 4.0 technologies such as collaborative robots and automated guided vehicles (AGVs).

The adoption of Industry 4.0 technologies from another survey conducted by a global team of researchers (Tortorella et al., 2023) is shown in table below in the order of adoption rate.

Late Adopters	Early Adopters
Machine Learning	Cloud Computing
IoT	Remote Monitoring
Wireless Sensors	Wireless Sensors
Cloud Computing	IoT
Big Data	Machine Learning
Remote Monitoring	AR/Simulation
Robotics	3D Printing
3D Printing	Big Data
AR/Simulation	Robotics

The Industry 4.0 market Is expected to reach around USD 377.30 Billion by 2030 with a forecasted growth of at a compound annual growth rate (CAGR) Of 16.3% during 2023 To 2030 (CDI, 2023). According to this study, North America has dominated the Industry 4.0 market share followed by Europe.

Practical Insight

Digital Twinning at Los Angeles, CA

"A digital twin of the transportation infrastructure of Los Angeles city has been initiated. The partnership with Open Mobility Foundation is to create a model of the activities of shared-use bicycles, e-scooters, carpools, and future autonomous taxi drones.

A digital twin of Los Angeles' Sofi Stadium, the home of LA Rams and LA Chargers is a model in existence. The model collects real-time data from every area of the park's operations into a single platform. The digital twin is used from helping event organizers to the maintenance of the stadium.

A digital twin of a section of Los Angeles city has been initiated with Cityzenith, a Chicago-based digital twin platform. This will help the city to make its buildings more sustainable and reduce carbon emissions. "

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