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Oksana Bakalyuk, Oksana Redkva PhD in Economics

Ivan Puluj Ternopil National Technical University, Ukraine

INDUSTRY 4.0, OR WHY TO DIGITIZE PRODUCTION PROCESSES

Оксана Бакалюк, Оксана Редьква к.е.н.

Тернопільський національний технічний університет імені Івана Пулюя, Україна

ІНДУСТРІЯ 4.0, АБО НАВІЩО ОЦИФРОВУВАТИ ВИРОБНИЧІ ПРОЦЕСИ

The concept of Industry 4.0 was created in Germany in 2011 as an "answer" to the question of what the country's economic strategy should be in the context of dynamic digital changes. Today we are witnessing a wave of digital "disruptions" around the world that are radically changing the manufacturing industry. Industry 4.0 involves the use of the functionality of the Internet of Things (IoT), based on the connection of intelligent sensors and control devices, robots and other systems required in production processes within digital networks, in order to manage effectively and smartly them in real time. Data collected at each stage of the production process from all sensors and devices are processed online. They are then used to adaptively manage these processes. The use of artificial intelligence solutions allows predicting conditions that have not occurred before (for example, failures) and proactively optimizing production processes to adapt them to new production conditions.

The development of telecommunication networks combined with the use of cloud computing solutions on an increasing scale supports the digital integration of production processes. The use of "distributed" digital resources in the clouds allows for cost-effective processing of data collected from various sensors and devices. Standardization is crucial for the success of the Industry 4.0 concept. In 2014, a special international organization, the Industrial Internet Consortium (IIC), was established to develop, increasingly use and promote solutions (sensors, robots, analytical systems) that support the construction of the Industrial Internet of Things. IIC also deals with the cybersecurity aspects of Industry 4.0, recognizing it as a key threat to the implementation of digital solutions for managing production processes.

The pace of Industry 4.0 development is driven by the dynamic increase in the availability of smart sensors equipped with communication modules that allow them to be connected (wired or wireless) to digital networks. In 2022, there will be 4-5 such devices per one statistical inhabitant of the world, and more than 40% of these devices are planned to be used in production processes. The development of telecommunication networks combined with the use of cloud computing solutions on an increasing scale also supports the digital integration of production processes. The use of "distributed" digital resources in the clouds allows for cost-effective processing of data collected from various

sensors and devices. Also important is the development of specialized robots, artificial intelligence solutions designed for applications in the manufacturing industry, or augmented reality (AR) systems that allow employees to remotely, realistically observe production processes or effectively implement very advanced training at production stations.

Digitalization of industry is not only about digitization of the production process itself. It is about the effective use of digital decisions in all areas of a manufacturing company's activities, from the digitization of research and development processes and the preparation of new products, through logistics, production processes or marketing, sales and customer relationship management.

There is no turning back from the implementation of Industry 4.0 solutions at the moment. Industrial companies are realizing the enormous scale of the benefits of digitalization. These are:

- Significant improvement of operational efficiency - through the use of "intelligent" production management using advanced data analytics, manufacturers will be able to create new products and produce faster and more efficiently, making all decisions much faster without the need to involve too many resources.

- Quality improvement - further automation will eliminate human errors. Artificial intelligence systems will proactively prevent failures.

- Cost reduction - implementing Industry 4.0 solutions is certainly expensive. However, in a relatively short time, the cost benefit will be achieved as a result of increased efficiency and quality.

- Improving the customer experience - in an increasingly competitive economy, the customer experience associated with the acquaintance with the brand and its products, purchase and all interactions within the framework of after-sales service plays an important role in the choice of supplier (manufacturer).

- Income increase - customers will choose suppliers who respond faster to customer needs, deliver new products to them faster, offer better and better quality, and whose customers are satisfied with the experience they are offered.

- Acquisition and retention of employees - digital manufacturers will be the most attractive employers for the best people in the market, which is especially important in Europe with the challenge of an ageing population.

At the moment, there are no completely ready-made solutions on the market that can be used everywhere for the complete digitization of any enterprise. We are still in a phase where standardization and immaturity of specialized decisions is one of the main challenges for the rapid digitalization of a manufacturing company. Another important risk is the security aspect. Industry 4.0 digital systems are exposed to deliberate terrorist attacks, industrial espionage, data theft and sabotage. Therefore, special attention should be paid to the development and implementation of cybersecurity solutions that will actively detect and process unwanted "digital" attacks.