

# What can we expect from Industry 5.0

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## Abstract

*This article focuses on the industrial revolutions and their impact on society. Each industrial revolution has left its mark on the history of mankind. The best way to predict the future is by looking back to the history, studying the past. If we are talking about industrial development, there have been several cycles throughout history. The formation of a society is a very complex and lengthy process. With each industrial revolution, mankind gradually abandoned heavy productive human work in favor of "machine" labor. In a word, the transition from manual labor to machine labor, from manufacturing to factory labor. The development of neural networks and artificial intelligence is now a historical process. Smart kettles, homes and the Internet of Things are all the foundation for the transition to Industry 5.0.*

*Ready we or not, now Industry 5.0 is here. While many manufacturers are still working on how to combine new technologies to improve efficiency and productivity - the guiding principle behind Industry 4.0. The next stage of industrialization has already begun and continues to develop. Today, data is the equivalent of currency. An economy based on energy and natural resources fades into the background. Now anyone who knows his capabilities and measures them against the market potential can get competitive advantages in time, which in the future will ensure a stable position in the market.*

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To make plans, to understand concepts, we need to know our history. To be able to predict, consider the spirals of industrial development. Each round is faster, more difficult, more innovative. The countdown begins with industrial revolutions, which lobby for a fundamentally new approach to the methods of production and consumption.

Many industries are tightly tied to energy. The dependence of the economy on a single source of energy is one of the main anchors on the way to new technological stages of development [1].

During the transition to the 1st industrial revolution, charcoal was replaced by coal coke. Thanks to such changes, the power and efficiency of many mechanisms instantly increased.

The prerequisites for the first revolution originated in Great Britain and, by unlocking the potential of water and steam, the revolution mobilized the mechanization of production. Three industries at once pulled themselves up to the trend: textile, metallurgical and transport. James Watt invented the multipurpose steam engine. The systems of railway communications began to be massively integrated. Trains and steamships appeared. During this period, the emergence of machines for various purposes became possible - turning, milling and others. Such a rapid development of the industry has caused an increased demand for the metal.

The second revolution introduced mass production using electricity. Thanks to the Henry Ford assembly line, many products have been made available. One of the main achievements is the car. Electricity appeared on the streets of cities, and then in houses. Some semblances of a network for the exchange of information appeared - the telegraph. The main result of the second industrial revolution was the appearance of free time among people. The third revolution made it possible to use free time in a useful way.

Industry 3.0 deals with the use of electronics and information technology in manufacturing. The era is also known for active lobbying for alternative energy and environmental friendliness in production. It began with the invention of the computer in the 60-70s of the XX century.

The development of the Internet, communication channels and information transfer, an exponential increase in data volumes, the emergence of cloud technologies, digital platforms - all this has led to an information boom. Digital systems have become open, industrial networks have become

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global. Thanks to them, companies began to unite their efforts and move forward in several industries at once.

Industry 4.0- Industry of our generation. It is caused by the integration of resources and technologies. Here cloud technologies are taking on a more significant role. They provide significant benefits to business success and push many industries towards the technological frontier.

In Industry 4.0, not only objects, but also machines, assembly lines and entire factories are combined into one network. Already, at some enterprises, RFID tags are installed on the workpieces, which transmit the necessary information to the assembly robot. Stocks of raw materials are tracked, and if earlier in business schools they taught industrial technology Just-in-Time as the most advanced, soon the need for this approach and the corresponding specialists will simply disappear. At the same time, customization is becoming more and more common, each product can be made at a large factory for an individual customer.

The key elements of the industry are such technologies as artificial intelligence, the Internet of Things, augmented reality, additive manufacturing, composite materials, multi-agent systems, microservices, service buses of enterprises. Intense networking in the flow of data between open information systems has led to an urgent need to increase the role of cybersecurity in the digital environment.

**Table 1. Results of revolutions**

| Revolution                   | Achievements of revolutions                  |  |  |
|------------------------------|--|--|--|
|                              | Period                                       | Results  | Innovations  |
| First industrial revolution  | End of XVIII cent. – begin of XIX cent.      | Transition from agrarian economy to industrial production              | Steam engine, metallurgy, textile industry, mechanical engineering             |
| Second industrial revolution | Second half of XIX cent. – begin of XX cent. | Assembly line, railways, improving labor efficiency                    | Electricity, high quality steel, oil industry, first telephones, conveyor belt |
| Third industrial revolution  | 1970-2010                                    | Automation and robotization of production                              | Digitalization of society, development of telecommunications and networks      |
| Fourth industrial revolution | 2011 - Now                                   | Globalization of production, assembly line improvements, Biotechnology | Internet of Things, big data, mass digitalization of society                   |

Each new industrial stage proceeds much faster than the previous one, this can be seen from Table 1. To move to a new stage of development, it is necessary to have time to realize the dying potential of technologies that are relevant in this stage. The transition begins locally and then becomes massive. We can already see the appearance of bits of technology from Industry 5.0.

Every digital product has a life cycle. It manifests itself in the balance of the potential of innovation and the attitude of people towards it. Any new technology can go through several cycles before it is even born. An example of this is artificial intelligence. In fact, artificial intelligence does not exist in its "pure form". At the moment we are dealing with machine intelligence. For artificial intelligence to appear in its purest form, computers need to be taught to think like humans.

It is very difficult to see the line between Industry 4.0 and 5.0 right now. There is no so-called "Leap" in technology, as was the case with the first cars. The main feature of Industry 4.0 is the transition to fully automated digital production in real time in constant interaction with the external environment, going beyond the boundaries of one enterprise, with the prospect of uniting into a global industrial network of Things and services [2].

In fact, Industry 4.0 characterizes the current trend in the development of automation and data exchange, which includes cyber-physical systems, the Internet of Things and cloud computing. It

represents a new level of organization of production and management of the value chain throughout the entire life cycle of products.

The next generation is expected to be the next destructive technological revolution, faster and more scalable. Analysts expect that Industry 5.0 will be based on existing Industry 4.0. Now the whole world is experiencing the fourth industrial revolution and watching the economic shocks associated with big various technological advances, such as: Artificial intelligence, Crypto, Internet of things, Blockchain, etc. Fifth industrial revolution will return our attention to us, to humanity. The next generation industry will not focus on digital transformation, but on communication between humans and robots.

New technical revolution will change present business. At the moment, the current digital transformation makes products consumer-oriented, they will become massively personalized. Such changes will affect all types of services and industrial production.

Industry 5.0 will focus more on humanity and mental work than ever before. The production of the future will lead to the maximum relationship between machines and people. Relationships with machines, both in production and in everyday life, already will reach a new level. That is, it will make life easier for people and increase productivity in enterprises and will help reduce production costs and improve quality of new products. The fifth industrial revolution will rather be a systemic transformation. It preparing to influence society, governance, and human identity. And that's not to mention on the economic and production consequences of the transition. The arrival of a new industry will inevitably lead to the disappearance of a large number of professions over the next ten years [3].

With the increase in the number of robots, computers, personal gadgets and IoT devices, the load on the network will potentially increase. We need to pay attention to the state of telecommunication networks, their ability to cope with heavy loads and large amounts of data. IPv4 addressing technology is already at its limit. For a full-fledged transition to a new generation industry, it is necessary to move to the IPv6 technology, where the number of available addresses is several times greater than now. Cybersecurity and telecommunication will be a major focus of Industry 5.0. Innovations in this area will have to ensure safety in production and especially, protect the privacy of people. Technology will need to help police and other regulatory agencies solve crimes faster.

## Conclusion

The fifth revolution will be more of a systemic transformation. It is preparing to influence society, governance, and human identity. From the point of view of modernity, the consequences of industrial revolutions can hardly be overestimated. In fact, thanks to revolutions, the entire modern technological civilization grows. It is difficult to find an area of life not affected by the Industrial Revolution. As such, Industry 5.0 will revolutionize artificial intelligence with the potential of other technologies, such as quantum computing, to effectively unify the workings of humans and machines. Cyber-physical systems will have to integrate into one network and interact with people in real time. In cyber-physical systems, it is possible to integrate computing more closely with the help of networks. With the development of technology, networks of machines are actively being created that can work with fewer errors and independently change production patterns, leaving the operation of the device system at peak efficiency. For the further successful integration of new technologies, such as artificial intelligence, neural networks, the Internet of things, cloud technologies, it is necessary to strengthen the development of network bandwidth and their cybersecurity. Industry 5.0 is already gradually replacing Industry 4.0. Every day discoveries are made that bring us closer to the era of artificial intelligence. The creation of complex and interconnected production systems is an important element of the transition to Industry 5.0

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