ADVANTAGES ON THE USE OF INDUSTRY 4.0 IN THE FIELD OF AGRICULTURE

DUMITRU D.*, GĂGEANU I., PERSU C., GHEORGHE G., CUJBESCU D.
INMA Bucharest / Romania
E-mail: dumitrudragos.nicolae@gmail.com

Keywords: agriculture, industry 4.0, evolution, technology.

ABSTRACT

Recently, studies show that the world is at the beginning of a new era of the industrial revolution, representing the fourth industrial revolution known as Industry 4.0. This will have an impact on research, technologies, manufacturing processes and people by connecting many products to the Internet, the presence of sensors, the expansion of wireless communications, the development of industrial robots and intelligent machines, the analysis of real-time data in order to transform how the research is conducted. The present paper presents the advantages of implementing Industry 4.0 in the field of agriculture.

INTRODUCTION

In the last 15 years, the variety of products used in the field of research has doubled, so the innovation and development process has a high complexity and requires new technological solutions and models to meet the needs of manufacturers. With the help of technological advancement, storage capacity, processing and numerous applications have made the industry evolve. Industry 4.0 represents a significant transformation for the implementation and development of research by unifying digital technologies and the Internet with conventional research. In Europe this concept was launched in Germany by government programs and leading companies such as Siemens and Bosch.

This paper presents the benefits of using this concept in order to understand the true potential of Industry 4.0 and to plan the digital transformation. There are significant development opportunities for Romania in the field of agriculture. This should begin the search and training of the best talent with digital skills to develop a plan for what digital research will look like.

MATERIAL AND METHOD

The concept "Industry 4.0" was created in 2011 at the Hannover Fair in Germany and has been accepted and implemented by most industries in other countries.

In Europe - The concept "Industry 4.0" is considered a new technology based on the cyber-physical system, defined as a combination of physical systems and cyber systems. Cyber-physical systems are used to develop autonomous research processes.

Figure 1 shows the evolution of the industry over time.

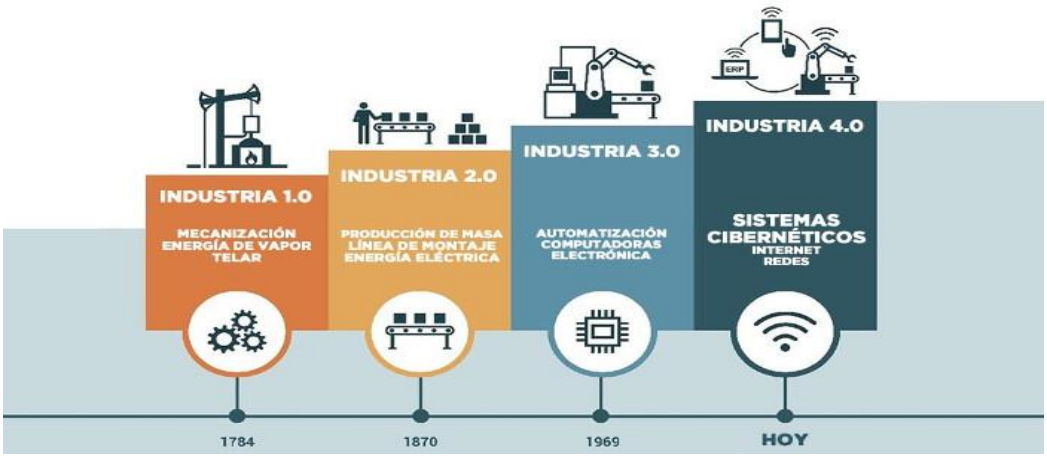

Fig. 1 Industry evolution 4.0

The first industrial revolution (Industry 1.0) was based on the mechanized production due to the exploitation of the power provided by steam and water. Steam engines were first used in the textile industry and subsequently spread to many other fields.

The second industrial revolution (Industry 2.0) was based on the use of new energy sources such as electricity and production. The increase in mass productivity was based on assembly lines, which together with the use of the parts led to its increase.

The third industrial revolution (Industry 3.0) represented electronic technology and information used to automate production.

The fourth industrial revolution (Industry 4.0) combines the virtual world with the physical world of research, production, intelligent machines and sensors to communicate with each other, at the same time, to control each other.

In general, Industry 4.0 identifies itself with the creation of intelligent products, processes and systems.

The methods and technologies used for this concept are applied in various fields of research:

- application of information and communication technology to digitize information and integrate systems of conception, development, research, manufacture and use of products;

- new software technologies for mod eling, simulation, visualization and use products;

- development of cyber-physical systems to monitor and control processes physical.

- the evolution of intelligent machines (machine numeric control units, 3D printers) to simplify manufacturing.

- support for the decision to the operators using augmented reality (new forms of human-machine interaction).

Research and development will be able to respond where more to the requirements of manufacturers accessing real-time data.

Devices, pro control systems and production systems will be connected to Industry 4.0 platforms.

The sensors will be integrated with the equipment production to monitor its function and to anticipate when the maintenance is required.

In addition, status and productivity data the father of the machines can be registered and transput in real time to the cloud for stand analysis data.

RESULTS AND DISCUSSIONS

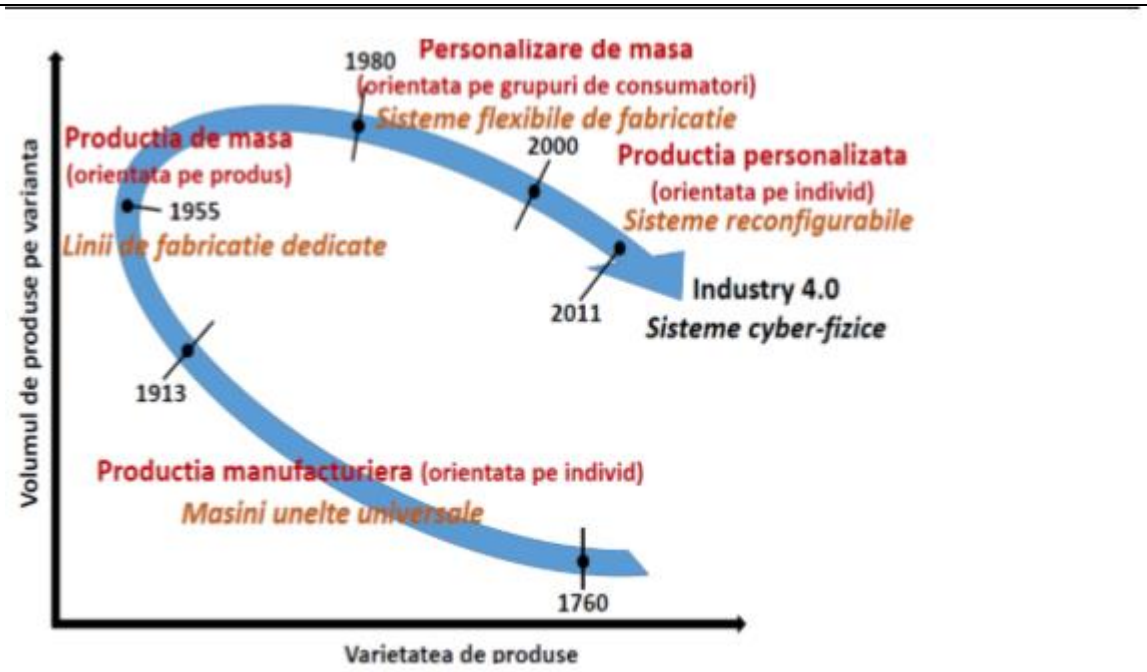

Fig. 2 Cyclic evolution

From Fig. 2 it follows that this concept has undergone a cyclical evolution, from personalized (individual-oriented) craft research to mass production (product-oriented), then to personalized mass-production (consumer-oriented) and returning back to personalized production. (focused on the individual consumer).

Industry 4.0 is included in the strategic development programs of some developed countries in Europe, America and Asia, with a view to the year 2025. At the same time, a platform has been created within the Federal Ministry of Education and Research. This platform comprises over 250 participants from the broadcast entire organizations (research institutes and universities). In this platform i a working group has developed a working report on implementation Industry 4.0. It includes technologies such as data security, Iot (Internet of Things) process simulation, devices equipped with sensors integrated by virtual technology.

CONCLUSIONS

The main expectations of agricultural research, as a result of its transition to the fourth phase of development (Industry 4.0):

- resource optimization by connecting equipment to the network;
- use of app-store and cloud applications.
- the use of artificial intelligence in the control of research systems,

for optimal decision making.

All this will lead to an increase of the efficiency of the research by reducing the technological process, a great adaptability to the needs of the producers and the increase of the quality of the experimental models.

ACKNOWLEDGEMENT

This work was supported by a grant of the Romanian Research and Innovation Ministry, through Programme 1 – Development of the national research-development system, sub-programme 1.2 – Institutional performance – Projects for financing excellence in RDI, contract no. 16PFE."

BIBLIOGRAPHY

1. D. Banabic, Industry 4.0 A patra revoluţie industrială, Simpozionul « Perspective în Inginerie », Zilele Academice Clujene, Cluj Napoca, 20 Mai, 2016;
2. O. Vermesan et al., IoT Digital value Chain Connecting Research, Innovation and Deployment: Digitising the Industry (Eds. O Vermesan, P. Friess), River Publishers, 2016;
3. I. Dumitrache, Cyber-Physical Systems (CPS)Factor determinant în economia bazată pe inovare şi cunoştinţe, Revista Română de Informatică şi Automatică, 23(2013), 43;
4. K. Schwab, The Fourth Industrial Revolution, World Economic Forum, Geneve, 2016;
5. A. Al-Fuqaha et al., Internet of Things: A Survey on Enabling Technologies, Protocols, and Applications, IEEE Communication Surveys & Tutorials, 17 (2015) 2347-2376;
6. G. Cușnarencu, Sub ochii noștri se naște a Patra Revoluţie Industrială, Magazin, 26 Iulie 2016.;
7. The fifth international workshop on cyber- physical systems-IWoCPS-5, Romanian Academy, Bucharest, May 26, 2016;
8. http://www.evosoft.com/
9. https://www.digitaltwin.ro;
10. http://www.fortech.ro/
.