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Klymenko Victoriya

PhD in Economics, Associate Professor, Associate Professor of Economic Theory Department, National Aviation University (Kyiv, Ukraine)

Akimova Luidmila

PhD in Economics, Associate Professor, Associate Professor of the Department of finance and nature resource, National University of Water and Environmental Engineering (Rivne, Ukraine)

Akimov Olexander

PhD in Public Administration, Associate Professor, Associate Professor of Documentation and information activities Academy of Municipal Administration (Kyiv, Ukraine)

THE POSSIBILITIES OF INDUSTRIAL INTERNET AND PROSPECTS OF ITS IMPLEMENTATION IN UKRAINE

The growing globalization of production and trade, development of information and telecommunication technologies (ubiquitous distribution of wireless networks, the emergence of cloud computing, the development of machine to machine technology, the development of software-configurable network), the transition from "Internet of people" and the "Internet of things" to "Industrial internet" have marked the

beginning of the fourth industrial revolution, which sets new challenges and tasks to the business sector.

The fourth industrial revolution involves adaptation to trends in society for changing the method of products' manufacturing. This is a revolution in which the products will be able to make themselves independently and determine target production depending on the needs identified by them through a connection between the intelligent products of Internet of Things and intelligent machines. It is characterized by the merging technologies and erasing the distinctions between physical, digital and biological spheres.

In general, the main characteristics of the Fourth Industrial Revolution are:

- integration of all project's participants within the framework of social production to increase productivity and stimulate competitiveness: the cost of transport and communications will fall; the efficiency of logistics and global supply networks will increase and the cost of trade will decrease;

- production flexibility, which ensures exact correspondence to consumer desires, and also allows to control costs and make a profit;

- intellectual production that combines products, machines, plants and humans;

- using of a new system of management – management of production and factory via the Internet. It is expected that the robots will replace the managers, they will quickly and efficiently measure changes in consumer preferences and markets' fluctuations;

- opening of new markets.

We should also identify the changes that will occur in the production:

- the means of production will become self-organizing, self-will interact with each other without human intervention;

- there will be interaction between the assembly components and the means of production. The means of production will be able to receive feedback from the final product, assembly, machine, household appliance;

- the so-called cyber-physical systems will be implemented;

- computer vision will be developed. In particular, the materials will be able to be identified using their own label, containing information about the manufacturer, destination and so on [1].

Those who provide intellectual and physical capital (inventors, shareholders and investors) will take advantage of a new revolution in

the highest degree.

Industrial Internet technologies increase the rate of production, reduce costs, including electricity costs, provide greater production flexibility and high quality of products (up to 99.9988%). Using this technology, it is possible to carry out a mass-production, and production for individual orders. Changes in behavior and consumer demands force companies to make up for them all: product design, market and deliver of goods and services.

Today the items of Industrial internet are used in Japan, USA, Europe developed. For example, in Germany there is a consortium, which includes major industrial companies, such as: Bosch, Siemens, BMW. So, the Siemens company has a special unit so-called "digital factory", where two worlds merge – the real (hardware) and virtual (simulation software) that allows to reproduce the manufacturing process by creating "digital double" even before the company will be entered into operation [2].

United States, for example, followed the example of Germany and created a non-profit consortium “Industrial Internet” in 2014, led by industry leaders, like General Electric, AT & T, IBM and Intel.

Companies from developing countries are trying to keep up with the developed countries companies. For example, the South Korean company Samsung in May last year introduced the Mini-Card Artik family, that let create intelligent sensors, a variety of portable devices, household appliances with web connectivity and so on.

Samsung expects that by 2017 the majority of devices produced by the company will be able to exchange data via the Web. But by 2020 it is planned to provide interaction between all-produced electronic gadgets and devices [3].

The main trend today is the development of technology platforms that bring together supply and demand and that break down the existing structure in the economy. The most successful businesses of the 21st century are:

- Uber – the world's biggest taxi service, which does not own cars;
- Facebook – the largest media platform in the world that does not create the content;
- Alibaba – marketplace with the highest market capitalization that has no inventory;
- Airbnb – the largest rental platform, which does not own real estate.

As regards the impact of the fourth industrial revolution on the trade,

the concept of a future supermarket has been developed on the example of the largest network of supermarkets in Italy, Coop Italia [4].

Instead of the usual maze of shelves with goods there is an open layout, completed with displays that are at the buyer's request, represent full information about the product, starting from its producer, the conditions of production and composition, and ending with the features of its consumption and the impact on the environment.

Accenture and Avanade, the partners of Microsoft developed the Concept of the supermarket of the future. They used the camera Kinect sensors and the Intel NUC computer, which displays an image. Data is stored in the Microsoft Azure “cloud” and uses Microsoft SQL database content and Microsoft management tools. Cash devices operate on the Intel platform under control of Microsoft Windows.

The distinctive features of this concept are:

- openness, practicality and spaciousness of retail outlets;
- providing customers with the possibility to get answers to their questions about the product;
- control the availability of goods on the shelves, which creates benefits for the workers, because additional quantities of goods can be stored in a warehouse, not in store;
- identification of the most popular products, as well as monitoring of how buyers make their choice, and move around the store, which, in turn, provide more efficient interaction with suppliers.

In general, the fourth industrial revolution will have on business four main effects: the expectations of consumers, the improvement of products and goods, joint innovation and organizational forms.

Naturally, the Fourth industrial revolution poses new challenges to the staff potential of enterprises. Highly skilled workers and people of creative professions will be valued much higher than cheap labor of unskilled workers from South-East. A significant part of the staff will be programmers, mathematicians and engineers. For example, Siemens employs more than 17,500 programmers who develop embedded software, applications, and methods of analysis of data, received from the equipment [2].

Today one of the main issues of further development of the Industrial internet is a lack of common technical standards, which are fundamentally important for the smooth operation of networks with the ability to ensure operations of billions of connected devices. First of all, the development of common platforms and languages in which machines of different corporations can communicate freely, and the

creation of secure networks are necessary. However, it should be noted, that the first steps in this direction have been already made.

In particular, Microsoft together with international IT-leaders, such as Qualcomm, Cisco, Electrolux and others, announced the creation of the organization Open Connectivity Foundation, which aims to create a common set of open protocols for the Internet of Things, which should contribute to the development of the industry. Thanks to the unified standards producers will be easier to create new devices with an Internet connection [5].

Thus, proceeding from the global trends in the development of the business sector, the main guidelines for the further transformation of the Ukrainian economy have become high-tech strategy, knowledge and innovation based on technologies' combinations. Without this, Ukraine cannot provide its competitiveness in the global market in terms of widespread implementation by developed countries the opportunities that the Fourth industrial revolution opens.

Therefore, in the nearest future the reserves of innovation and informational potential of the business sector of Ukraine should be identified, and measures aimed at increasing the innovative activity of the enterprises and the further spread of information and communication technologies must be developed.

Table 1.6 provides information about the innovation activity of enterprises of Ukraine.

Table 1.6

The dynamics of innovation activity of Ukrainian enterprises in 2010-2014*

Indicators	2010	2011	2012	2013	2014
Percentage of enterprises engaged in innovation, %	13.8	16.2	17.4	16.8	16.1
The total cost, million UAH	8045.5	14333.9	11480.6	9562.6	7695.9
including the following directions:					
- research and development	996.4 (12.4%)	1079.9 (7.5%)	1196.3 (10.4%)	1638.5 (17.1%)	1754.6 (22.8%)
- purchases of new technologies	141.6 (1.8%)	324.7 (2.3%)	47.0 (0.4%)	87.0 (0.9%)	47.2 (0.6%)
- purchases of machinery, equipment and software	5051.7 (62.8%)	10489.1 (73.2%)	8051.8 (70.1%)	5546.3 (58.0%)	5115.3 (66.5%)

Compiled and calculated by authors according to statistical information on science, technology and innovation, State Statistics Service of Ukraine. [Electronic resource]. Available from Internet: <<http://www.ukrstat.gov.ua>>

As shown in table 1.6 the percentage of enterprises, engaged in innovations, was not more than 17.4% during 2010-2014. Costs on research and development ranged from 7.5% to 22.8% of the total costs; purchases of new technologies - 0.4% -2.3%; purchase of machinery, equipment and software – from 58.0% to 73.2%.

Positive dynamics is observed in the costs on research and development, while the percentage of costs on the purchase of new technologies is decreasing. This can be seen as an indicator that the companies can develop on the way of creating of their own technologies.

Table 1.7 provides information about the innovations' implementation at industrial enterprises of Ukraine.

Table 1.7

The dynamics of innovations' implementation at industrial enterprises of Ukraine in 2010-2014

Indicators	2010	2011	2012	2013	2014
Percentage of industrial enterprises engaged in innovation, %	11.5	12.8	13.6	13.6	12.1
Introduced new technological processes, processes	2043	2510	2188	1576	1743
including low-waste, resource saving processes	479	517	554	502	447
Introduced production of innovative products, items	2408	3238	3403	3138	3661
including new types of equipment	663	897	942	809	1314
Percentage of sold innovative products in total amount of industrial products,%	3.8	3.8	3.3	3.3	2.5

Compiled and calculated by authors according to statistical information on science, technology and innovation, State Statistics Service of Ukraine. [Electronic resource]. Available from Internet: <<http://www.ukrstat.gov.ua>>

As can be seen from table 1.7, the reserve of further innovative development of industrial enterprises is the introduction of new technological processes. The situation with the introduction of innovative products, including new types of technology has improved, although the percentage of sold innovative products has decreased and

equals 2.5% in total amount of industrial products.

As for the possibilities of the Ukrainian enterprises on the application of technologies and services of industrial Internet, this is a prospective area of development, particularly with regard to:

- significantly reduction in price of technology (sensors and RFID-tags are cheaper than one dollar), making them accessible to the mass customers;

- the growth of Mobile communication penetration and development of the Internet, including 3G. In particular, in 2015 in Ukraine there were 60720.1 thousand mobile subscribers, 6075.4 thousand Internet subscribers, including 4964.3 thousand broadband subscribers, was taken into operation 224.9 km of fiber-optic communication lines [6];

- increasing the use of SIM cards by machine clients, such as banks, large security companies, suppliers of vehicle tracking solutions, solutions for retailers, transporters, taxi services, delivery services, electric power suppliers, water utilities. At the beginning of 2015 machine clients used more than 1 million SIM cards. ATMs, trucks, sensors in the industry and security are connected to the network.

Using of information and communication technologies by Ukrainian enterprises is presented in table 1.8.

Table 1.8

Using of information and communication technologies at Ukrainian enterprises, 2014

Type of business activity	Percentage of enterprises used a computer during the year, %	Percentage of workers used the computer during a year, %	Percentage of enterprises that had access to Internet, %	Percentage of workers regularly used the Internet connected to a computer, %	Percentage of enterprises that had a Web site functioned on the Internet, %	Percentage of enterprises carried out the electronic exchange of data, %
1	2	3	4	5	6	7
Processing industry	93.4	22.5	97.6	69.8	40.2	79.4
Delivery of electricity, gas, steam and conditioned air	92.8	24.8	99.2	64.0	29.3	85.4
Water supply; sewerage, waste management	96.5	14.4	95.9	79.3	13.5	77.2

table 1.8 (continued)

1	2	3	4	5	6	7
Construction	96.0	22.1	97.8	92.5	22.5	78.2
Wholesale and retail trade; repair of motor vehicles and motorcycles	94.1	43.0	98.1	84.8	28.9	81.7
Transport, storage, postal and courier activities	94.2	16.2	97.3	64.5	19.7	77.7
The temporary arrangement and catering	87.6	19.1	96.7	88.0	31.6	69.5
Information and telecommunications	96.6	72.1	98.5	96.4	51.5	85.5
Financial and insurance activities	95.8	72.6	98.7	82.8	62.3	84.3
Real estate transactions	92.2	27.2	96.6	92.0	16.7	70.5
Professional, scientific and technical activities	96.3	61.5	97.5	83.3	39.7	80.4
Activities in administrative and support services	88.3	20.5	94.5	92.0	17.1	68.1
Providing other services	98.2	72.2	98.2	93.1	45.6	80.7
Total	93.4	30.0	97.4	79.5	30.6	78.5

Compiled and calculated by authors according to statistical information on Using of information and communication technologies at Ukrainian enterprises. (2014) [7].

Modern information and communication technologies make it possible to create information and knowledge, to use and share them, to produce goods and provide services, promoting the development of the business sector. It should be mentioned, that 93.4% of enterprises used computers in their work in Ukraine. High level of computerization was in business, provided information and communications – 96.6%; lowest level of computerization was in the temporary arrangement and catering – 87.6%.

The percentage of enterprises that had access to the Internet was 97.4% of the total number of enterprises used a computers. Companies that had access to Internet, used it for banking and financial services (86.3% of enterprises); submitting forms electronically (83.9%); obtaining forms electronically (79.3%); getting information about goods and services (48.7%); receiving administrative services (declaration, registration, request authorization) (40.5%).

The percentage of workers used the computer during a year was 30.0%. The maximum level of the indicator was in financial and insurance activities, information and telecommunications sector (more

than 72%), the minimum level – in water supply; sewerage, waste management and transport, storage, postal and courier activities (near about 14%-16%). 79.5% of them regularly used the Internet connected to a computer.

The recommendations on implementation of the Industrial internet in Ukraine should be focused on follows:

- providing financial, material and technical conditions for the domestic inventors to create devices with connecting. It is possible to invent different useful things and even entire ecosystem from devices. It is a very promising field for Ukraine Startups;
- ensuring the public awareness of the possibilities of the Industrial internet technology;
- forming psychological readiness of society to the perception of this technology;
- training specialists and establishing companies, able to service this technology;
- reducing bureaucracy and fighting corruption.

This will have a positive effect, especially in today's conditions of decrease in real GDP, falling of domestic demand due to high inflation, declining of exports to Russia and other post-Soviet countries and finding the ways of integration of Ukrainian enterprises in the European and Asian markets.

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Maslak Oleksandr

PhD in Economics, Associate Professor, Department of Foreign Trade and Customs, National University «Lviv Polytechnic»

Doroshkevych Kateryna

PhD in Economics, Associate Professor, Department of Management and International Business National University «Lviv Polytechnic».

Petryshyn Nataliya

PhD in Economics, Associate Professor, Department of Foreign Trade and Customs, National University «Lviv Polytechnic»

IN ADDITION TO THE QUESTION OF THE DEVELOPMENT OF THE NORMATIVE-LEGAL FIELD OF CLUSTERING

The essence of clusterization can be determined as a process of creating within the national economy clusters (cluster systems) and other network structures. At the same time clusters should be regarded as special types of groups of interconnected companies, research institutions, NGOs, etc., which are aimed at obtaining synergies, improving the competitiveness of products as well as the region as a whole. The structure of the cluster includes the main companies (industrial ones), manufacturers of related products, research institutes, research and experimental centers and others. More developed clusters