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INDUSTRIAL INTERNET OF THINGS: CONCEPT AND LEGAL CONSCIOUSNESS, MEANING FOR INDUSTRY 4.0

INTERNET INDUSTRIAL: CONCEPTO Y CONCIENCIA LEGAL, SIGNIFICADO PARA LA INDUSTRIA 4.0

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Abstract

The paper is devoted to the study of the concept and meaning of the Industrial Internet of Things (IIoT). The authors explain this concept and its nature. The paper presents the author's concept for describing and explaining the essence and advantages of the Industrial Internet of Things. The authors show the importance and perspectives of the Industrial Internet of Things for Industry 4.0.

Keywords

Industry 4.0 – Industrial Internet of Things (IIoT) – Internet of Everything – Internet 4.0
Artificial intelligence

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Introduction

We are all witnessing a digital transformation of the economy and industry. For an engineer, integrating and amalgamation of technologies to create products, systems and solutions is part of everyday life. Natural and technical sciences provide the foundation for this activity. Until recently, such concepts as "ontology" and "semantics" were studied by the human sciences, as a rule. However, they are now also part of the ever-changing world of engineering. The world of digital transformation is shaped by us ourselves. The most dynamic industry in this world is known as “smart manufacturing” or “Industry 4.0”[1].

Industry 4.0 and the Industrial Internet of Things (IIoT) have become one of the most discussed concepts of industrial business in recent years. Industrial Internet of Things covers a huge number of disciplines such as energy production, manufacturing, agriculture, healthcare, retail, transport, logistics, aviation, space travel and many others[2].

Gradually, all these concepts enter our life, and these technologies themselves displayed with these concepts are increasingly being introduced into the industrial space, and into the economy[3].

However, these concepts themselves have not yet been properly explained, especially from a scientific and legal point of view, which inevitably merges with the most complex and highly debatable issue of the possibilities and limits of computer formalization of law. And this implies that the normative legal regulation of relations in this area in our country today is extremely unsatisfactory; it does not meet the technological challenges that already occur today (it goes without saying about feed-forward control, which is simply absent today).

On the issue of the concept "Industrial Internet of Things" and its meaning

According to Alasdair Gilchrist, General Electric proposed the name Industrial Internet as a term meaning “Industrial Internet of Things”; others, such as Cisco, called it the Internet of Everything, and others called it "Internet 4.0" or using other options[4].

These technological solutions are connected with the digital intellectual economy[5].

According to K. M. Belikova, “the digital intellectual economy seems to be a relatively new phenomenon, therefore there are not yet universal and most optimal

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[1] Toward smart manufacturing with data and semantics. Köln: eCl @ ss e.V. 2017.

[2] A. Gilchrist, Industry 4.0: The Industrial Internet of Things (New York: Apress, 2016).

[3] M. V. Markhgeym; A. E. Novikova; E. E. Tonkov; A. D. Khlebnikov; V. E. Levchenko; A. N. Tsapkov and M. E. Rodionova, “Land and Natural Resources in the Constitutional Subjects of the Eastern European Countries and the Regional Experience of Adaptation of the Land use in the Reform of Land Relations”, Journal of Engineering and Applied Sciences. Vol: 13. Issue 10 (2018): 3493-3499.

[4] A. Gilchrist, Industry 4.0: The Industrial Internet…

[5] I. V. Ponkin, and A. I. Red'kina, “On the issue of an intellectual digital economy concept and on some of the challenges it determines concerning the field of intellectual property rights”. The role of intellectual property in the scientific community: Rospatent conf. (Moscow, September 19–20, 2018) y K. M. Belikova, “Digital Intellectual Economy: Understanding and Peculiarity of Legal Regulation (Theoretical Aspect)”, Science and Education: Economy and Economics; entrepreneurship; right and management, num 8 (2018): 82-86.

approaches to its measurement and definition, as there is no consensus among scientists about the definition of its concept, that the optimal and universal ways of developing legislation in this area have not yet been found"[6].

These technological solutions are aimed at increasing the emergence of production, trade and logistics, transport and other systems.

In the most general sense, the principle of emergence of a system reflects the existence of integrity properties in this system and, in particular, the irreducibility of its properties to the sum (aggregate) of properties of its components, availability of specific properties and potentials at the system, which are absent in its subsystems and elements, and which are originated as a result of the synergistic combination and conjugation of the properties and potentials of subsystems and elements, that is, the system has a certain independence with respect to its constituent elements[7].

Descriptive elements of the ontology of intellectual production include:

- An integration layer as a transitional layer from the level of material and financial assets to the information world layers;
- A communication layer that describes the functional information to be exchanged with other assets, and defines the connection that is compatible with Industry 4.0 based on ISO / OSI-7 level models;
- An information layer for describing functionally relevant information and asset data, individually separated from the functional level and positioned with regard to it, in order to facilitate the assessment and evaluation of the separated data (big data);
- A functional level with technical functions specific to a particular asset; this level contains information about the functionality of assets associated with a specific goal;
- A business layer with information related to the use of the asset and its role in business operations, such as regulations and laws, contract details, discounts, prices, etc.[8]

It is the latter position that determines the interest of lawyers to these issues. .Equally, this is determined by the risks that, in their multitude are produced today by the significantly retarded and lagging development of legislation from what is already exist in the economy, in the industry. According to one of the well-known definitions, the **Internet of things** is a concept based on creating systems that interact with the physical world using network objects (for example, sensors, actuators, information resources, people). The Internet of Things consists of two basic concepts: 1) IoT components are interconnected by a network that provides connectivity between many components (this network capability may or may not be based on TCP / IP); and 2) some of the IoT components have sensors and actuators that allow components to interact with the physical world[9].

The industrial Internet of things is a special case of the Internet of things, but the case is very complex.

[6] K. M. Belikova, "Digital Intellectual Economy: Understanding and Peculiarity of Legal Regulation…
[7] Theory of Public Administration: A Textbook for Masters and Programs for Masters of Public Administration. Institute of Public Administration and Management RANEPA under the President of the Russian Federation. 2017.
[8] Toward smart manufacturing with data and semantics… 84-85.
[9] Draft NISTIR 8200, Cybersecurity Standardization for International Internet of Cybersecurity. Things (IoT) (Gaithersburg: US Department of Commerce, 2018).

The essence and advantages of the Industrial Internet of Things (IIoT)

According to our concept, the **Industrial Internet of Things (IIoT)** is a digital (computer-software-hardware) **poly-lateral** method of transforming business processes and management processes, business relations and managerial relations, as well as the instrumental-technological and logistic digital platform associated with this method. Due to the peculiarities of their ontological nature and, instrumentally, through the use of various new technologies (neurotechnologies[10], cloud technologies[11], blockchain technologies[12], integration of cyber-physical systems, and the use of artificial intelligence technologies[13], big data processing technologies[14], etc.), they integratively provide the following advantages (capabilities):

- Higher-quality (relevant, effective, fast, advanced) analytical and monitoring (for significantly expanded indicator systems), as well as validation hardware and software (with a greater frequency of verification steps, with a much more relevant and high-speed feedback system), which is achieved through high-speed and multimodal handling of big data (information, statistics, indicators of data, etc.) and heterogeneous complex data streams in IIoT systems in the online and in real-time modes, with the use of cloud technologies and high-speed telecommunications, high-capacity computer memory arrays and distributed cloud storage systems - for subsequent analytics, performed in package and multi-level formats, including analytics of significantly more voluminous, complex and heterogeneous sample pools;

- Achievement, maintain and support the effect of a significantly higher and more resilient emergence of the system, moreover, the dynamic emergence (“the Internet of things is not a permanent history, but a dynamic history”) and in conditions of high entropy and uncertainty levels;
- Providing a significant intensification of the density, orderliness and relevance of operating streams and spaces, significantly higher and optimal operational efficiency, and a significant increase in productivity due to the use of more powerful and significantly improved algorithms, increasing the density and intensity of interrelations, increasing logical optimality; and as a result
- Ensuring more smart rationality through the use of the latest semantic and ontologized approaches in general (the semantic Internet of the new generation - Semantic Web) through “smart standardization” and introduction of computer-interpreted semantics integrated into existing systems;

[10] S. Mirjalili, Evolutionary Algorithms and Neural Networks: Theory and Applications. Brisbane. 2019 y G. G. Rigatos, Advanced Models of Neural Networks: Nonlinear Dynamics and Stochasticity in Biological Neurons (Berlin: Springer-Verlag, 2015).
[11] Cloud Computing Law (Oxford: Oxford University Press, 2013).
[12] R. Herian, Regulating Blockchain: Critical Perspectives in Law and Technology (New York: Routledge, 2019) y J. J. Bambara and P. R. Allen, Blockchain: A Practical Guide to Developing Business, Law, and Technology Solutions. McGraw-Hill Education. 2018.
[13] P. M. Morhat, Law and Artificial Intelligence (Moscú: Uniti-Dana, 2018) y I. V. Ponkin and A. I. Red'kina, “Artificial intelligence in legal contemplation”, Bulletin of Peoples' Friendship University of Russia. TV series "Jurisprudence". Vol: 22 num 1 (2018): 91-109.
[14] D. Loshin, Big Data Analytics: From Strategic Planning to Enterprise Integration with Tools, Techniques, NoSQL, and Graph (Waltham (MA, USA): Elsevier, 2013) y V. Ankam, V. Data Analytics: A handy reference guide for data analysts and data scientists to help to obtain value from big data analytics using Spark on Hadoop clusters (Birmingham: Packt Publishing, 2016).

- Increase in commercial and production potential of industrial assets due to their intellectualization, use of end-to-end design, interfaced and shared use technologies (shared economy), optimizing virtualization of production functions and modeling of technological processes;

- Receiving and handling fundamentally new, previously inaccessible data (for example, new data on users of transport systems).

The technologies of the Industrial Internet of Things open up completely new opportunities and offer completely new models for companies and business processes. Among other things, these technologies and approaches provide relief from redundancy, significantly reducing unplanned downtime and operational time.

As Alasdair Gilchrist notes, it is big data and advanced analytics that are the key drivers and tools of IIoT, as they provide historical, predictive and prescriptive analysis that can give an idea of what actually happens inside a production or process[15].

Ontological (semantic) technology defines and interconnects data on the Internet or within an enterprise, developing languages to express rich, self-describing data relationships in a computer-processable form. Thus, computers are not only able to process long computing lines of characters and to index “tons” of data, but they can also store, manage and retrieve information based on their meaning and logical relationships between things in knowledge. Ontologies and semantics add another layer to the new Internet and can show related things, facts and objects instead of just matching words. The ontological (semantic) technology is used to define and link data (on the Internet or inside an enterprise) by developing a language to express rich data interconnections in a form in which computers can handle it. Thus, computers are not only able to process long computational lines of characters to index “tons” of data, but they can also store, manage, and receive information on meaning and logical relationships. The main difference between ontological (semantic) technologies and other technologies for data and relational databases, for example, is that semantic technology is about meaning, not data structure[16].

Conclusion

The Industrial Internet of things is still in the very initial stage of its genesis – in its embryonic state, although its development trends are already such that this phenomenon can no longer be left out of the attention of legal scholars.

A striking argument here among others is that with respect to the Industrial Internet of Things, an indicator called “one percent power” reflecting the savings (due to the Industrial Internet of Things) of operating costs by 1% or reducing inefficiency by 1% is essential. For example, in aviation, fuel savings of 1% per year are associated with savings of $ 30 billion. Similarly, fuel savings of 1 % for gas generators at power plants result in savings of $ 66 billion. In addition, in the oil and gas industry, the reduction of capital expenditures for equipment by 1% per year will return about 90 billion dollars[17].

[15] A. Gilchrist, Industry 4.0: The Industrial Internet…
[16] O. V. Grin'ko; V. P. Kupriyanovskiy; O. N. Pokusaev, et.al. “The ontologization of the European Union data as a transition from economics to economic knowledge”, International Journal of Open Information Technologies, Vol: 6 num 11 (2018): 65-84.
[17] A. Gilchrist, Industry 4.0: The Industrial Internet…

The legislation of the absolute majority of states in the world today is not ready for these changes.

According to the report by the Organization for Economic Cooperation and Development dd. January 2017 for the G20

> "in recent years, the transformative and often destructive effects of digitalization have led many governments to revise legal framing in an even wider range of areas. Although some questions determined by digitalization clearly need in the legal response, and legal certainty is crucial to many aspects of digitalization, there are problems with clarity, and how we must deal with other challenges. In today's conditions of rapid growth of digital innovations and extensive use of digital technologies in the economy and society, the complex legal framing of digitalization becomes outdated very quickly as it was expected"[18].

Gradually increasing activity in the legislative regulation of blockchain and cryptocurrency, and in the field of artificial intelligence in a number of countries, gives rise to a positive trend in this area.

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