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MANUFACTURING FOR INDUSTRY 4.0

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ABSTRACT
The production of a new generation needs to be adapted to modern requirements of the market that creates the foundation for vertical and horizontal integration of production systems. Such integration, based on the extremely rapid development of information-communication technologies leads us to the path of the new Industrial Revolution – Industry 4.0. Thanks to advances in respect of such technology enabled the creation of smart things, smart tools, smart machines, smart services, all thanks to the integrated web technologies in smart environments.Such smart environments represent a basis for structuring the new cyber-physical production systems that are the basis of production of Industry 4.0.
Keywords: Cyber-physical production systems, information-communication technology, Industry 4.0

1. INTRODUCTION
In the past twenty years, in the field of industrial production, significant changes were occurring, the state market borders are deleted and the comprehensive globalization kicked in. Globalization is objective planetary processes through technological evolution and its fruit, such as compression of time and space, reducing the distance and time required for all branched communication.
Defining globalization as an objective planetary process, although important, is not the only feature of globalization. Her second and crucial dimension is embodied in the social form of globalization standard.
Modern market becomes global and less national or local disappearing. Developed world market is reflected in the wide range of new products, the rapid obsolescence of products and the emergence of new products, high quality standards, short delivery and decreasing costs. Such conditions are very difficult for the classical industrial production we have today, making us, and thanks to the progress of modern technological achievements, such as communication networks and the Internet, enter in a new modern era of industrial production based on communication - information linking manufacturers and customers. This era, which is inevitably ahead, in scientific circles of developed European countries is known as the new industrial revolution or Industry 4.0 [1, 2, 3].

2. OF CIM TO INDUSTRY 4.0
Computer integrated manufacturing and CIM system is not the product that is sold on the market, but it is made for integration of available components using appropriate CIM interspaces or CIM interfaces. CIM is the strategy and each industry should define its CIM concept.
CIM system is the integration of production technology, communication and computer equipment that is installed in the organizational unit of the enterprise but it can also be observed as a mark of quantity of business partners in the observed companies.
The goal of any organization is very clear: to live and succeed and that means to produce what the market wants, with high quality, affordable price and delivery deadlines required by the market. It defines our claim that the profit is the difference between selling price and production costs [4].

Significant efforts are needed for a continuous decrease in costs at the level of the entire organization. This is the Lean approach. Such an approach that eliminates all production losses, but not only in manufacturing but also in the whole process, from order to delivery and use of the product.
The main goal of lean manufacturing is continuous improvement. This means that participants must never be satisfied with the extent of achievements but, must constantly in every moment, look for new ways to improve the smallest segments of the process. It is necessary to constantly look for ways to reduce waste, improve quality, optimize equipment, in other words, ways to do things better, faster and easier [5]. It is this kind of tendency, based on CIM and LEAN manufacturing that created new perspectives in approaches to the development of production systems that tend towards a new industrial revolution named - Industry 4.0.
Industry 4.0 [4,6,7] implies a horizontal integration of data flow between partners, suppliers and customers, as well as vertical integration within the organizations themselves - from development to final product. It merges the virtual and the real world. The result of this integration is a system in which all processes are fully integrated - system in which sensors and chips identify and locate products, and in which products they know their history and current status. Such systems define cyber - physical systems. They provide network connectivity productive work systems, logistics systems, and social environment in cyber space, where the exchange of information takes place in real time.

3. CYBER – PHYSICAL PRODUCTION SYSTEMS

Cyber-physical systems (CPS) represent a relatively new area of research, but also exponentially growing expansion, from the time you first define Helen Gill until today. CPS are a new generation of systems that integrate computer and physical abilities [8, 9, 10].
Cyber-physical systems provide multiple opportunities such as the distribution of electricity in distribution networks, where time plays a crucial role. Today's computing and networking technology have such features those undoubtedly lead to the realization of applications cyber-physical systems. Software component technologies, including object - oriented design and service-oriented architecture, built on abstractions put software in a much better position than the physical system.
Application CPS undoubtedly has a great role in the development of information-technological revolution. Highly positioned in the field of medical devices and systems, in control and monitoring systems, advanced automotive systems, environmental control, aircraft control systems, distributed robotic systems, defense systems, and smart production structures.
Cybernetic system is a segment of the new production system, which has a vital role to the new requirements that are placed in front of the new generation production systems based on the new Industrial Revolution. CPS are unlike traditional systems where the dominant control organization in the form of a pyramid of automation, decentralized. This feature represents the ability to control system at any level. It is this feature of the new production system allows the structuring of cyber-physical production system starting from the level of technical processes organized in elementary work system [11].
Under the influence of advanced information-communication technology that every day takes its place in the production systems the role of the subject in elementary random system is expected to change. An entity manager working system and its role is becoming increasingly important and sensitive. Such a change requires the creation of a new concept of production systems based on modern information-communication technology, Internet and network connections, in which the subject is seen from the perspective of social components of advanced manufacturing systems.
The concept of socio-cyber-physical production systems (SCPPS) is resulting from previous researches and questions related to the concept of Pekleniks elementary work system [11, 12] over Butala & Sluga elementary virtual work system [13] and Butala & Sluga autonomous work system and their network connectivity B2NM [14, 15]. For the structuring of a new concept, it served a generic basis of elemental virtual work system.

3.1. Socio – cyber – physical work system

The integration based on modern information-communication technologies and the Internet, in the form of the Internet of Things, internet services and social networks in cyberspace, allows that in such an environment we pull away the subject from the level of control systems and introduce the level of management. His place is in the new concept of smart licensed agents and multi-agent systems.

Featured conceptual model of socio-cyber-physical working system consists of three subsystems, Figure 1:

- Physical working subsystems which basically is the elementary operating system (machining center or more, positioning systems, automated clamping kits, measuring systems, etc.).
- Virtual work subsystem that encompasses different control equipment consisting of various of agent and multi-agent assisted systems (control systems, equipment for coordinating sensor systems, etc.).
- The social subsystem which is home to the workers, operators who manage and supervise the work of cyber-physical work system as a whole, have the role of managers, policy work activities.

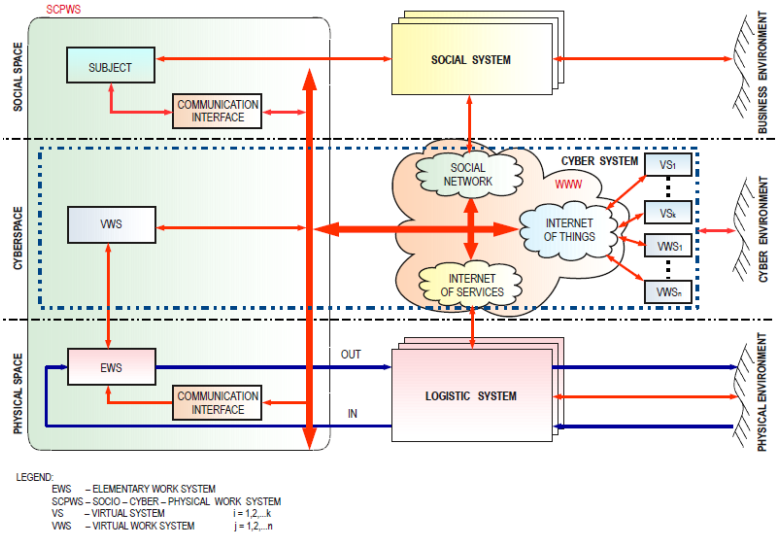

Figure 1. Socio-cyber-physical work system

Data between the physical working subsystems and the virtual work subsystem are transferred via interfaces. Communication between the subsystem containing the subject and cyber-physical system, which is built from elementary work subsystem and virtual work subsystem is via intelligent communication interface. Information flow between the subsystems is realized in common cyberspace. Modern ICT represents the required communication infrastructure, and it provides for the required tools to solve the practical problems of distributed socio-cyber-physical manufacturing systems.

3.2. Human resources of socio-cyber-physical production systems

The basic principle of production in the future must be based on practices that production serves man, and not man production. This practice is not prevalent in the prior production philosophy, which is usually a man led to the margins of the production system. In striving to achieve competitiveness, which is reflected primarily in the quality and price of products or services, manufacturing companies often wrestle with cutting costs and the abolition of employment opportunities, and the resulting load of human resources and a decline in product quality and working conditions. Loads of human resources through the normative limits of natural causes frustration and dissatisfaction which directly implies the product or service.

In today's modern world, human beings are a tool for producing the inescapable water in the wrong direction. The majority of the working population is dissatisfied with their work activities, frustrated and under stress. In general, the position of man in the production system, in a time of expansion of information-communication technologies, is very demanding. Information overload is one of the aggravating circumstances that the man acting as a result of the introduction of such technologies in production systems. Capabilities receiving increasingly complex information in a human cause paranormal situation, because man is usually limited to their senses and reason have no idea all the information surrounding it. Information technology is emerging as a means of attack on private life, a source of stress and often leads to alienation of man. New technology ignores the logic of human behavior, which leads us in an untenable position within the production system.

Human resource in socio-cyber-physical production systems has enormous potential, which is reflected in the management activities of man in real time. His role in advanced systems opens up a wide field for the analysis of the aspects that are consequences of network systems, if they are community service network and power production systems. Position the subject between these two network systems undoubtedly affects the robustness and productivity of socio-cyber-physical production systems. Precise definition of the role of the subject in advanced socio-cyber-physical production systems allows reaching comprehensive competitiveness in the global uncertainty.

4. CONCLUSION

Through the structure of this work is shown in the evolutionary development of production systems that have formed the basis for the implementation of CIM systems through lean manufacturing and the production of new industrial production – Industry 4.0. New global market rules require new production systems to be able to meet the challenges of globalization mega trends. Such cyber-physical production systems are based on the use of ICTs and the Internet in production environments. The role of the subject in all the concepts of production systems had its own approach which is reflected through the prism of socio-technical systems. In this paper, the emphasis is on the role of the subject in the cyber-physical production system through the concept of socio-cyber-physical work system as the basic building block to connect to the production network. Area of cyber - physical production systems is a relatively new area that in the future requires a profound research in order to define the role of the subject in the new production systems based on the new, upcoming industrial revolution – Industry 4.0.

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