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APPROACHES AND CHALLENGES IN THE APPLICATION OF HIGH TECHNOLOGY IN THE INDUSTRY

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Abstract: *Increasing competition in the market requires manufacturers to bring high technology solutions to optimize production processes on the one hand and to offer personalized products on the other hand. In the current conditions of digitization, namely the application of information and computer technologies requires the use of new management approaches. The report attempts to systematize the approaches and challenges of applying high technology to the modern industry.*

KEYWORDS*: HIGH TECHNOLOGIES, APPLICATION APPROACHES, INDUSTRY*

1. Introduction

The requirements of the EU directive on digitization of the economy determine the steady growth of investments with high added value. High technologies penetrate in parallel in many sectors, such as electronics, machine building, power engineering, etc. The main factors behind these technological advances are: increasing user requirements on personalizing products, integration of users in the design process, the reorganization of the value chain and the rapid development of information and communication technologies.

2. Approaches to the application of high technology in the industry

A. Product Life Management PLM

Introduction of intelligent technological equipment to all activities, during the life-cycle of the product (repair, maintenance, correction, etc.), as well as the purposes and conditions of use of the product are automatically recorded and stored. This necessitates a transparent product life-cycle management (Product Life - Management PLM). The purpose of this approach is to develop an individual product, but with series of production requirements. Integrating user requirements and optimizing costs, time and quality throughout the product's life-cycle. This requires a comparison of the requirements of market / client / company / regulatory requirements, Fig.1.

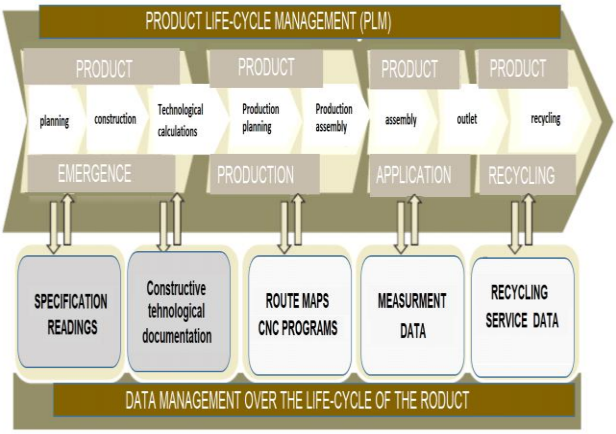

Fig.1 *Managing the life cycle of the product*

B. Partial (segmented) approach

Integration of technology components can bring enormous potential, but it is also associated with much higher requirements. That is why we are talking about so-called "isolated solutions" or segmented development of a partial system to the transition to high technology, which is called a segmented (partial) approach ,Fig.2.

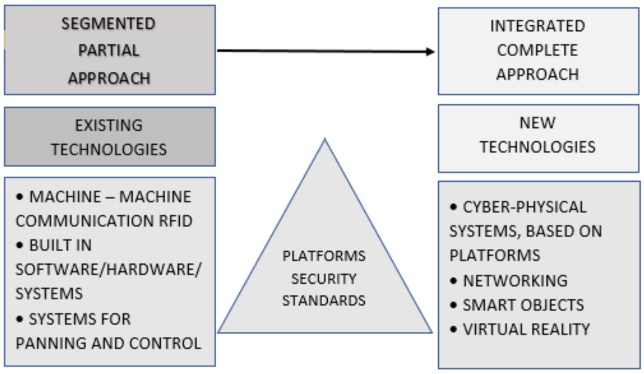

Fig.2 *Characteristics of the partial approach*

C. "Step-by-Step" Approach

From the standpoint of individual companies, greater flexibility and cost savings can be achieved by integrating suppliers and customers, as well as transport systems. Using technology as well as real-time transport statistics monitoring will allow to specify their expected arrival time and content (e.g. transport from the front door of the warehouse accompanied by RFID-control of the goods transported. The system also deals with vehicle availability notification and warehouse space management). With this strategy, it is possible to improve internal logistics processes, but also to develop new business models.

D. A holistic approach to optimizing the overall technological chain

Requirements for manufacturing companies resulting from the further development of information technology, can not be achieved only by focusing on the automation of the production process, but it is necessary to create and implement a comprehensive one (holistic) technological approach throughout the value chain – from product design through planning and manufacturing to after-service ,Fig.3.

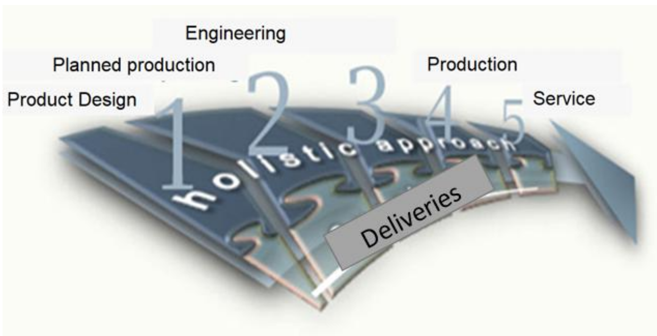

Fig.3 *Holistic Approach (Siemens)*

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This approach is related to the definition of the product idea, study of its maintenance and its use until it is out of use, with special attention being paid to integration and without a problem technical connection and data exchange with the network. This means intensity of the **socio-technical** interaction of all participants in the production and the resources. The focus is on a network of autonomous, situationally controlling, knowledge-based configuration, based on sensors and spatially distributed production resources like machines, robots, transport and storage systems, control systems and their planning, and others.

3. The pyramid of automation

The introduction of high technology and "smart" products is closely related to the pyramid of automation, the basis of which are the automated technical process control systems (SCADA), in the middle part are located the MES systems, and at the top of the pyramid - ERP systems. The pyramid represents the information flows from the work centers (machinery, equipment, jobs) to the top management of the organization. From the different industrial controllers and sensors these systems collect data, which come into the modules of the MES systems, which are located in the offices of the production units. After processing of the data, they become management information, which enters the ERP system, which functions in the organization's middle management units. The pyramid of automation consists of six base levels (0 to 5), which correspond to different levels of automation of the manufacturing in a company. Individual pyramid levels of automation can be determined as follows, Fig.4. :

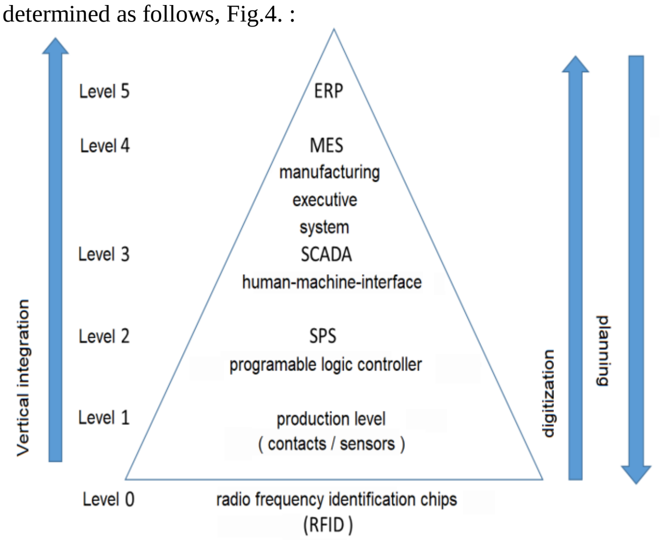

Fig. 4. *The pyramid of automation*

The boundaries of the classic pyramid of automation are mainly in the implementation of data transmission and processing, as advances in the development of Network Industrial Components in the Internet of Things and Services (IoTS), affects the amount of processed data. Growing volumes of data (Big Data) in the future can lead to business and corporate problems, because the higher the level is in the pyramid of automation, the more it reduces the transmission speed. One solution to this problem is data collection and application of "cloud services". The collected data can be stored quickly and safely in the cloud service, to be stored and revised through analysis and submitted to management and control level.
The development of IT support at all hierarchical levels leads to new trends., namely increasing information flows at all levels and thus the need for a new " Reference model of industrial information architecture", which should reflect the three dimensions of vertical and horizontal integration, as well as life-cycle integration of production equipment.

4. Information security

Risk management for information security is a component of high technology, which includes defining the exact context, analysis and continuous monitoring. The risk management strategy for information security is the decentralization of electronic information (modular approach), which ensures continuity of the processes, while ensuring information security. Any interested person (operator, supplier, customer) has access to limited information structured in modules.

5. Consequences of the implementation of high technology

New value creation chains and business technology models lead to the creation of new alliances and interconnections between enterprises and this has a huge impact on the organization of labor. Thanks to the rapidly evolving digital technology in the industry and especially in the business services sector new forms of work organization and employment are constantly emerging and skills are being updated. These transformations should be carefully monitored. People at all levels should be prepared to learn new skills, which in view of the enormous social challenge, gives even more ground to encouraging curriculum updating and lifelong learning. Studies or evaluations of the transformation process should help to identify correctly the necessary professional skills and the need for qualification.

6. Literature

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