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New approach to industrial engineering education with the help of interactive tools

Antonin Miller*, Marek Bures

Department of Industrial Engineering and Management, Mechanical Faculty, Univerzitni 22, Pilsen 30614, Czech Republic

Abstract

One of the universities responsibilities is to form a quality graduates who will be armed with the knowledge needed in industrial practice. In this context a constant improvement of teaching materials must be done in order to reflect the current needs of the industry. This paper presents a new approach for updating the content of the Industrial Engineering course as well as a new concept of teaching according to the principles of Constructivism theory. The main aim of the practical part of the course is to design layout of the industrial company with the help of computer modeling, for which we used an e-learning form.

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1. Introduction

After centuries of steam and plastics is the 21st century marked as a century of information technologies. At the current rate of information and communication technologies development, it is almost unthinkable for the company to maintain stable market position without them including various support software tools. This also applies to the field of industrial engineering. For the support of the majority of industrial engineering methods a highly advanced software products that help in meeting the challenges of industrial engineers are available today. Not only a summary of the software, but also the overall concept how to approach and work with data, are nowadays referred to as the concept of digital factory.

* Corresponding author. Tel.: +420-377-638432; fax: +420-377-638400.
E-mail address: amiller@rti.zcu.cz

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The comprehensive planning and operation approach of the digital factory has already become a central innovation issue in the automotive and aviation industry but also in other advanced and globalized sectors (Bracht, 2005).

The term is defined as follows:

Digital factory is the generic term for a comprehensive network of digital models, methods and tools – including simulation and 3D visualization – integrated by a continuous data management system.

Its aim is the holistic planning, evaluation and ongoing improvement of all the main structures, processes and resources of the real factory in conjunction with the product (VDI Richtlinien 4499, 2008).

The focus of the digital factory is early production planning and design of the factory closely coordinated with all corporate processes. The main aim of the digital factory is to accelerate and improve production planning and to overlap it intensively in the sense of simultaneous engineering with product development. Digital factory has the ambition to cover whole product lifecycle management (PLM). Figure 1 shows possible application areas for the digital factory right up to the end of the product life.

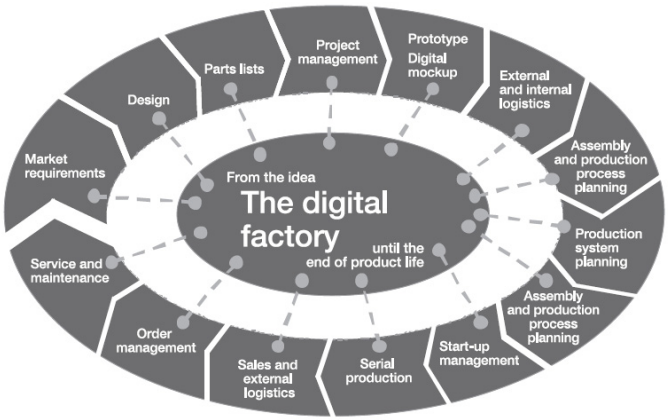

Fig. 1. Examples of application areas for the digital factory through PLM (VDI Richtlinien 4499, 2008)

From these current trends, it is clear that even universities must respond to new demands of practice, where a clear need for engineers who can work and develop in conditions of modern production technologies can be seen. In this context a constant improvement of teaching materials must be done in order to reflect the current needs of the industry. That's why we also decided to innovate the content and form of transferring knowledge to the students with regard to the requirements of practice. The main part of innovation was the practical part of the industrial engineering course.

2. Methodology

As we mentioned before one part of the innovation was the new approach to education of industrial engineering. Education on universities in Czech Republic is provided still in more traditional way. As described by Barbosa (Barbosa, 2012) the teaching methods are based on memorization and repetition, without students' realization of the true meaning of the information. The prevailing thought is that the teacher has the knowledge and on the other hand the student knows nothing. This education can be seen as an act of depositing information in student´s memory. In this way students get proper education and information though, but they do not stay in theirs head for a long time and are very rapidly displaced by other information.

More appropriate is the Constructivism approach or Constructivism theory. It is based on the idea that people construct their own knowledge through their personal experience. The effectiveness of Constructivism is that it