

## GUEST EDITORIAL

Continuous and rapid changes in the global economy emphasize knowledge as one of the most valuable resources. In these new conditions described as “knowledge-based society” knowledge became a basis for evaluation of individuals, as well as of entire organizations. The ability to create new knowledge and to manage it is commonly recognized as one of the most important qualities of a modern and innovative organization. Management and control of knowledge and skills, and more recently management of firms’ competencies, have turned out to be essential factors of industrial processes’ performance (Journal of Computers in Industry, 58, 2007). Production organizations are no longer considered only as production systems of products and services. They have to be also understood as production systems of knowledge, which requires new integrated decision supports systems, management systems and production systems regarding the cognitive dimension of knowledge, at every managerial level.

This special issue is dedicated to the problems of Knowledge-based management in production network environment and was prompted by the emergence of a series of research activities seeking to exploit new knowledge-based management development to add intelligence to production networks. In particular, researchers have sought models for development of production networks with associated information and decision rules, which can assist and guide the way they are designed, maintained and modified. The purpose of this special issue is to offer an opportunity to present the state of the art in international research and development work with special emphasis on the applications of optimization methods and automation, information and communication technologies in management of production networks and in the entire supply chain within an e-enterprise. The editorial will stress the scientific challenges and issues raised by the Intelligence Manufacturing Systems, Production Networks and Supply Chain paradigms for optimization and agile digital control of the entire production system. The entire life cycle of products and processes is covered, from the design, through manufacturing and maintenance, to distribution and service.

We can distinguish two approaches to knowledge-based management in production networks. The first one is based on the OR methods. In this approach the focal point is the quantitative aspect of the production process. The second one is taking advantage of the AI methods. In this case, knowledge representation and modeling are the main research points.

**OR-based approach.** Knop and Borkowski (Czestochowa University of Technology) proposed the paper: *The estimation of alternative control efficiency with the use of the Cohen’s Kappa coefficient*. In the paper examination of the Cohen’s Kappa method was conducted, taking into consideration the following: history, use, calculation, results’ interpretation, example, pros and cons of the method, research methodology. It was indicated that the Cohen Kappa coefficient, when skillfully used, may cause an increase in efficiency of the control activities performed by individual inspectors as well as by an adequate choice of people, designed to fulfill the key control operations.

Kulba, Nikolsky (Trapeznikov Institute of Control Sciences and Moscow State Institute of Electronics and Mathematics Russia) in the paper: *Metaontology deds: operational dynamic system on classes* present a model of a dynamic system for a wide class of industrial objects. The decision of information technology automation is connected to the functioning of management in the organization-technological system and consist in consecutive synthesis of a set of models of management objects, a set of decision making problems and a set of the decisions. The decision is based on using the dynamic objects’ model in a general form and a dynamic definition of the object in the states’ space using an ontological approach to analysing the modeling process. The proposed model was verified through a Higher Education application.

Kuznetsov and Zhilyakova (Trapeznikov Institute of Control Sciences, Russia) in the paper: *Nonsymmetric Resource Networks. The Study of Limit States* examine a network resource model represented by an oriented weighted graph, where total value of the resource is constant. Resources of vertices are reallocated with certain rules in discrete time. The analysis of the limit state of the network in a steady state is provided. The threshold value  $T$  is proven to exist. If total resources are less than the value of  $T$ , the process can be

interpreted as a regular Markovian chain. Authors propose the concept of potential attractors and formulate the criterion of attractiveness of vertices.

Wisniewski and Zaikin (West Pomeranian University of Technology in Szczecin and Warsaw School of Computer Science, Poland) in the paper: *A simulation approach to evaluating manufacturing system performance* examine a re-entrant job shop production. An optimization model is established to achieve an optimal buffer allocation plan and to select servicing discipline at each workstation ensuring that all jobs are finished in a given time interval with a minimum number of resources and without any buffer overflow. An algorithm based on simulated annealing approach is developed to solve the problem. A real industrial application is implemented for offset printing based on this model and algorithm. Experimental results show that this method is effective.

**AI-based approach.** Bakhtadze, Kulba, Yadikin, Lototsky, Maximov (Trapeznikov Institute of Control Sciences, Russia) in the paper: *Identification methods based on associative search procedure* provide the state-of-the-art of their earlier work related to modeling dynamic objects. Authors present a technique of a new associative search, which enables analyzing the model of dynamic objects at every stage. The proposed method is based on use of samples of data extracted from the history of the process at the learning stage. Analysis of models of individual behavior of process operators, stock analysts and traders, based on professional knowledge formalization, is presented. The results are verified through different industrial applications.

Małachowski and Zaikin (West Pomeranian University of Technology in Szczecin and Warsaw School of Computer Science, Poland) in the paper: *Multiple Criteria Decision Support Model for Competent Research Consortium Building* examine the problem of project consortium building and propose a decision-making method for selecting project members and their roles base on a multiple criteria hierarchical model. The study is based on current rules of participation in European Union research initiatives.

Różewski (West Pomeranian University of Technology in Szczecin, Poland) in the paper: *Concept of intangible production network system for competence development in open and distance learning* examines the problem of guarantying competences through a proposed curriculum and presents a model of an Intangible Production Network, adapted to the open and distance learning environment. The production network is formulated as a set of collaboration nodes with different types of knowledge and competence. The model includes market demands and is analyzed at an ontological level.

Vassilyev, Smirnova, Sukonnova and Shvarts (Trapeznikov Institute of Control Sciences, Lomonosov Moscow State University, Russia) examine the problem of elevating the intellectual level of an interactive tutoring system. Authors present a method of knowledge representation that provides intelligent control of the tutoring system. The proposed method is based on coupling the logical and the heuristic approach with incomplete information. A case study includes presentation of architecture of a concrete intelligent tutoring system “Volga”, which realizes automation of course task solving, actions planning and construction of the student’s model technique.

**What next?** In this area science fiction is way ahead of the research world. Although many academic and technical challenges remain, perhaps the greatest challenge in this area is demonstrating that knowledge based management of production networks is not simply gimmicks but that it has a valuable and useful place in a more intellectual and information-efficient society.

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