Special Issue Editorial

Hard and Soft Modeling Tools and Approaches to Data and Information Management in Real-Life Projects and Systems

Edward Szczerbicki, Guest Editor

This special issue follows the previous one titled Information- and Knowledge-Based Approaches to Improving Performance in Organizations, and it contains carefully selected and reviewed papers (each paper was reviewed by two independent reviewers) that expand significantly on those topics of APIEMS’04 (Asia Pacific Industrial Engineering and Management Systems Conference) held in Gold Coast, Australia, in December 2004, which may be of interest to information science and information systems communities. I chaired the Track and Special Sessions on “Information and Knowledge Management” during this conference. Generally, the papers presented in my sessions, and at the conference as a whole, dealt with various issues related to managing real-life systems and projects functioning in information reach environments. The common theme that was integrating a number of presentations at APIEMS’04 was the drive to develop and implement hard and soft modeling tools and approaches to data and information management in a variety of real-life systems. This special issue presents a selection of papers that concentrate on some recent developments in this general area of research.

Complexities of decision-making issues within project management can no longer be dealt with by traditional approaches to information management. This is especially true in the area of software project management, which usually involves a wide variety of often distributed and interdisciplinary expertise. The first paper of this issue authored by Orłowski and Kowalczuk, titled Project Management in Enterprises: IT Implementation Based on Fuzzy Models addresses this problem by developing a knowledge-based system for software project management (SPM). The authors develop formal approaches to supporting SPM by focusing first on a collection of separate procedures for assessment of project teams and processes and then by venturing into the development of an integrated architecture for ongoing assessment of both teams and processes. This architecture represents one of the most sophisticated and promising tools available for SP managers. The core of this tool is the fuzzy SPM model developed by
the authors that is able to continuously model, monitor, and control all relevant information management issues within the whole life cycle of a given project.

Data analysis, storage, transformation, and mining are becoming more and more complex issues within the general area of modern information and knowledge management. We often try to deal with these complexities by information and data granulation. Information or data granules are defined as collections of entities that are grouped together because of their similarity, functional closeness, or any other criterion helpful in understanding and solving a problem at hand.

Bargiela, Kosonen, Pursula, and Peytchev are the authors of the next paper in this selection titled *Granular Analysis of Traffic Data for Turning Movements Estimation*, in which they develop principles and an algorithm of granular analysis of data with illustrative application to a very specific area of modeling of urban traffic. Granular analysis of data offers a powerful tool for creation of information abstractions in the context of data that cannot be easily characterized by statistical relationships. The authors show in their paper that the essential characteristics of data are preserved in the process of information granulation and that quantification of these characteristic features does not depend significantly on the level of abstraction offering a very powerful tool in the hands of information systems analysts developing large scale system models.

In the next paper titled *Selfish Users and Fair Sharing of Bandwidth in Distributed Medium Access*, the authors, Guha and Rakshit, offer an insight into application of information games in the problem of fair access and sharing of bandwidth for distributed computer network users. This is a common problem for information system analysts, and there are usually two main issues in achieving fairness: lack of information and lack of coordination. The authors propose a novel modeling and analysis approach to this problem based on game theoretic concepts. They develop the “Access Game” model together with a simple technique to approximate an incomplete information game as a complete information game and illustrate their approach with numerical examples. The authors finish their paper with an interesting discussion of directions for further research in this area.

Advanced, modern information systems are in transition into knowledge management systems. One of the most important issues in this transition process is transformation of information into knowledge. This problem is addressed in the next paper *Using Set of Experience in the Process of Transforming Information into Knowledge* authored by Sanin and Szczerbicki. The authors introduce first a knowledge supply chain system (KSCS), which is a platform suitable to administer formal decision events in a knowledge-explicit way. Then they focus on a set of experience knowledge structure, which can effectively process transformation of information into knowledge. The main purpose of this paper is to show how a set of experience knowledge structure is implemented into the KSCS. If properly implemented and stored in the KSCS, a set of experience can explore new ways to put explicit knowledge in the hands of employees, customers, suppliers, and partners.

Reliable sharing of information across different information systems is known to be a difficult problem. The last paper of the collection, authored by Aisbett, Zhou, Gibbon, and Dampney, and titled *Maintaining Meaning of Information when it is Shared amongst Information Systems*, deals with this problem. The authors propose a feasible and reliable approach to check whether the data structures of a target information system conform to those of the master system. The approach is based on a mathematical categorical theory. Advantages of the presented model are the simplicity of the repre-
sentational language, which uses only un-adorned objects and mappings, and the ability to define compliance in terms of mathematical constructs. Some aspects of the proposed platform independent Java implementation of the system were also described.

Over the last decade the development and application of intelligent techniques and approaches in real-life organizations and related systems have emerged as the primary determinants of success and survival in a global economy. Intelligence in this context is generally understood as the ability of a given system to act appropriately in an uncertain and changing environment. Industries and related systems have to perform today in an environment characterized mainly by uncertainties, rapid change, and imprecision. These industries need new approaches, tools, and methodologies that could move us towards developing effective systems to support problem solving and decision making for ill-structured situations in information rich environments. The papers included in this issue illustrate an effort toward developing such tools and approaches. They also define very clearly future research trends and directions in this area which are focused on Web-based, integrated, platform independent, hybrid soft and hard approached promising to deliver answers to challenges and needs of information society of the new millennium.

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