

Selected Topics in Management and Modeling of Complex Systems: Editorial Introduction to Issue 27 of CSIMQ

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Information systems (IS) can be considered as complex systems due to the fact that their development and management often requires the application and combination of theories and practices from various fields, such as computer science, management science, organizational sciences, systems engineering, information engineering, information management, social science, and economics sciences. In this context, modeling of business processes, organizational structures, business models including products and services, decision criteria, business rules, or other perspectives relevant for information systems forms an important contribution to managing this complexity. As a field of study, management and modeling of complexity gains importance, which also is reflected in scientific workshops dedicated to this topic, as for example the 5th workshop on Managed Complexity that was co-located with the 13th conference on the Practice of Enterprise Modelling (PoEM 2020) in Riga, Latvia, in November 2020.

The 27th issue of CSIMQ includes four articles that address research topics from the field of managing and modeling complexity in information systems. When selecting the articles for this issue, the intention was to combine different perspectives of modeling that all are important for understanding and managing IS complexity: modeling of workflows, aspects of decision making, organizational structures or microservices as part of application architectures.

The first article is written by Thomas M. Prinz and Wolfram Amme. Both come from the Friedrich Schiller University Jena in Germany. Their article entitled “Control-Flow-Based Methods to Support the Development of Sound Workflows”, which, starting from a review of the basics of workflow verification, defines soundness of (BPMN) workflow models through the absence of the causes of deadlocks and abundances. Furthermore, the paper introduces two new compiler-based techniques to find causes of deadlocks and abundances. The research results indicate that the techniques have a cubic asymptotic runtime complexity, although the approaches provide accurate diagnostic information, which is an advantage compared to existing approaches. It is worth to mention that the algorithms can find faults without delays during construction. The efficiency and quality of those techniques is evaluated using a benchmark of over thousand real-world examples. Additionally, there is a comparison with two leading state-of-the-art approaches.

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The second article is provided by Arnis Stasko and Ilze Birzniece from the Riga Technical University in Latvia. The third author Girts Kebers comes from the company Lursoft. The article on “Development of Bankruptcy Prediction Model for Latvian Companies” addresses the financial performance prediction for Latvian companies with a focus on estimating the risk of bankruptcy and providing timely warnings, which are of importance for various stakeholder groups (company management, investors, employees, etc.). The authors experiment with the well-known Altman Z-score approach and a machine learning decision tree algorithm to predict bankruptcy of Latvian companies. As both approaches show disadvantages, the work proposes an extended company performance prediction model that also considers additional factors, such as changes in regulation and other environmental factors. In their conclusions the authors mention: “The research is currently limited to Latvian companies but, because the proposed model does not include any country-level specifics, as a theoretical framework it may serve for wider use”.

Ilia Bider from Stockholm University in Sweden and Erik Perjons from also the University of Tartu in Estonia are the authors of the third article: “Identity Management in an Institution of Higher Education: A Case Study Using Structural Coupling and Fractal Enterprise Model”. The article investigates a less exploited way of organizational identity and identity management: identity as a set of structural couplings that the organization has, and identity management as an activity aimed at maintaining these couplings. The study identifies principles to be used when making a decision that can affect one or more structural couplings. For illustration purposes, the paper uses an institution of higher education to identify a set of structural couplings. Furthermore, the paper shows how Fractal Enterprise Model can serve as a useful tool for identifying structural couplings.

The Issue 27 of CSIMQ closes the article from Daniel Staegemann, Matthias Volk, Aamir Shakir, Erik Lautenschläger, and Klaus Turowski. Except Erik Lautenschläger all authors come from the Otto-von-Guericke-Universität Magdeburg in Germany. Erik is from the Fernuniversität Hagen which is the Germany’s State Distance-Learning University. The title of their paper is: “Examining the Interplay Between Big Data and Microservices – A Bibliometric Review”. The article focuses on the systematic and in-depth analysis of the state of research in the area of microservices use for building big data applications. The bibliometric review performed for this purpose is described with much detail for all steps taken. The result of the analysis of existing scientific work is a structured summary of future research directions, i.e., the work ponders over the new avenues of research regarding interplay of Big Data and microservices.

For this thematic issue we owe thanks to the members of CSIMQ’s Editorial Review Board and the additional reviewers for providing valuable feedback for the submitted articles. Special thanks go to the Managing Editor of the CSIMQ – Prof. Marite Kirikova – for her great support in realizing this thematic issue, as well as to the publicizing team of the CSIMQ journal for their professional help and efficiency. Finally, we are grateful to the authors for submitting the articles reporting their scientifically innovate and passionate work.

Hopefully, the readers will find this article and the other three articles interesting, and they will provide new insights and promote new solutions. We hope these articles will stimulate the scientific discussion and encourage researchers to produce and present new scientific contributions.