

Selected Topics in Digital Business Systems Research: Editorial Introduction to Issue 30 of CSIMQ

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The digitalization trend has permeated all aspects of life and is a key to the competitiveness of enterprises, including facing economic, social and environmental challenges. The concept “Digital Business System” refers to two aspects. First, it means any traditional business activity that uses digital technology. Secondly, it draws attention to the whole enterprise system, it is to a set of systems operating at all enterprise levels – business, information processing and technological [1]. As a result of this digitalization trend, enterprises increasingly rely on artificial intelligence, cyber-physical systems, technological devices, multimedia, virtual counterparts of physical entities, to name a few, and apply digital technology to reinvent business models [2].

The 30th issue of CSIMQ includes four articles that present research results from the field of digital business systems. The analysis, design and management of ecosystems, systems and subsystems are at the centre of all articles. Understanding and developing the complex digital systems or their components is supported by modeling, and this is the key to any business decision making [3]. Modeling is about the use of models to conceptualize and create business and technology level systems. This is an important problem to deal with and all the articles in this issue are in some way also concerned with this aspect.

The first article “Modeling Digital Business Ecosystems: A Systematic Literature Review” authored by Chen Hsi Tsai, Jelena Zdravkovic, and Janis Stirna focuses on the investigation of conceptual modeling for the digital business ecosystems development life cycle. It adds to the analysis of means for understanding complex systems which has become a nowadays reality. The review covers a total of 94 studies after a systematic selection process. The article provides answers about the conceptual modeling approaches used for the analysis, design, and management of digital business ecosystems. These results are complemented by presenting the identified various points of view and different perspectives to enable a holistic understanding of these complex systems. The management aspect is covered by investigating the support of modeling methods and tools for runtime management of digital business ecosystems.

“Behavior-Centered Digital-Twin Design for Dynamic Cyber-Physical System Development” co-authored by Christian Stary, Matthes Elstermann, Albert Fleischmann, and Werner Schmidt is

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the second article in this issue. It proposes a methodological addition to the development of digital twins. More specifically, this article investigates the methodological and technological aspects of developing digital models of cyber-physical systems which are considered to be constituents of target ecosystems. This approach contributes to the understanding of digital representation of cyber-physical systems by stakeholders, enables variability of physical and digital parts according to operational conditions, it also allows adjustment of organizational and technological dimensions. The case study from traffic management demonstrates the feasibility and practical utility of the approach.

The third article by Linda Eglite and Ilze Birzniece as its title “Retail Sales Forecasting Using Deep Learning: Systematic Literature Review” suggests, is the second review in this issue. It focuses on the analysis of deep learning methods for retail sales forecasting. For the evaluation authors compare deep learning based models with non-neural network machine learning and linear models. The deep learning network architectures most commonly used for sales prediction are identified in this article. The review results are complemented by presenting the summary of evaluation metrics used to compare the prediction models.

The fourth article “Decision Making Control Algorithm for Cogeneration Plants in Operating with the Heat Accumulator Deep Analysis Model” by Varis Žentiņš, Dmitrijs Rusovs, Aleksandrs Soročins, and Vera Kulakova proposes methodology for calculating heat loss for a heat accumulator depending on the operating mode based on correction coefficients. The authors develop a method for optimizing real processes based on real data, where there is a risk of financial loss using the deep analysis method. The developed methodology allows to calculate heat loss in various heat storage operating modes. The results of the study show that by automating the model of in-depth analysis of heat accumulation using input data such as weather, heat forecasts, and cogeneration operating mode forecasts, accurate and economically justified decision-making for various operating modes is possible.

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