

## Preface

The Business Informatics Research (BIR) conference series focuses on the fields of business informatics and information systems. It targets the research that bridges business application and information system engineering in order to foster communication between scientific and practical applications. The 17th BIR conference was held in Stockholm during September 24–26, 2018, at the Department of Computer and Systems Sciences, Stockholm University. The theme of the conference was “Business Resilience – Organizational and Information System Resilience in Congruence.” This volume contains publications presented during the conference as short papers as well as pre-conference events such as workshops and doctoral consortium.

This BIR-WS 2018 volume contains the proceedings of the following events of BIR 2018:

- Short papers of BIR 2018
- The 10th Workshop on Information Logistics in the Age of Digitization – ILOG 2018.
- The International Workshop on Resilient Enterprise Architecture – REA 2018
- Workshop Security Analytics – a Business Informatics Perspective
- 3rd Workshop on Managed Complexity – ManComp 2018
- The 5th International Workshop on Intelligent Educational Systems, Technology-Enhanced Learning and Technology Transfer Models – INTEL-EDU 2018
- Doctoral Consortium of BIR 2018.

Each of the BIR events adhered to the BIR 2018 submission and acceptance guidelines and this volume presents 43 peer-reviewed contributions on significant and emerging topics of business informatics.

As chairs of BIR 2018 we would like to express our gratitude to all workshop organizers and to all corresponding scientific committees of the workshops for their invaluable contribution.

September 2018

Jelena Zdravkovic  
Jānis Grabis  
Selmin Nurcan  
Janis Stirna

# **BIR 2018 Short Papers**

## **Preface**

Business Informatics is an integrative academic discipline combining Information and Communication Technology (ICT), informatics and management. It is about empowering enterprises to, by utilizing advantages of existing ICT solutions, create and introduce new solutions corresponding to ever-changing business needs and conditions.

This year the BIR conference attracted 59 submissions from 16 countries. They were rigorously reviewed by the Program Committee. As the result, 4 papers have been selected for publication in the short format and for the presentation in a dedicated session on the main conference.

The accepted papers address highly important and emerging aspects of the business informatics research addressing analytics in requirements engineering, similarity measuring for process model matching, workers task modeling and smart-self management and context-aware management.

We would like to thank everyone who contributed to the BIR 2018 conference. We thank the authors for contributing and presenting their research, we appreciate invaluable contribution of the members of the Program Committee and external reviewers and we thank all members of the local organization team from Stockholm University for ensuring smooth processing of the conference. We acknowledge the CEUR-WS.org development team for enabling publishing of such short, but promising and innovative contributions. Last but not the least we thank the Steering Committee for their support and we hope that BIR 2018 was a valuable addition to further development of the BIR conference series.

September 2018

Jelena Zdravkovic and Jānis Grabis  
Program co-chairs of BIR 2018

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# **The 10th Workshop on Information Logistics in the Age of Digitization – ILOG 2018**

## **Preface**

The 10th Workshop on Information Logistics in the Age of Digitization (ILOG 2018) continued a series of events which focuses on approaches, methods, technologies and solutions for reducing information overflow and for improving information flow in organizations. Knowledge-intensive industry and service sectors, public organizations and governmental bodies are dependent on accurate and timely information supply for efficient and high quality processes and services. Intelligent information supply has become an important issue that is characterized by just-in-time, demand-oriented and context-sensitive information. A specific focus of this ILOG edition was on digitization. Digitization is a topic frequently discussed in the public both from a technological and societal perspective. The term digitization as such describes the massive use of latest developments in ICT, such as Internet-of-Things, mobile communication, sensors, machine learning, self-organizing systems and big data for a fusion of real-world objects and processes, and their virtual representation. This is supposed to lead to new products and services, new business models and more efficient operations in enterprises and organizations.

The digitization of businesses poses new requirements to optimized information supply and emphasizes the importance of information logistics solutions. In this context, ILOG invited papers addressing these requirements with their potential solutions and also encouraged submissions addressing the use of semantic technologies, like ontologies, semantic nets, semantic web standards and other knowledge technologies. Such technologies and related methods have proven to be an important element of information logistics and knowledge supply solutions. Many information logistics applications wouldn't be feasible without moving from data processing to also interpreting the meaning of this data.

Based on at least three reviews per submission the international Program Committee selected four high-quality papers for inclusion in the workshop and this volume. The authors of these papers include both researchers and practitioners from different disciplines. We dedicate special thanks to the members of the international Program Committee for promoting the workshop, their support in attracting high-quality submissions, and for providing excellent reviews of the submissions. Without their committed work a high-quality workshop like ILOG 2018 would not have been possible. Our thanks also include the external reviewers supporting the paper selection process and the authors of submissions and presenters at the workshop.

September, 2018

Birger Lantow  
Kurt Sandkuhl  
Ulf Seigerroth

## **ILOG 2018 Organization**

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# **International Workshop on Resilient Enterprise Architecture – REA 2018**

## **Preface**

This REA workshop on Resilient Enterprise Architecture was held first-time at the University of Stockholm, Sweden on September 24, 2018 in conjunction with BIR 2018, the 17<sup>th</sup> International Conference on Perspectives in Business Informatics Research. The REA workshop focuses on the synergy of Enterprise Architecture (EA) and Resiliency in the context of current digital transformation endeavors to support digital services and associated digital products.

Enterprise Architecture (EA) is since years a well-motivated discipline of enterprise and IT governance. Enterprise Architecture has been developed since more than one decade as a discipline with a scientific background and useful decision supporting functions and models for forward-thinking enterprises and organizations. Enterprise Architecture aims to model, align and understand important interactions between business and IT to set a prerequisite for a well-adjusted and strategically oriented decision-making framework for both digital business and digital technologies.

Resiliency is the capability of enterprises and their information systems to cope with fast and real-time changing events. Resiliency is the ability of an IT system to provide, maintain and improve disturbed services even when changes occur. Resiliency is an emergent capability because it is often achieved by combining a multitude of different perspectives on different abstraction levels such as organizational resiliency, information system resiliency, cyber resiliency, network and technology resiliency, as well as organizational resiliency. Resiliency refers to an entity's ability to continuously deliver the intended outcome despite adverse cyber events. This includes response and recovery and developing resilient-by-design systems. Resiliency requires constructive and organizational approaches with a strong focus on a managed environment for enterprise architectures of information systems and services.

Digital transformation and digital disruption create many events that may impact enterprises and organizations. Resilient enterprise architecture management plays an important role in fostering strategies and capabilities for resiliency by providing methods and tools for designing enterprises architectures in a resilient way. It may address enterprises but also selected parts of enterprise architecture such as services and processes. Resilient Services are services that provide additional meta-services in addition to their core functionality to cope with disruptive events. E.g. airlines reschedule passengers of delayed flights. Resilient Processes provide event handlers to cope with external events and are thus capable to lead back the control flow on the desired track even in the case of adverse events. Their decision points use data from a multitude of internal and external sources allowing them to detect and react to changes in the environment.

The goal of the REA 2018 workshop is to encourage a broad understanding of architecting and modeling resiliency for information systems, including new ideas, challenges, and current topics of research in progress. The Workshop on Resilient Enterprise Architecture – REA brings together academics, researchers, and practitioners to address fundamental and practical aspects of resiliency for digital enterprise architecture in the context of digital transformation.

The Program Committee has selected from seven submissions the most accurate five papers to be presented and discussed at the workshop. Additionally, the workshop provides an introduction chapter to the REA workshop. We would like to cordially thank the Chairs of the BIR 2018 conference and all members of the Program Committee of the REA workshop.

The REA workshop provides a focused scientific discussion on following themes of research and practice:

- Architectures for Resiliency
- Adaptive Enterprise Architectures
- Resiliency Analytics and Decision Support
- Value-oriented Modeling for Resiliency
- Resilient Digital Services and Products
- Capabilities for Resiliency
- Resilient Information Systems
- Technologies for Resiliency
- Architecture Patterns for Digitization
- Resiliency in the Internet of Things
- Resilient Microservices
- Design and Composition of Resilient Services
- Architectural Metamodels and Ontologies for Resiliency
- Analytics for Resiliency
- Resiliency and Digital Strategy
- Governance and Management of Resilient Architectures and Systems
- Self-optimizing and Knowledge-based Resilient Systems
- Resilient Platforms and Ecosystems
- Resilient Business and Technological Processes
- Cyber Resiliency and Security.

We would like to thank all the people who submitted papers to REA 2018 for having shared their work with us, as well as the members of the REA 2018 Program Committee, who made a remarkable effort in reviewing the submissions. We also thank the organizers of BIR 2018 for their help with the organization of the event.

September, 2018

Alfred Zimmermann  
Rainer Schmidt



## **REA 2018 Organization**

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# **Workshop Security Analytics – a Business Informatics Perspective**

## **Preface**

During the last years, Cyber Security Analytics has gained increasing awareness both in industry and academia. This is due to a number of factors, including a significant increase in the number and severity of attacks, increasing focus from media, and increasing amounts of legislation such as the European General Data Protection Regulation (GDPR). This is again related to the fact that all parts of society are becoming more and more dependent on reliable and fast Internet connections, not only between computers but also among other devices including Internet of Things devices and components in Industry 4.0. This dependency becomes very visible when the infrastructure is unavailable e.g. due to cyberattacks, and there is no doubt that some of the recent and severe attacks on key sectors such as finance and energy have been an eye opener for many. The increasing awareness has taken cyber security from being only a matter of IT operations into the boardrooms of companies, and made it a high priority for governments all over the world. §

While much research focuses on either technical, business or compliance perspectives, there is a need to think of these disciplines together and develop solutions across traditional disciplines. This workshop discusses Security Analytics from different perspectives: From a study of the definitions and concepts of Security Analytics through security requirements to applications in Internet of Things and Industry 4.0.

It is our hope that the workshop will contribute to a better understanding of Security Analytics and its importance in a world where increasing Internet connectivity of people and machines provides many new opportunities, but also requires us to think across traditional disciplines to address new and increasing cyber threats.

The Program Committee selected four high-quality papers for the presentation on the workshop, which are included in this proceedings volume. We would like to thank all authors for their contributions. We owe special thanks to the Workshop Chairs of BIR 2018 for supporting the Security Analytics workshop, as well as for providing us facilities to publicize it. We also thank the Program Committee for providing valuable and timely reviews for the submitted papers.

September, 2018

Ilze Birzniece  
Jens Myrup Pedersen

# **Workshop Security Analytics – a Business Informatics Perspective**

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# **3<sup>rd</sup> Workshop on Managed Complexity – ManComp 2018**

## **Preface**

Managing complexity has a long tradition for algorithms and general problems. However, it is an important issue also in Business Informatics domain. Here the complexity of different systems and systems of systems has to be managed. While complexity usually associates with large or very large scale systems, still managing complexity is important even for systems with small sizes operating in complex environment. Nowadays informatics requires handling complexity at different levels and configurations of social, physical, enterprise, software, and hardware systems. The workshop focuses on approach-es and methods for managing complexity in the domain of applied informatics that may concern interplay of systems and ecosystems of various sizes and substances. Its purpose is to share and transfer knowledge on complexity identification, representation, controlling, and reduction as well as to exploit possible synergies in development of innovative complexity handling strategies, approaches, and methods.

The ultimate goal of the workshop is bringing together researchers and practitioners to discuss theoretical approaches or real-life case studies featuring success and/or failure stories in managing complexity.

Based on these discussions, we expect to deepen the understanding of strategies, approaches, and methods in managing complexity in enterprise, software and hardware engineering. A cross-pollination of experiences in both domains is assumed

September, 2018

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## **ManComp 2018 Organization**

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# **The 5<sup>th</sup> International Workshop on Intelligent Educational Systems, Technology-Enhanced Learning and Technology Transfer Models – INTEL-EDU 2018**

## **Preface**

The main aim of the INTEL-EDU series of the workshops is to provide an international platform for the presentation of research on intelligent educational systems theory, development of advanced tools and technologies, and their transfer to innovative applications.

The 5th workshop (WSs) INTEL-EDU 2018 continues the series of WSs held in:

- 1st WS (Riga, 2009) in conjunction with 13th East-European Conference on Advances in Databases and Information Systems (ADBIS 2009)
- 2nd WS ( Riga, 2011) in conjunction with 10th International Conference on Perspectives in Business Informatics Research (BIR 2011)
- 3rd WS (Riga, 2012) in conjunction with Riga Technical University 53rd International Conference Dedicated to the 150th Anniversary.
- 4rd WS (Prague, 2016) in conjunction with 15th International Conference on Perspectives in Business Informatics Research, BIR 2016

We invite researchers and practitioners from both industry and academia to submit original results of their completed or ongoing research and projects.

September, 2018

Janis Grundspenkis  
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# **Doctoral Consortium of BIR 2018**

## **Preface**

The BIR 2018 - Doctoral Consortium was held on 24 September 2018 at Department of Computer and Systems Sciences (DSV), Stockholm University.

The Doctoral Consortium has attracted seven papers from which, after the review process, six papers were accepted. Each paper submitted to Doctoral Consortium was reviewed by two faculty members that are senior researchers in business informatics area. After the acceptance, the authors have been invited to revise their papers based on the feedback received from the reviewers of the Doctoral Consortium and resubmit it for presentation at the Doctoral Consortium of BIR 2018 and publication in the CEUR-WS proceedings.

The accepted papers for presentation at the Doctoral Consortium have focused their research in different business informatics areas like business-IT alignment, enterprise modeling, blockchain technology, business process management, knowledge management, and agile software development. During the presentations of the accepted papers at the Doctoral Consortium the participants have had usefully discussions with the faculty members related to their research work. Moreover, the participants in the Doctoral Consortium have communicated and exchanged knowledge between them and also identified different research issues related to their research interest.

September 2018

Lazar Rusu  
Doina Danaita



## **Doctoral Consortium Organization**

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Doina Danaiaata, West University of Timisoara, Romania

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Marite Kirikova, Riga Technical University, Latvia  
Anne Persson, University of Skövde, Sweden  
Gianluigi Viscusi, École Polytechnique Fédérale de Lausanne, Switzerland

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