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Preface

A continuous challenge in modern information systems engineering (ISE) is to provide significant aid toward the improvement of the design, implementation, and fielding of advanced information systems. However, a timely daunting task is to employ ISE approaches to real-world, large-scale, adaptable systems that can have a potential impact in various diverse aspects of people's life. All of these topics and potential roadmaps toward innovation that might lead to development and welfare were discussed in the workshops that took place under the framework of the 26$^{\text{th}}$ CAiSE held in Thessaloniki, Greece, June 16–20.

It is a long-standing tradition of the International Conference on Advanced Information Systems Engineering to be accompanied by an ensemble of high-quality workshops. Their aim is to serve as a discussion forum between stakeholders in this domain, to exchange innovative ideas on new approaches, techniques or tools, covering a wide range of specific thematic areas. This year, CAiSE had two associated working conferences (BPMDS and EMMSAD) and seven workshops. Several workshop proposals were received initially and those accepted were chosen after a careful consideration by the corresponding chairs, based on maturity and compliance with our usual quality and consistency criteria.

This volume contains the proceedings of the following five 2014 workshops (in alphabetical order):

- First International Workshop on Advanced Probability and Statistics in Information Systems (APSIS)
- First International Workshop on Advances in Services Design based on the Notion of Capability (ASDENCA)
- Second International Workshop on Cognitive Aspects of Information Systems Engineering (COGNISE)
- Third New Generation Enterprise and Business Innovation Systems (NGEBIS)
- 4$^{\text{th}}$ International Workshop on Information Systems Security Engineering (WISSE)

The CAiSE 2014 workshop 10$^{\text{th}}$ EOMAS decided to publish their proceedings in a separate LNBIP volume. The 7$^{\text{th}}$ iStar workshop decided to publish the proceedings in the *CEUR Workshop Proceedings* series. Each workshop complied with the CAiSE 2014 submission and acceptance rules. The paper acceptance ratio across all workshops was approximately 40%.

As workshop chairs of the 26$^{\text{th}}$ CAiSE 2014 we would like to express our gratitude to all organizers and to all corresponding scientific committees for their invaluable contribution. We hope that this volume will offer a comprehensive and

timely view on the evolution of advanced information systems engineering and that it will stimulate potential authors toward participation in future CAiSE events.

June 2014

Lazaros Iliadis
Mike Papazoglou
Klaus Pohl

First International Workshop on Advanced Probability and Statistics in Information Systems (APSIS 2014)

Preface

The rapid and continuous evolution of technology and especially the evolution of the Internet are changing the problems related to the development, the application, and the impact of information systems. Modern information systems are associated with the collection, management, processing, analysis, and production of massive amounts and different types of data. Although research in computer science has produced highly advanced methodologies for analyzing them, new complex research challenges appear.

Probability theory and statistics are considered well-defined and mature disciplines that have evolved through centuries and have become powerful based on the foundations of mathematics. Probabilities and statistics have offered innumerable theories, techniques, and tools to all aspects of data analysis with applications to all areas of information systems.

The aim of the First International Workshop on Advanced Probability and Statistics in Information Systems (APSIS), which was organized in conjunction with the 26th International Conference on Advanced Information Systems Engineering (CAISE 2014), was to bring together scientists from different branches of information systems who use or develop statistical or probabilistic methods in their research.

For this first year of the workshop, we received eight high-quality submissions from researchers in different fields of information systems, which were each peer-reviewed by at least two reviewers. Out of these submissions, three contributions were selected as full papers, while one short paper with promising research was also accepted.

The accepted papers are indicative of the wide applicability of probabilities and statistics in information systems research. Specifically, Yazdi et al. apply time series in order to describe and analyze the evolution of software systems at the abstraction level of models. Liparas and Pantraki propose a combination of the statistical Mahalanobis–Taguchi strategy with a Genetic Algorithm for Intrusion Detection Systems. Shoaran and Thomo use probabilistic methods for privacy mechanisms in social networks. Finally, Mavridis uses probabilistic notions to measure the quality evolution of open source software.

June 2014

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Keynote by Magne Jorgensen*

Abstract. The keynote addresses a selection of questionable statistical practices commonly observed in empirical software engineering research. This includes a discussion of the topics: "p-values considered harmful","inflated effect sizes", "publication bias in regression analysis","how much can we trust the outcome of statistical tests in software engineering studies?", "regression-towards-the-mean in non-random samples", "the fixed variables assumption is essential" and "Simpson's paradox". The topics will be illustrated with observations on how questionable statistical practices have produced misleading and incorrect results in software engineering research. We should never use a statistical method without understanding it thoroughly and never violate a statistical assumption without understanding the likely consequences of doing so. Several changes in statistical practice in software engineering research are suggested.

* Subject: Things you were never told, did not understand, forgot, or chose to ignore in statistics.

First International Workshop on Advances in Services Design Based on the Notion of Capability (ASDENCA 2014)

Preface

Lately the notion of *capability* is gaining much presence within the field of information systems engineering, due to a number of factors: the notion directs business investment focus, it can be used as a baseline for business planning, and it leads directly to service specification and design. Historically, it has been examined in economics, sociology, and management science. More recently, it has been considered in the context of business-IT alignment, in the specification and design of services using business planning as the baseline, in enterprise architecture, and in service-oriented architecture.

Capability is commonly seen as an *ability* or *capacity* for a company to deliver value, either to customers or shareholders, right beneath the business strategy. It consists of three major components: business processes, people, and physical assets. In recent academic proposals, such as of the Open Group Standard, capability is seen as originating from competence-based management and military frameworks, offering a complement to traditional enterprise modelling approaches by representing organizational knowledge from a result-based perspective. Thus it is an abstraction away from the specifics of how (process), who (agent), and why (goals), i.e., with a focus on results and benefits. At the same capability should allow fairly straightforward integrations with the aforementioned established bodies of knowledge and practices, such as goals (through "goal fulfillment"), processes (through "modelling"), and services (through "servicing").

The latter relation, specific to service-oriented engineering, has been described in service-oriented architecture, i.e., capability is seen as existing business functionality that enables a well-defined need, implemented through a service accessible through an interface. The business drive approach to service identification provides a solution for typical challenges of alignment between business and IT in this engineering context. Service design based on business capabilities is seen as an alternative to process-based service design, especially useful in cases of varying business contexts, where different capabilities address different contexts.

Traditionally, methods, approaches, theories, and applications of business–IT alignment have been vividly discussed by practitioners and researchers in IT. The idea for this first edition of the ASDENCA workshop came from the academic and industrial community gathered in the recently launched EU/FP7 project – CaaS.

Furthermore, the special theme of the 26th edition of CAiSE was "Information Systems Engineering in Times of Crisis." Capability orientation in IS design

may play an important role in planning and reacting to crises of different kinds perceived as different contexts in which businesses may be found, and requiring efficient shifts to the services capable of sustaining these contexts.

ASDENCA 2014 attracted 21 submissions out of which the Program Committee selected nine high-quality papers for presentation at the workshop, which are included in this proceedings volume. The results of submitted proposals clearly demonstrate an increasing interest in the topic, and more specifically in service engineering emphasizing the use of capability notion. Divided into three sessions, the program of the workshop reflects different topics of capability-oriented service design, including modeling of capabilities, the practices of capability-based approaches, as well as variability and context modeling.

We owe special thanks to the Workshop Chairs of CAiSE 2014 for supporting the ASDENCA workshop, as well as for providing us with facilities to publicize it. We also thank the Program Committee for providing valuable and timely reviews for the submitted papers.

June 2014

Jelena Zdravkovic
Oscar Pastor
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Keynote by Janis Stirna, Pericle Loucopoulos, Oscar Pastor and Jelena Zdravkovic subject: "Designing Business Capabilities: Challenges and Outlooks".

Second International Workshop on Cognitive Aspects of Information Systems Engineering (COGNISE 2014)

Preface

Cognitive aspects of information systems engineering is an area that is gaining interest and importance in industry and research. In recent years, human aspects and specifically cognitive aspects in software engineering and information systems engineering have received increasing attention in the literature and conferences, acknowledging that these aspects are as important as the technical ones, which have traditionally been in the center of attention. This workshop was planned to be a stage for new research and vivid discussions involving both academics and practitioners.

The goal of this workshop is to provide a better understanding and more appropriate support of the cognitive processes and challenges practitioners experience when performing information systems development activities. By understanding the challenges and needs educational programs as well as development supporting tools and notations may be enhanced for a better fit to our natural cognition, leading to better performance of engineers and higher systems quality. The workshop aimed to bring together researchers from different communities such as requirements engineering, software architecture, and design and programming, who share an interest in cognitive aspects, for identifying the cognitive challenges in the diverse development-related activities.

The second edition of this workshop included four full research papers and three short position papers. The papers presented at the workshop provide a mix of novel research ideas, some presenting completed research and others research in progress or research plans.

The full research papers included the following papers. "Low-Cost Eye-Trackers: Useful for Information Systems Research?" by Stefan Zugal and Jakob Pinggera explores whether low-cost eye-trackers are of use for investigating cognitive aspects of information systems research and, specifically, examines the accuracy of the low-cost eye-tracker Gazepoint GP3 in an empirical study. Their results show that Gazepoint GP3 is well suited for respective research, given that experimental material acknowledges the limits of the eye-tracker. "Supporting BPMN Model Creation with Routing Patterns" by Idan Wolf and Pnina Soffer proposes routing patterns combined with a decision guidance tool to support BPMN model creation, in order to overcome cognitive difficulties that may be encountered when using BPMN, due to the large number of constructs and the lack of ontological clarity of this language. The proposed set of patterns builds on an existing set of routing behaviors and operationalizes these behaviors by providing their BPMN representations. Testing the impact of this support in a study showed a significantly positive effect on the quality of the produced

models, but longer modeling durations as compared with unsupported modeling. "Coupling Elements of a Framework for Cognitive Matchmaking with Enterprise Models" by Sietse Overbeek addresses the issue of the excessive cognitive load actors working in knowledge-intensive organizations need to cope with and its negative influence on the quality of knowledge-intensive task fulfillment. The paper discusses how elements from a cognitive matchmaking framework can be coupled with an example enterprise model to partly provide a solution for reducing cognitive load. This exercise enables one to achieve a better understanding of the cognitive fit of actor types and the knowledge-intensive task types they have to fulfill. "Investigating Differences Between Graphical and Textual Declarative Process Models" by Cornelia Haisjackl and Stefan Zugal reports on an investigation focusing on the question of whether a notation that does not contain graphical lookalikes, i.e., a textual notation, can help to avoid problems in understanding declarative process models, and particularly aspects that are present in both imperative and declarative process modeling languages at a graphical level, while having different semantics. The results indicate that even though a textual representation does not suffer from lookalikes, it performed worse in terms of error rate, duration, and mental effort.

The short position papers included the following papers. "Reducing Technical Debt: Using Persuasive Technology for Encouraging Software Developers to Document Code" by Yulia Shmerlin, Doron Kliger, and Hayim Makabee discusses the phenomenon of developers' reluctance to document code, which leads to increased costs of software systems maintenance. It searches for efficient ways of using persuasive technology to encourage programmers to document their code, thus assisting software practitioners and project managers to control and reduce documentation debt. "Conceptual Understanding of Conceptual Modeling Concepts: A Longitudinal Study Among Students Learning to Model" by Dirk van der Linden, Henderik Proper, and Stijn Hoppenbrouwers reports on a longitudinal study investigating the conceptual understanding that students have of common concepts used for conceptual modeling (e.g., actors, processes, goals), as well as if and how these understandings may change over time while a student progresses through the academic curriculum. The authors discuss the seeming lack of connection found between educational stimuli and such changes, and reflect on what this means for the training of people in conceptual modeling. Finally, "What Do Software Architects Think They (Should) Do?" by Sofia Sherman and Naomi Unkelos-Shpigel explores software architects and their perceptions regarding their role and responsibilities. Perception, being a part of and having an effect on cognitive processes and decision making, is explored in order to gain a deeper understanding of what tasks architects find to be included in their role and responsibility. The results highlight several differences between the role of the architect as defined in the existing literature, and the way architects perceive their role.

We hope that the reader will find this selection of papers useful to be informed and inspired by new ideas in the area of cognitive aspects of information systems engineering, and we look forward to future editions of the COGNISE workshop following the two editions we had so far.

June 2014

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Barbara Weber

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Keynote by Stijn Hoppenbrouwers "Pragmatics, Cognition, and Conceptual Modelling; why Process Modelling and Process Mining may Converge"

Third Workshops on New Generation Enterprise and Business Innovation Systems (NGEBIS 2014)

Preface

Innovation is one of the major drivers for enabling European enterprises to compete in global markets, especially in a severe economic downturn. Yet innovation is an elusive term that is often used in an imprecise or generic way. If we consider widely accepted definitions, we can see that they capture only part of the essence of innovation. Furthermore, an innovation process is different from a "usual" business process we find in an enterprise that is (supposedly) well defined in its activities, committed resources, time plan, etc. Conversely, innovation is a creative activity that falls in the category of "wicked problems," i.e., problems difficult to solve because of incomplete, contradictory, and changing requirements.

The New Generation Enterprise and Business Innovation Systems (NGEBIS) workshop, now in its third edition, intends to address the area of information systems dedicated to enterprise and business innovation, traditionally considered too fuzzy and ill-defined to be systematically tackled by using existing information systems and information engineering methods. We expect that the ideas discussed in the workshop will contribute to the development of methods to be used in the implementation of a new generation of information systems capable of supporting innovation, with particular attention to networked enterprises.

In this frame, NGEBIS 2014 included an interesting scientific program with the presentation of the research papers contained in this volume. This edition of NGEBIS received 12 submissions, each of which was reviewed by at least two Program Committee (PC) members in order to supply the authors with helpful feedback. The PC decided to accept four contributions as full papers and two as short papers. The workshop tackled the key issues in the field. The content of innovation and methods to support creation and management of content are addressed in "Leveraging User Inspiration with Microblogging-Driven Exploratory Search" and "Towards Semantic Collective Awareness Platforms for Business Innovation." The paper "Data Mart Reconciliation in Virtual Innovation Factories" considers the problem of monitoring innovation that takes place in the context of networked enterprises, where also decision making is a strategic issue, as discussed in "Cooperative Decision Making in Virtual Enterprises." Important architectural issues are illustrated in "System Architecture of the BIVEE Platform for Innovation and Production Improvement." Finally, the point of view of the end user is addressed in "A Methodology for the Set-Up of a Virtual Innovation Factory Platform." The scientific program of NGEBIS was completed by demo and poster papers, plus a final panel dedicated to the discussion of the

hot issues that emerged in the workshop and in the dedicated NGEBIS Forum on LinkedIn.

We would like to thank all authors for their contributions and the members of the Program Committee for their excellent work during the reviewing phase. We would also like to thank the organizers of the CAiSE 2014 conference for hosting the workshop and the BIVEE European Project that is the initiator of this venture that we expect to continue in the future.

June 2014

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4th International Workshop on Information Systems Security Engineering (WISSE 2014)

Preface

As modern information systems support significant areas of the human society, which require storage and processing of sensitive personal and organizational information, security problems of information systems are currently a widespread and growing concern. The scientific community has realized the importance of aligning information systems engineering and security engineering in order to develop more secure information systems.

The International Workshop on Information System Security Engineering (WISSE) aims to provide a forum for researchers and practitioners to present, discuss, and debate on one hand the latest research work on methods, models, practices, and tools for secure information systems engineering, and on the other hand relevant industrial applications, recurring challenges, problems, and industrial-led solutions in the area of secure information systems engineering.

This fourth edition of the workshop, held in Thessaloniki (Greece) on June 17, 2014, was organized in conjunction with the 26th International Conference on Advanced Information Systems Engineering (CAiSE 2014). In order to ensure a high-quality workshop, following an extensive review process, four submissions were accepted as full papers and two as short papers addressing a large variety of issues related to secure information systems engineering.

We wish to thank all the contributors to WISSE 2014, in particular the authors who submitted papers and the members of the Program Committee who carefully reviewed them. We express our gratitude to the CAiSE 2014 workshop chairs, for their helpful support in preparing the workshop. Finally, we thank our colleagues from the Steering Committee, Nora Cuppens, Jan Jürjens, Carlos Blanco, and Daniel Mellado, for initiating the workshop and contributing to its organization.

June 2014

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