Lecture Notes in Business Information Processing 100

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Business Process Management Workshops

BPM 2011 International Workshops
Clermont-Ferrand, France, August 29, 2011
Revised Selected Papers, Part II

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Foreword

These volumes collects the proceedings of the workshops held on August 29, 2011, in conjunction with the 9th International Conference on Business Process Management (BPM 2011), which took place in Clermont-Ferrand, France. The proceedings are so-called post-workshop proceedings, in that the authors were allowed to revise and improve their papers even after the workshops, so as to take into account the feedback obtained from the audience during their presentations.

Due to its interdisciplinary nature, which naturally involves researchers and practitioners alike, the BPM conference has traditionally been perceived as a premium event to co-locate a workshop with – both by academia and by industry. The 2011 edition of the conference was no exception: its call for workshop proposals attracted 17 proposals with topics ranging from (among others) traditional BPM concerns like design and analysis to novel, emerging concerns like social BPM and compliance. Given the high quality of the submissions, selecting candidate workshops and assembling the best mix of workshops was not an easy task. Eventually, the following 12 workshops were selected for co-location with BPM 2011:

- *7th International Workshop on Business Process Design (BPD 2011)* – organized by Marta Indulska, Michael Rosemann, and Michael zur Muehlen.

  BPD 2011 focused on the design, innovation, evaluation, and comparison of process improvement techniques and tools to comprehensively cover process enhancement approaches such as, for example, TRIZ, reference (best practice) models, process innovation, or resource-based approaches to process improvement.
- *7th International Workshop on Business Process Intelligence (BPI 2011)* – organized by Boudewijn van Dongen, Diogo Ferreira, and Barbara Weber.

  BPI 2011 aimed to bring together practitioners and researchers from different communities such as BPM, information systems research, business administration, software engineering, artificial intelligence, process and data mining with the goal to provide a better understanding of techniques and algorithms to support a company's processes at build-time and the way they are handled at run-time.
- *4th International Workshop on Business Process Management and Social Software (BPMS2 2011)* – organized by Selmin Nurcan and Rainer Schmidt.

  The objective of BPMS2 2011 was to explore how social software interacts with business process management, how business process management has to change to comply with weak ties, social production, egalitarianism and mutual service, and how business processes may profit from these principles.
- *Second International Workshop on Cross-Enterprise Collaboration (CEC 2011)* – organized by Daniel Oppenheim, Francisco Curbera, Frank Leymann, Dimka Karastoyanova, Alex Norta, and Lav R. Varshney.

CEC 2011 explored the management, coordination, and optimization of complex end-to-end processes carried out collaboratively by people across enterprise boundaries. The goal of the workshop was to foster research in the emerging area of cross-enterprise collaboration.

– *Second International Workshop on Empirical Research in Business Process Management (ER-BPM 2011)* – organized by Bela Mutschler, Jan Recker, and Roel Wieringa.

  ER-BPM 2011 stimulated empirical research aimed at the better understanding of the problems, challenges, and existing solutions in the BPM field. The workshop provided an interdisciplinary forum for both researchers and practitioners.

– *5th International Workshop on Event-Driven Business Process Management (edBPM 2011)* – organized by Nenad Stojanovic, Opher Etzion, Adrian Paschke, and Christian Janiesch.

  edBPM 2011 continued its tradition of previous editions in exchanging novel ideas, methods, tools, and solutions for event-driven BPM, with the main goal to connect research and industry in better understanding what can be done from the research point of view and what is the need from the industry/business point of view.

– *First International Workshop on Process Model Collections (PMC 2011)* – organized by Hajo Reijers, Marcello La Rosa, and Remco Dijkman.

  PMB 2011 aimed to attract novel research in the area of business process model collections. Among its topics, we find concerns related to process model repositories such as version management, efficient storage, querying, and retrieval of process models.

– *First International Workshop on Process-Aware Logistics Systems (PALS 2011)* – organized by Nejib Ben Hadj-Alouane, Ramzi Hammami, Samir Tata, and Moez Yeddes.

  PALS 2011 dealt with problems related to the design and optimization of global logistics systems, from a business process management perspective. It is dedicated to exploring and mastering the tools needed for operating, reconfiguring and, in general, making decisions within logistics-based systems.

– *4th International Workshop on Process-Oriented Information Systems in Healthcare (ProHealth 2011)* – organized by Mor Peleg, Richard Lenz, and Manfred Reichert.

  ProHealth 2011 focused on the potential and the limitations of IT support for healthcare processes. The workshop provided a forum wherein challenges, paradigms, and tools for optimized process support in healthcare were debated.

– *Second International Workshop on Reuse in Business Process Management (rBPM 2011)* – organized by Marcelo Fantinato, Maria Beatriz Felgar de Toledo, Itana Maria de Souza Gimenes, Lucinéia Heloisa Thom, and Cirano Iochpe.

  rBPM 2011 focused on exploring any type of reuse in the BPM domain at its various levels: the basic service-oriented foundation level; the service

composition level; the management and monitoring upper level; and, the quality of service and semantics orthogonal level.

– *Second International Workshop on Traceability and Compliance of Semi-Structured Processes (TC4SP 2011)* – organized by Francisco Curbera, Frank Leymann, Hamid Motahari Nezhad, and Beth Plale.

  TC4SP 2011 focused on processes whose lifecycle is not fully driven by a formal process model and a business process management system (BPMS). These processes do not benefit from the advantages of BPMSs, but have the same need for transparency, monitoring, compliance management, and root cause analysis capabilities as fully structured processes.

– *First International Workshop on Workflow Security Audit and Certification (WfSAC 2011)* – organized by Rafael Accorsi and Wil van der Aalst.

  WfSAC 2011 brought together researchers working on innovative, well-founded methods for workflow security audit and certification and industry applying these methods in practical cases.

With these 12 workshops, the BPM 2011 workshop program was the largest workshop program in the history of the conference. Yet, as the unexpectedly large participation in the workshop day testifies (more than 210 registered attendees for all the workshops together), the selected workshops formed an extraordinary and balanced program of high-quality events. We are confident the reader will enjoy this volume as much as we enjoyed organizing this outstanding program and assembling its proceedings.

Of course, we did not organize everything on our own. Many people of the BPM 2011 Organizing Committee contributed to the success of the workshop program. We would particularly like to thank the General Chairs, Farouk Toumani and Mohand-Said Hacid, for involving us in this unique event, the Organizing Chairs, Michel Schneider and Raoul Medina, for the smooth management of all on-site issues, the workshop organizers for managing their workshops and diligently answering the wealth of emails we sent around, and, finally, the authors for presenting their research and work at the BPM 2011 workshops and actually making all this possible.

September 2011

Florian Daniel
Kamel Barkaoui
Schahram Dustdar

Preface

The following preface is a collection of the prefaces of the post-workshop proceedings of the individual workshops. The actual workshop papers, grouped by event, form the body of these volumes.

7th International Workshop on Business Process Design (BPD 2011)

Organizers: Marta Indulska, Michael Rosemann, and Michael zur Muehlen

The 2011 International Workshop on Business Process Design (BPD) was the seventh consecutive workshop in its series, organized in conjunction with the 9th International Conference on Business Process Management, held in Clermont-Ferrand, France, 2011. The workshop was born out of the recognition that designing a process that improves organizational performance is a challenging task that requires a plethora of inputs (for example, organizational strategies, goals, constraints, and IT capabilities, to name a few). This task is the most value-adding step in the process lifecycle, yet it has attracted only limited academic contributions thus far. Accordingly, since the workshop's inception in 2005, the workshop has provided a forum for researchers interested in all aspects of design, innovation, evaluation, and comparison of process improvement techniques and tools.

The BPD 2011 proceedings represent a collection of six excellent research papers that were presented in extended presentation and discussion sessions during the BPM2011 conference. The paper selection was based on a rigorous double-blind process, which resulted in a 32% acceptance rate. As Organizing Chairs of the BPD workshop, we would like to sincerely thank the Program Committee for their thorough reviews of BPD2011 submissions. We would like to extend our thanks to the authors for their presentations, and to all participants of the workshop for their comments on the presented papers. We would also like to thank Hajo Reijers, Eindhoven University of Technology, Germany, for his insightful keynote presentation.

September 2011

Marta Indulska
Michael Rosemann
Michael zur Muehlen

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7th International Workshop on Business Process Intelligence (BPI 2011)

Organizers: Boudewijn van Dongen, Diogo R. Ferreira, and Barbara Weber

Business process intelligence (BPI) is an area that is quickly gaining interest and importance in industry and research. BPI refers to the application of various measurement and analysis techniques in the area of business process management. In practice, BPI is embodied in tools for managing process execution quality by offering several features such as analysis, prediction, monitoring, control, and optimization.

The goal of this workshop is to promote a better understanding of the techniques and algorithms to support business processes at design-time and the way they are handled at run-time. We aim to bring together practitioners and researchers from different communities, e.g., business process management, information systems, database systems, business administration, software engineering, artificial intelligence, and data mining, who share an interest in the analysis and optimization of business processes and process-aware information systems. The workshop aims at discussing the current state of ongoing research and sharing practical experiences, exchanging ideas, and setting up future research directions that better respond to real needs. In a nutshell, it serves as a forum for shaping the BPI area.

The seventh edition of this workshop attracted 16 international submissions. Each paper was reviewed by at least three members of the Program Committee. From these submissions, the top five were accepted as full papers and, in addition, another five interesting submissions were accepted as short papers for presentation at the workshop.

The papers presented at the workshop provide a mix of novel research ideas, practical applications of BPI, as well as new tool support. Ailenei, Rozinat, Eckert, and van der Aalst are motivated by the need for a systematic comparison of existing process mining tools, and their work presents a list of process mining use cases as a first step toward an evaluation framework. Swinnen, Depair, Jens, and Vanhoef present a case study on the use of process mining together with association rule mining for analyzing deviating cases. Clase and Poels describe a method to merge separate log files coming from different systems. Trkman et al. investigate the relationship between business analytics and supply chain performance. Ferreira and Alves present an approach for finding communities in the social network of process participants by means of clustering. Barba, Weber, and Del Valle introduce an approach for assisting users during process execution through a recommendation system that considers both the control-flow and the resource perspectives. Aiolli, Burratin, and Sperduti propose a metric for the comparison of business process models, which is based on the relations

defined for the algorithm. Leyer and Moormann suggest the combination of process mining techniques and statistical methods to evaluate customer integration in service processes. Luengo and Sepúlveda apply clustering for the detection of different versions of a business process. Finally, Damer, Jans, Depaire, and Vanhoof propose a new compliance analysis approach based on clustering the log into homogeneous groups.

For the first time this year, the workshop was accompanied by a challenge, for which researchers and practitioners were asked to apply any BPI technique of their disposal to a real-life dataset of a Dutch academic hospital in order to get insights into the treatment processes of that hospital. We invited a jury to rank the proposals and our sponsors – Pallas Athena and Futura Process Intelligence – provided the prizes for the two best submissions.

The BPI challenge attracted three international submissions which were ranked by a jury consisting of practitioners and researchers, as well as the owner of the dataset. The jury unanimously ranked the submissions, which resulted in Filip Caron and J.C. Bose winning the challenge and receiving an iPad 2 each. These proceedings contain a two-page abstract of the two winning submissions. The jury particularly liked the fact that both authors stepped outside of the BPI domain and included knowledge from the medical domain in order to come to certain conclusions. This clearly showed that real-life analysis cannot be done only from within the academic walls, but that the strong relation between researchers and practitioners is and will stay particularly important in the field of BPI.

These proceedings additionally contain the Process Mining Manifesto, which has been jointly developed by more than 70 scientists, consultants, software vendors, and end-users in the BPI area. As part of this workshop, a meeting of the IEEE task-force was held, during which the content of the Process Mining Manifesto was discussed. This document aims to promote the area of process mining and provides a set of guiding principles and challenges.

As with previous editions of the workshop, we hope that reader will find this selection of papers useful to keep track of the latest advances in the area of BPI, and we look forward to keep bringing new advances in future editions of the BPI workshop.

September 2011

Boudewijn van Dongen
Diogo R. Ferreira
Barbara Weber

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4th International Workshop on Business Process Management and Social Software (BPMS2 2011)

Organizers: Selmin Nurcan and Rainer Schmidt

Social software[1] is a new paradigm that is spreading quickly in society, organizations, and economics. Social software has created a multitude of success stories such as wikipedia.org and the development of the Linux operating system. Therefore, more and more enterprises regard social software as a means for further improvement of their business processes and business models. For example, they integrate their customers into product development by using blogs to capture ideas for new products and features. Thus, business processes have to be adapted to new communication patterns between customers and the enterprise: for example, the communication with the customer is increasingly a bi-directional communication with the customer and among the customers. Social software also offers new possibilities to enhance business processes by improving the exchange of knowledge and information, to speed up decisions, etc.

Social software is based on four principles: weak ties, social production, egalitarianism, and mutual service provisioning.

- *Weak Ties*[2]: Weak ties are spontaneously established contacts between individuals that create new views and allow combining of competencies. Social software supports the creation of weak ties by supporting the creation of contacts on impulse between non-predetermined individuals.
- *Social Production*[3,4]: Social production is the creation of artifacts, by combining the input from independent contributors without predetermining the way to do this. By this means it is possible to integrate new and innovative contributions not identified or planned in advance. Social mechanisms such as reputation assure quality in social production in an a posteriori approach by enabling a collective evaluation by all participants.
- *Egalitarianism*: Egalitarianism is the attitude of handling individuals equally. Social software highly relies on egalitarianism and therefore strives to give all participants the same rights to contribute. This is done with the intention to encourage a maximum of contributors and to get the best solution fusioning

[1] R. Schmidt and S. Nurcan, "BPM and Social Software," Business Process Management Workshops, 2009, pp. 649-658.

[2] M.S. Granovetter, "The Strength of Weak Ties," American Journal of Sociology, vol. 78, 1973, S. 1360.

[3] Y. Benkler, The Wealth of Networks: How Social Production Transforms Markets and Freedom, Yale University Press, 2006.

[4] J. Surowiecki, The Wisdom of Crowds, Anchor, 2005.

a high number of contributions, thus enabling the wisdom of the crowds. Social software realizes egalitarianism by abolishing hierarchical structures, merging the roles of contributors and consumers, and introducing a culture of trust.

– *Mutual Service Provisioning*: Social software abolishes the separation of service provider and consumer by introducing the idea that service provisioning is a mutual process of service exchange. Thus both service provider and consumer (or better prosumer) provide services to one another in order to co-create value. This mutual service provisioning contrasts with the idea of industrial service provisioning, where services are produced in separation from the customer to achieve scaling effects.

To date, the interaction of social software and its underlying paradigms with business processes have not been investigated in depth. Therefore, the objective of the workshop was to explore how social software interacts with business process management, how business process management has to change to comply with weak ties, social production, egalitarianism and mutual service, and how business processes may profit from these principles.

The workshop discussed three topics:

1. New opportunities provided by social software for BPM
2. Engineering next generation of business processes: BPM 2.0?
3. Business process implementation support by social software

Based on the successful BPMS2 2008, BPMS2 2009, BPMS2 2010 workshop, the goal of this workshop was to promote the integration of business process management with social software and to enlarge the community pursuing the theme.

We wish to thank all authors for having shared their work with us, as well as the members of the BPMS2 2011 Program Committee and the workshop organizers of BPM 2011 for their help with the organization of the workshop.

September 2011

Selmin Nurcan
Rainer Schmidt

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Second International Workshop on Cross-Enterprise Collaboration (CEC 2011)

Organizers: Alexander H. Norta, Daniel V. Oppenheim, Lav R. Varshney, Francisco Curbera, Dimka Karastoyanova, and Frank Leymann

On August 29, 2011, the Second International Workshop on Cross-Enterprise Collaboration (CEC) was held as part of the 9th International Conference on Business Process Management (BPM 2011) in Clermont-Ferrand, France.

Cross-enterprise collaboration (CEC) occurs when two or more organizations collaborate to realize a common goal. The move of process, work, and operations from an organization-centric environment to a collaborative ecosystem of partners and providers is becoming pervasive because many organizations find they can no longer develop all the required innovation in-house or lack necessary capabilities. Sharing the financial cost and overall risk is another important incentive for collaboration, especially in projects with a high degree of uncertainty that may require frequent change and adaptation.

The workshop focused on how to reconcile the continuum from rather informal to very strongly formalized CEC models in which the collaborating organizations utilize organization-bridging choreographies to connect with partner and/or provider in-house business processes for carrying out sourced transactions to achieve the collaboration's goal. The workshop goal was to provide a venue for academics and practitioners to establish a community for CEC with future expansion potential. Consequently, the workshop identified the state of the art, core research challenges, enterprise-collaboration models, corresponding architectures, frameworks, or methodologies.

The first workshop keynote was presented by Hamid Motahari Nezhad from HP Labs, Palo Alto, who discussed CEC in the context of multi-sourced service engagements and outlined a vision and conceptual architecture for offering the supporting technology for CEC as a service. Then there was a keynote presentation by Alex Kass from Accenture Technology Labs. This talk identified collaboration between people and between systems as two pillars of any CEC and presented a vision for a CEC platform in which technology support for knowledge sharing, process sharing, and data coupling has to be offered. The final part of the keynote talks was from Alex Norta on the completed EU-FP6 CrossWork research project on which a recently published book in the Springer *Information Systems* series was based. In this approach external processes could be defined and utilized by the collaborating organizations and then mapped to individual organizations through a layer of conceptual processes.

The subsequent paper presentations covered the following areas. First, an approach was shown by Christian Pichler et al. for creating conflict-free updates of UN/CEFACT-based cross-organizational modeling consensus. The

second presentation by Jorge Roa et al. was about using colored Petri-net notation for designing collaborative business processes. The advantage of this approach is the availability of established formal verification techniques. Finally, a paper by Stefan Mutke et al. about a service-provision framework based on prior analysis and deconstruction of customer requirements focused on how to set up enterprise collaborations from the logistics domain.

September 2011

Alexander H. Norta
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Second International Workshop on Empirical Research in Business Process Management (ER-BPM 2011)

Organizers: Bela Mutschler, Jan Recker, and Roel Wieringa

In an effort to manage and improve business processes to enable business benefits, *business process management* (BPM) heavily relies on the use of IT-based systems. Past years have seen the emergence of holistic enterprise resource planning systems, automated workflow systems, process design tools, expert systems, virtual collaboration systems and business rule systems as process-aware information systems that enable process change and management and thereby contribute to business value generation.

BPM research has traditionally taken one of two forms. One vein of BPM research has focused on the development and extension of associated tools, methods, standards, and technologies. The other vein of BPM research has been concerned with evaluating the suitability of existing BPM technology, to build informed opinions about qualities and deficiencies of BPM practices and tools.

Over recent years, we have witnessed a growing demand for insights or evaluations of BPM technology based on dedicated empirical research strategies. Such research has only recently gained prominence in the community but is now firmly established as an important strand of research around the use of BPM, as evidenced, for example, by dedicated journal special issues on this topic[5]. The benefits of empirical research include improved problem understanding and improved insight into the performance of techniques in practice. These benefits have been demonstrated in areas like software engineering (e.g., in the context of software development processes or code reviews), information systems (e.g., in the form of theories of acceptance and use of information systems), or, indeed, business (e.g., in studies of organizational performance) for a long time, we believe, and are still under-represented in the academic field of BPM, notwithstanding the efforts made to date.

The Workshop

The Second International Workshop on Empirical Research in Business Process Management (ER-BPM 2011) set out to be a premier forum for researchers to address the demand for further empirical research, and sought to stimulate

[5] Recker, J., Mutschler, B., Wieringa, R.: Empirical Research in Business Process Management: Introduction to the Special Issue. in: *Inf. Syst. E-Business Management*, 9(3), pp. 303-306 (2011).

empirical research that, in turn, can contribute to a better understanding of the problems, challenges, and existing solutions in the BPM field.

In particular, the workshop provides an interdisciplinary forum for both researchers and practitioners to improve the understanding of BPM-specific requirements, methods and theories, tools and techniques. Therefore, the workshop deals with different facets of applying and using BPM methods and technologies and strives to provide new insights into the challenges, applications, and perspectives emerging for BPM technology.

ER-BPM 2011 was the follow-up workshop of a very successful first ER-BPM workshop that took place in Ulm (Germany) in conjunction with BPM 2009. The papers from this workshop appeared as part of a dedicated book series[6], and the best papers were also published as extended articles as part of a journal special issue[1].

The Papers in a Nutshell

At ER-BPM 2011, we accepted six papers for presentation. These articles provide a snapshot of current examples for how empirical research in BPM can be conducted, and what insights such research can uncover.

The paper by Houy et. al investigates theoretical foundations of empirical BPM research based on conceptual considerations and a review of empirical BPM literature. Their analysis clearly shows that empirical BPM research is only to a certain extent guided by existing theory. Furthermore, it can be seen that the investigated contributions often refer to theories originating from other different fields of research, like economics or sociology.

The paper by Michelberger et. al investigates fundamental issues related to process-oriented information logistics based on two exploratory case studies in the automotive and the clinical domain. Additionally, they present results of an online survey with 219 participants supporting the case study findings. Their research does not only reveal different types of process information, but also allows for the derivation of factors determining its relevance. Understanding such factors, in turn, is a fundamental prerequisite to realize effective process-oriented information logistics.

In the third paper, Luebbe and Weske present a new technique for process co-creation with domain experts called tangible business process modeling. More specifically, they present not only results of a laboratory experiment in which the method is applied, they also illustrate how they used action research in two further studies in which groups modeled BPMN and EPCs using tangible tiles on a table.

Soffer et. al propose to study the process of process modeling based on problem-solving theories. Specifically, their work takes the approach that problems are first

[6] Rinderle-Ma, S., Sadiq, S.W., Leymann, F.: Business Process Management Workshops - BPM 2009 International Workshops. in: Lecture Notes in Business Information Processing, 43, Springer, Ulm (2009).

conceptualized as mental models, to which solution methods are applied. The paper then suggests that investigating these two phases can help understand and hence improve the semantic and syntactic quality of process models. Specifically, the paper reports on an empirical study addressing the mental model created during process model development, demonstrating the feasibility of such studies. It then suggests designs for other studies that follow this direction.

The paper by Pinggera et. al introduces the formal concept of a phase diagram through which the modeling process can be analyzed, and a corresponding implementation to study a modeler's sequence of actions. In an experiment building on these assets, they observed a group of modelers engaging in the act of modeling. Collected data are used to demonstrate their approach for analyzing the process of process modeling.

Finally, the paper by Pichler et. al investigates in an experimental setting whether either the imperative or the declarative process modeling approach is superior with respect to process model understanding. Their study finds that imperative process modeling languages appear to be connected with better understanding.

September 2011

Bela Mutschler
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5th International Workshop on Event-Driven Business Process Management (edBPM 2011)

Organizers: Opher Etzion, Adrian Paschke, Christian Janiesch, and Nenad Stojanovic

Event-driven computing is gaining ever-increasing attention from industry and the research community and this workshop shows its importance in the business process management domain. We had more than 15 submissions almost uniformly spread over industry and academic communities. Topics ranged from modeling data-intensive processes to various types of monitoring business processes. Events have become first-class citizens in BPM, enabling novel real-time applications on top of the business process execution. However, there is still much to be done, especially in the context of unified terminology and conceptualization (e.g., what is an event in BPM).

We selected nine papers for presentation although, almost all of the submissions contained very interesting material for this kind of workshop and we would like to thank all authors for their great job.

We also thank to the members of the Program Committee for very constructive reviews, which helped authors improve their work.

September 2011

Opher Etzion
Adrian Paschke
Christian Janiesch
Nenad Stojanovic

Program Committee

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First International Workshop on Process Model Collections (PMC 2011)

Organizers: Hajo Reijers, Marcello La Rosa, and Remco Dijkman

Nowadays, as organizations reach higher levels of business process management maturity, they tend to collect large repositories of business process models. It is quite common that such collections of industry-strength business process models include thousands of activities and related business objects such as data, applications, risks, etc. These models are increasingly published over an intranet to a large number of stakeholders with varying skills and responsibilities. In that sense, it may not come as a surprise that many organizations struggle to manage such high volumes of complex process models. The problem is exacerbated by overlapping content across models, poor version management, process models that are used simultaneously for different purposes, the use of different modeling notations such as EPCs, BPMN, etc. In light of these challenges, the aim of the First Workshop on Process Model Collections was to present and discuss novel research in the area of business process model collections.

Topics and Papers

The workshop attracted 14 paper submissions. Each of these submissions was reviewed by at least three Program Committee members. After receiving the reviews, eight papers were accepted for presentation at the workshop. In addition a keynote speaker was invited.

The papers address various topics in the area of process model collections, in particular:

- Similarity of process models
- Clustering of process models
- Variability management and consolidation of process model collections
- Configurable models as a means to consolidate process model collections
- Process log collections in addition to process model collections
- Novel concepts and technology to share process model collections
- Navigating process model collections
- Relations between process models
- Frameworks to organize process model collections
- Searching process models in a collection

The keynote (1) on "Consolidated Management of Business Process Variants" by Marlon Dumas compares three different approaches for consolidating a collection of similar process models: consolidation based on shared subprocesses, consolidation based on configurable process models, and consolidation based on model synchronization. "Towards Cross-Organizational Process Mining in Collections of Process Models and Their Executions" by Joos Buijs, Boudewijn van Dongen, and Wil van der Aalst (2) presents a means to join process model collections

Table 1. Topics of the workshop and related papers

Topic	**1**	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Similarity	X				X				
Clustering			X						
Consolidation	X					X			
Configurable Models	X					X			
Log Collections		X							
Sharing Models				X					
Navigation									X
Process Relations								X	
Organizing Models							X		
Search		X							

with process log collections. By joining these two, questions can be answered like "Which process model in the collection best reflects the behavior of my organization." "Activity-Oriented Clustering Techniques in Large Process and Compliance Rule Repositories" by Stefanie Rinderle-Ma, Sonja Kabicher, and Thao Ly (3) presents techniques for clustering both process models and rules. Clustering allows more efficient checking of rules on a process model collection. "An Open Process Model Library" by Rami-Habib Eid-Sabbagh, Matthias Kunze, and Mathias Weske (4) presents novel concepts and techniques for sharing process model collections, which it calls "process libraries." "Analyzing Differences Between Business Process Similarity Measures" by Michael Becker and Ralf Laue (5) presents an analysis of 22 different process similarity metrics that have been proposed until now. "Comparing Business Processes to Determine the Feasibility of Configurable Models: A Case Study" by Jan Vogelaar, Eric Verbeek, Borana Luka, and Wil van der Aalst (6) presents an analysis of the extent to which process similarity metrics can be used to determine how process models in a collection can be consolidated by means of configurable process models. "Industry Operations Architecture for Business Process Model Collections" by Jorge Sanz, Ying Tat Leung, Ignacio Terrizzano, Valeria Becker, Susanne Glissmann, Joseph Kramer, and Guang-Jie Ren (7) presents a framework for organizing process model collections. "On Formalizing Inter-process Relationships" by Tri Kurniawan, Aditya Ghose, Lam-Son Lê, and Hoa Khanh Dam (8) discusses and formalizes the different relations that process models in a collection can have with each other. "Navigating in Process Model Collections: A New Approach Inspired by Google Earth" by Markus Hipp, Bela Mutschler, and Manfred Reichert (9) presents a novel way to navigate process model collections. Thus, the papers that are presented at the workshop address the topics outlined above as shown in Table 1.

September 2011

Hajo Reijers
Marcello La Rosa
Remco Dijkman

Program Committee

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First International Workshop on Process-Aware Logistics Systems (PALS 2011)

Organizers: Nejib Ben Hadj-Alouane, Ramzi Hammami, Samir Tata, and Moez Yeddes

The PALS workshop spanned one day and intended to bring together researchers and practitioners from BPM and logistics systems communities to discuss the key issues related to the design and optimization of global logistics systems, from a BPM perspective. It was dedicated to exploring and mastering the tools needed for operating, reconfiguring, and, in general, making decisions within logistics-based systems, in order to provide the customers and system users with the greatest possible value.

Operationally, the PALS workshop was grouped into two topics: BPM in logistics systems and optimization of global logistics systems using BPM.

BPM in Logistics Systems

The first topic of the workshop included three full papers.

- On the Modeling of Healthcare Workflows Using Recursive ECATNets
- Negotiating Deadline Constraints in Inter-Organizational Logistic Systems: A Healthcare Case Study
- Configurable Process Models for Logistics: Case Study for Customs Clearance Processes

The first paper claims that logistic processes in healthcare systems (or careflows) are highly flexible and extremely dynamic. To deal with theses issues, the authors proposed to take advantage of the description power of recursive ECATNets for realizing flexible workflows in the healthcare domain. The benefit of such modeling is that soundness verification of these workflows can be obtained via model checking techniques.

The second paper argues that current logistics methods are more focused on strategic goals and do not deal with short-term objectives, such as, reactivity and real-time constraints. The authors propose to apply inter-organizational workflows for automating logistic procedures in a collaborative context. As a proof of concept they consider a case study of a healthcare process and focus on the negotiations aspects of temporal constraints in critical situations.

The third paper discusses the main challenges for the use of configurable process models in logistics systems and describes some future work. It proposes to use configurable process models in logistics systems and analyzes and creates a set of process models for customs clearance services for import and export processes and delivers the configurable process model out of these models.

The Optimization of Global Logistics Systems Using BPM

The second topic of the workshop included five full papers.

- A Formal Framework for Cooperative Logistics Management
- Linear Integer Programming for the Home Healthcare Problem
- Evolutionary Algorithm for Scheduling Production Jobs and Preventive Maintenance Activities
- On the Modeling of Logistics Decisions Impact on Product Greenness: Sensitivity Analysis
- A Mathematical Model for Global Supplier Selection

The first paper discusses transportation sharing and vehicle routing within the context of green cooperative logistics for the purpose of reducing carbon emissions and satisfying product delivery deadlines. The author addresses the use of a symbolic calculus permitting users of a large logistics-sharing system to reason about vehicle routes and delivery demands while being aware of carbon emission reductions. We note that this calculus bares resemblance to declarative workflow languages.

The second paper discusses business processes that address vehicle routing and nurse assignment for the purpose of providing healthcare services, at home, for the elderly, and/or disabled persons. This paper addresses a problem that is increasingly gaining importance in today's modern societies. The paper gives a mathematical model for the process and addresses resource assignment and scheduling issues. The third paper discusses a scheduling problem combining production operations as well as preventive maintenance tasks. The paper provides an evolutionary heuristics for producing schedules that aim to reduce the cost of maintenance while optimizing the completion dates of the production operations.

The fourth paper addresses the problem of providing a model for global supply chains that aims to optimize the environmental impacts of production, within the context of current legislation, while still maximizing profit making. A nice application of the model is provided for the case of a textile manufacturing operation. The paper focuses on issues related to the sensitivity of the results with respect to small changes in the problem parameters.

The last paper in this second workshop topic deals with the problem of supplier selection within the context of global logistics chains. The paper deals with this problem by providing a framework for integrating inventory and transportation activities. A multi-stage process is provided for dealing with the supplier selection problem.

Concluding Remarks

At the end of the workshop we conducted a brainstorming session inviting PALS participants to identify research issues and ideas which they consider to be at the forefront of attention when considering process-aware logistics systems. The main areas of research that stemmed from this discussion are the following:

- Focusing on suitable business process models integrating activities and resources, suitable for capturing logistics systems and problems
- Identifying appropriate workflow patterns for modeling logistics
- Developing tools for transforming workflow models, semi-automatically, into mathematical models that allow for the application of optimizations techniques

The participants showed considerable enthusiasm related to inciting research in the business process area that has a direct impact on modern industrial environments.

We thank all our authors and participants for their valuable contributions. We are also grateful to our Program Committee members who helped us in evaluating the papers for this workshop. Furthermore, we would like to thank the BPM Workshop Chairs and all the BPM organizers for making this event possible.

September 2011

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4th International Workshop on Process-Oriented Information Systems in Healthcare (ProHealth 2011)

Organizers: Mor Peleg, Richard Lenz, and Manfred Reichert

Healthcare organizations and providers are facing the challenge of delivering high-quality services to their patients, at affordable costs. A high degree of specialization of medical disciplines, prolonged medical care for the ageing population, increased costs for dealing with chronic diseases, and the need for personalized healthcare are prevalent trends in this information-intensive domain. The emerging situation necessitates a change in the way healthcare is delivered to the patients and healthcare processes are managed.

BPM technology provides a key with which to implement these changes. Though patient-centered process support has become increasingly crucial in healthcare, BPM technology has not yet been broadly used in healthcare environments. This workshop elaborated on both the potential and the limitations of IT support for healthcare processes. It further provided a forum wherein challenges, paradigms, and tools for optimized process support in healthcare could be debated. We wanted to bring together researchers and practitioners from different communities (e.g., BPM, information systems, medical informatics, e-health) who share an interest in both healthcare processes and BPM technologies.

The success of the first three ProHealth Workshops, which were held in conjunction with the 5th, 6th, and 7th International Conferences on Business Process Management (BPM 2007, BPM 2008, and BPM 2009), demonstrated the potential of such an interdisciplinary forum to improve the understanding of domain-specific requirements, methods and theories, tools and techniques, and the gaps between IT support and healthcare processes that are yet to be closed, providing insights into the social and technological challenges, applications, and perspectives emerging for BPM in this context.

Enterprise-wide process-oriented information systems have been demanded by healthcare institutions for over 20 years and terms like "continuity of care" have even been discussed for over 50 years. Yet, healthcare organizations are currently using a plethora of specialized non-standard information systems and continue to focus on the development of systems for specialized departments that frequently only focus on their internal processes. Many of the successful existing information systems focus on non-process-oriented systems, such as imaging, drug order-entry, laboratory test result storage, storage of diagnoses and progress notes in electronic medical records, alerts and reminders, and billing applications.

Information systems and decision-support systems for managing patient care processes, however, are still scarcely developed; most often only by a small number of university-led teams. Such patient care management systems are highly complex and pose many challenges: they require availability of encoded data coming from different sources, flexibility in deviating from the encoded process

at the discretion of the physician user, and may involve a team of clinical users that together take care of a patient in a coordinated way.

The recent trend toward healthcare networks and integrated care even increases the need to effectively support interdisciplinary cooperation along with the patient treatment process. Recent studies discussing the preventability of adverse events in medicine recommend the use of information technology, since insufficient communication and missing information turned out to be among the major factors contributing to adverse events. Yet, there is still a discrepancy between the potential and the actual usage of IT in healthcare.

The ProHealth 2011 workshop was held in Clermont-Ferrand, France, in conjunction with the 8th BPM Conference. It focused on IT support of high-quality healthcare processes. It addressed topics including the modeling of healthcare processes, conformance and compliance checks of clinical guidelines, adaptive healthcare processes, and process quality improvement as well as healthcare process security.

The workshop received 14 papers from Germany (7), South Korea (2), Canada (1), UK (1), Italy (1), Spain (1), and a paper with authors from the USA and The Netherlands. Papers had to clearly establish their research contribution as well as their relation to healthcare processes. Eight full papers were selected to be presented in the workshop according to their relevance, quality, and originality.

In his keynote paper "Context, Retrospection, and Prospection in Healthcare Process Definitions," Leon Osterweil from the Department of Computer Science at the University of Massachusetts, Amherst, discussed the execution of precise and complete formal definitions of healthcare processes in the Little-JIL formalism, focusing on how the process definition can be used to provide run-time information to guide process participants. This new focus has made it clear that more thought must be given to how to communicate with participants in order to assure more effective guidance. The work suggests that participants, especially human participants, will require that process-provided guidance be accompanied by context, history, and prospective information if the guidance is to be credible, acceptable, and ultimately useful.

The following three papers focus on conformance and compliance checks of clinical guidelines. The paper entitled "Reusing a Declarative Specification to Check the Conformance of Different CIGs" by Adela Grando, Wil van der Aalst, and Ronny Mans explored formal methods for checking whether computer-interpretable guidelines (CIGs) expressed in formal languages such as PROforma (previous work) and GLIF conform to declarative specifications of constraints that the guideline should obey. They started with a GLIF CIG that was automatically translated into a colored Petri net (CPN) and used CPN model-checking tools to establish conformance to a DECLARE specification of the guideline.

In the paper entitled "Conformance Checking of Executed Clinical Guidelines in Presence of Basic Medical Knowledge" Bottrighi, Chesani, Mello, Montali, Montani, and Terenziani explore the interaction between clinical guideline knowledge and basic medical knowledge from the viewpoint of the adherence of an observed CIG execution trace to both types of knowledge. They propose an

approach based on the GLARE language to represent clinical guidelines, and on a homogeneous formalization of both clinical guidelines and basic medical knowledge using event calculus and its Prolog-based implementation REC, focusing on a posteriori conformance evaluation.

In the paper "Compliance-Oriented Process Management Using the Example of Clinical Trials," Jörg Schlundt and Stefan Jablonski provide an overview of compliance management in clinical trials, analyzing current scientific approaches and their shortcomings. To overcome the deficiencies, they present a framework for process-oriented compliance management, in which the extraction and modeling of compliance requirements are done in a process-oriented way. In addition they present a matching operator by which different compliance standards can be made comparable.

The next three papers focus on adaptive healthcare processes from different perspectives. Christoph Neumann, Peter Schwab, Andreas Wahl, and Richard Lenz present the "α-Adaptive" approach, which is intended to support runtime adaptability of metadata for document-based decentralized process management. The approach extends the α-Flow approach, which uses distributed case files (α-Docs) as a coordination platform for ad hoc cooperation among different healthcare organizations. The authors demonstrate how the metadata to annotate α-Docs can be extended on demand.

In the paper "Guarded Process Spaces (GPS): A Navigaton System Towards Creation and Dynamic Change of Healthcare Processes from the End-User's Perspective," Claudia Reuter, Peter Dadam, Stephan Rudolph, Wolfgang Deiters, and Simon Trillsch introduce a framework that enables user-defined processes based on a predefined set of possible processes. A guarded process space is to be seen as a roadmap that contains all possible processes. Specifying and modifying clinical pathways can be assisted based on that paradigm, as it is essentially just navigating through that roadmap.

The paper "Enabling YAWL to Handle Dynamic Operating Room Management" by Sebastian Schick, Holger Meyer, Markus Brandt, and Andreas Heuer addresses yet another approach to flexibility. The approach is aimed at achieving flexibility by monitoring data changes and specifying where corresponding process changes should take effect. The last two papers focus on process quality improvement and access control. In the paper "Developing a Process Quality Assessment Questionnaire – A Case Study on Writing Discharge Letters," Robert Heinrich, Barbara Paech, Antje Brandner, Ulrike Kutscha, and Bjoern Bergh propose a systematic approach to creating a questionnaire intended to detect business process quality problems. The approach is based on comprehensive standard catalogs of quality criteria for both processes and data. The case-based reduction of these criteria and the deduction of appropriate questions is exemplified by a case study on writing discharge letters.

The paper "A Personalized Access Control Framework for Workflow-Based Health Care Information" by Nazia Leyla and Wendy McCaull finally addresses the important issue of data security in healthcare. The approach presented in the paper is based on the assumption that patients should decide themselves who is

allowed to see which data. The authors explain how such individual constraints can be enforced within the NOVA Workflow Management System.

We would like to thank all authors who submitted a paper to the ProHealth Workshop, including those whose papers were not accepted for presentation. We particularly thank the invited speaker as well as the members of the Program Committee and the reviewers for their efforts in selecting the papers (in αbetical order): Joseph Barjis, Oliver Bott, Adela Grando, Stefan Jablonski, Wendy McCaull, Ronny Mans, Bela Mutschler, Oystein Nytro, Lee Osterweil, Hajo Reijers, Shazia Sadiq, Danielle Sent, Yuval Shahar, Ton Spil, Annette ten Teije, Paolo Terenziani, Lucineia Thom, Dongwen Wang, and Barbara Weber. They helped us to compile a high-quality program for the ProHealth 2011 workshop and contributed to improving the initial submissions by their recommendations to the authors. We would also like to acknowledge the splendid support of the local organization and the BPM 2011 Workshop Chairs.

We hope you will find the papers of the ProHealth 2011 workshop interesting and stimulating.

September 2011

Mor Peleg
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Second International Workshop on Reuse in Business Process Management (rBPM 2011)

Organizers: Marcelo Fantinato, Maria Beatriz Felgar de Toledo, Itana Maria de Souza Gimenes, Lucinéia Heloisa Thom, and Cirano Iochpe

The current complexity inherent in the corporative world demands a great dynamism from the IT infrastructure in order to provide technical solutions for conducting business. Business process management (BPM), including its service-oriented foundation, has been providing important technological support to improve organization competitiveness. In order to increase dynamism and competitiveness, BPM can benefit from reuse approaches and techniques at several stages of the business process life cycle.

The Second International Workshop on Reuse in Business Process Management was dedicated to exploring any type of reuse in the BPM domain. Therefore, it was a forum in which to discuss systematic reuse applied to BPM at its various levels:

1. The basic service-oriented foundation level—including issues such as service development, description, publication, discovery and selection
2. The service composition level—encompassing service negotiation and service aggregation
3. The management and monitoring upper level—including business process modeling, execution, monitoring, and contract establishment and enactment
4. The Quality of Service and Semantics orthogonal level

Moreover, the impact of reuse on business- and service-oriented engineering as well as how it can help in the design of more high-quality process models were very important topics to be discussed in this workshop.

Different existing reuse approaches and techniques can be extended to be applied to this fairly new domain, including: software product line or software product families; variability descriptors; design patterns such as feature modeling; aspect orientation; and component-based development. In addition, completely new approaches and techniques can be proposed. Their use must also be discussed, preferably under experimentation as well as results analysis.

We would like to thanks the PNPD and the SticAmSud Programs of the Coordenao de Aperfeioamento de Pessoal de Nivel Superior (CAPES) from the Brazilian government.

September 2011

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Wil M.P. van der Aalst	Eindhoven University of Technology, The Netherlands

Second International Workshop on Traceability and Compliance of Semi-Structured Processes (TC4SP 2011)

Organizers: Francisco Curbera, Frank Leymann, Hamid Motahari Nezhad, and Beth Plale

Semi-structured processes are those business or scientific processes whose life cycle is not fully driven by a formal process model. Often, an informal description of the process is available in the form of a process graph, flow chart, or an abstract state diagram, but the execution is not completely controlled by a central entity (such as a workflow engine), if at all. Instead, a variety of IT and human-centric mechanisms are used, including email, content management systems, Web-based forms, custom applications, or a combination thereof.

Examples of semi-structured processes are collaborative and case-oriented processes as well as most end-to-end line of business processes in commercial enterprises. Even when there is a formally managed process in place, there are often exceptional situations that fall outside the purview of the workflow engine, making measuring compliance against desired business and regulatory policies difficult. In spite of the widespread adoption of BPM technology, semi-structured processes are commonplace in today's commercial and governmental organizations.

Semi-structured processes do not benefit from most advantages provided by business process management systems (BPMSs). In particular, one major advantage of process management is oversight through the inherent provenance of data and actions. Being able to answer the question "Who did what when and how?" makes processes transparent and reproducible, supports compliance monitoring and root cause analysis, and provides the means for deep mining of activities and information.

The goal of the TC4SPs workshop is to investigate how to extend the oversight, traceability, and compliance management of traditional BPMSs to semi-structured processes through techniques and algorithms to gather, correlate, analyze, and persist provenance data of processes. The workshop aims to bring together practitioners and researchers from different communities – such as business process management, scientific workflow, complex event and compliance monitoring, data and process mining – who share an interest in semi-structured processes. We encourage submissions that report the current state of research in the area and share practical experiences.

Workshop Program

The program of the 2011 edition of the TC4SP workshop included an invited keynote talk and four papers selected among the submissions to the workshop.

Keynote, Social BPM: opening organizational processes to social interactions.
Piero Fraternali, Politecnico di Milano.

Abstract: The talk overviews the motivations, background disciplines, scientific and technical challenges of social BPM, defined as the emerging effort of bringing together the methodological rigor of structured business process management and the flexibility and communication power of social software. The approach of the BPM4People project (www.bpm4people.org) is illustrated, which exploits model-driven architectures and generative software production to support the rapid prototyping and deployment of BPM solutions integrated with social interaction platforms.

Accepted Papers

Four submitted contributions were presented during the second edition of the workshop focusing on the topics of compliance, noisy provenance capture, and runtime support for semi-structured process execution.

Building on a review of recent research on the topic of governance, risk, and compliance (GRC) in business process management, Thomas Schäfer, Peter Fettke, and Peter Loos trace the high number of failures in compliance enforcement for business processes to three main complexity drivers: the increased complexity of the regulatory environment, the growing complexity of major business processes in an organization, and the high frequency of change of the processes themselves. The authors identify the need for new tools and a new methodology to deal with GRC requirements in BPM practice. Awareness of the three complexity drives they identify is likely to drive a new focus on the economic aspects of compliance management and its impact on processes and organizations.

The need to manage the risk exposure derived from an organization's business processes is the topic of the paper by Yurdaer Doganata and Francisco Curbera. Building on previously published work on the performance of automated auditing tools, the paper first examines the factors that determine the effectiveness of automated auditing tools, and considers the economic returns that an organization can expect form investments in an automated tool providing a certain amount of risk reduction. The design of an auditing tool providing a target level of risk reduction is addressed in the second part of the paper, which gives criteria for how to select the parameters affecting the tool's performance to reach the desired risk reduction.

Provenance databases capture records of process execution to support compliance checking, historical analysis, ensure repeatability, etc. One of the main challenges when analyzing provenance data is that the provenance captured in most real-world use cases is noisy and incomplete. This challenge motivates the paper by You-Wei Cheah, Beth Plale, Joey Kendall-Morwick, David Leake, and Lavanya Ramakrishnan. They discuss the process of creating a large (10 GB) noisy provenance database based on realistic scientific workflows and exhibiting specific rates of certain failure types, and they analyze its performance characteristics. The data are then used to test two analysis techniques that work

on noisy data, one assessing the quality of captured provenance traces, and the other using a case reasoning technique to repair broken provenance.

The paper by Bernardo Oliveira Pinto and António Rito Silva considers the problem of enabling and supporting a more flexible execution paradigm of semi-structured processes. They propose an architecture that combines the prescriptive aspects of activity-centric workflows with the flexibility and guidance provided by a goal-based model. The proposed "blended workflow" architecture allows deviation from prescribed activities through a set of predefined, goal-centric operations, and uses a shared data model to maintain consistency between the activity and goal-based sides of the process. The blended architecture provides a seamless extension of the traditional activity models to support a flexible, ad-hoc execution that is semi-structured in nature.

September 2011

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First International Workshop on Workflow Security Audit and Certification (WfSAC 2011)

Organizers: Rafael Accorsi and Wil van der Aalst

The automation of business processes by means of workflow management systems enables the flexible adjustment of enterprise systems to the current demand, which is highly appreciated at managerial level. Technically, it also provides for a systematic separation of processes and IT-architectures, allowing, for example, the seamless outsourcing of process fragments to a cloud or the selection of different service sets for process execution.

Despite these immediate advantages, enterprises are still reluctant in fully relying on automated workflows. For instance, a recent survey carried out in Germany shows that merely 23% of the enterprises employ workflow management systems, whereas security, privacy, and compliance concerns are the main inhibitors for new deployments [7]. While research, methodologies, and corresponding tool support lying at the intersection of business process management, security and privacy, and (formal) analysis could provide an appropriate basis for tackling these issues, the current state of the art fails to do so [8].

Certification to provably attest and control workflow adherence to properties and *auditing* to detect violations happening at runtime are essential instruments to achieve reliably secure process-aware information systems. The W*f*SAC Workshop series on Workflow Security Audit and Certification brings together researchers and practitioners investigating and applying preventive and detective analyses to check security and compliance requirements for workflow models and the corresponding management systems.

Scientific Program

The program of W*f*SAC addresses these topics. W*f*SAC included two invited speakers, five long papers, and three short papers. The balance of authors from academia and industry shows that the topics addressed at W*f*SAC are of relevance to both communities, indicating a high potential to transfer research techniques into commercial tools.

Keynotes: The *academic* keynote of Ernesto Damiani (Milan University) presented the current state of the art and challenges on service certification, thereby

[7] L. Lowis and R. Accorsi. Finding vulnerabilities in SOA-based business processes. *IEEE Transactions on Service Computing*, 4(3):230–242, August 2011.

[8] Statistisches Bundesamt. *Unternehmen und Arbeitstätten. Nutzung von Informations- und Kommunikationstechnologien in Unternehmen (in German).* Statistisches Bundesamt, 2011.

summarizing the efforts in the EU-funded project ASSERT4SOA. The *industry* invited speech given by Mieke Jans (Hasselt University / Deloitte) addressed the use of process mining [9] in audits. Dr. Jans focused on the current technical limitations and economical inhibitors encountered in the application of process mining techniques in large-scale audits, indicating research topics to improve this situation.

Long Papers

- K. Haller (Swisscom, Switzerland): *Data-Privacy Assessments for Application Landscapes: A Methodology*
- J. Crampton (Royal Holloway, UK), M. Huth (Imperial College, UK): *On the Modeling and Verification of Security-Aware and Process-Aware Information Systems*
- S. Burri (ETH Zurich, Switzerland), G. Karjoth (IBM Research Zurich, Switzerland): *Flexible Scoping of Authorization Constraints on Workflows with Loops and Parallelism*
- A. Baumgraß et al. (Vienna WU, Austria): *Conformance Checking of RBAC Policies in Process-Aware Information Systems*
- E.P. Santos et al. (Curitiba Catholic University, Brazil): *Modeling Business Rules for Supervisory Control of Process-Aware Information Systems*

Short Papers

- E. Ramezani et al. (Furtwangen HS, Germany): *Separating Compliance Management and Business Process Management*
- S. Schefer et al. (Vienna WU, Austria): *Checking the Satisfiability of Binding Constraints in a Business Process Context.*
- T. Stocker (Freiburg University, Germany): *Time-Based Trace Clustering for Evolution-aware Security Audits.*

September 2011

Rafael Accorsi
Wil van der Aalst

[9] W. van der Aalst. *Process Mining – Discovery, Conformance and Enhancement of Business Processes.* Springer, 2011.

Program Committee

The W*f*SAC organizers would like to thank the PC members for their great job producing detailed reports on the submitted manuscripts.

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