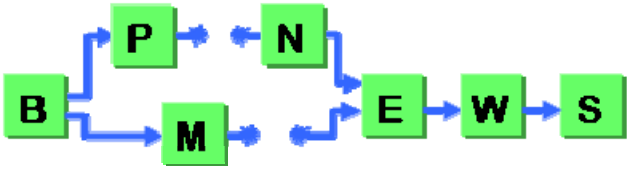


BPM News

Folge 3

Manfred Reichert (Universität Twente, Niederlande)
Stefanie Rinderle (Universität Ulm)
Barbara Weber (Universität Innsbruck)

Liebe Leser,

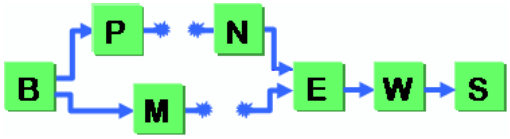
mit der aktuellen Ausgabe des EMISA Forums erhalten Sie Folge 3 unserer EMISA-Kolumne zum Thema *Business Process Management (BPM)*. Themen zur Modellierung und zum Management von Prozessen nehmen bei Veranstaltungen mit EMISA-Beteiligung traditionell eine wichtige Rolle ein. Mit der BPM-Kolumne tragen wir diesem Umstand Rechnung und berichten über aktuelle Themen, Projekte und Veranstaltungen aus dem BPM-Umfeld.

Schwerpunkt der heutigen Kolumne bildet das Thema Standardisierung von Prozess-beschreibungssprachen und –notationen im Allgemeinen und BPEL4WS (Business Process Execution Language for Web Services) im Speziellen. Hierzu liefert Jan Mendling von der Wirtschaftsuniversität Wien ein aktuelles Schlagwort. Des weiteren erhalten Sie eine Zusammenfassung zweier im ersten Halbjahr 2006 veranstalteten Workshops zu den Themen „Flexibilität prozessorientierter Informationssysteme“ und „Kollaborative Prozesse“ sowie einen BPM Veranstaltungskalender für die 2. Jahreshälfte 2006.

Liebe Leser, im Besonderen sind wir auch an Ihren Anregungen und Beiträgen zum Thema interessiert. Wir freuen uns u.a. über Kurzbeiträge zu folgenden Rubriken:

- Vorstellung von Projekten und Arbeitsgruppen
- Aktuelle Schlagworte
- Aktuelle Produktangebote
- Aktuelle Dissertationen & Habilitationen
- Veranstaltungen

Ihre Beiträge und Kommentare senden Sie bitte an Manfred Reichert **(**m.u.reichert@cs.utwente.nl**),** Stefanie Rinderle **(**rinderle@informatik.uni-ulm.de**)** oder Barbara Weber **(**Barbara.Weber@uibk.ac.at**).**



Aktuelles Schlagwort

Business Process Execution Language for Web Service (BPEL)

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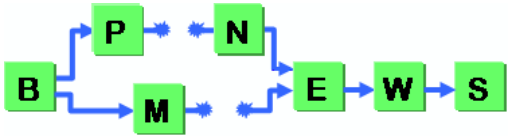
Abstract: BPEL is gaining increasing attention as a potential standard for the definition of executable business processes based on web services. This paper gives an overview of standardization efforts in the area of business process execution, of the main concepts of BPEL, and of its support in practice.

1 Business Process Execution and Standardization

The standardization of business process management and workflow technology has been discussed for more than ten years (see e.g. [Hol04]). Several standardization bodies have proposed specifications for different aspects of business process management. The five bodies that have gained the most attention in this context are WfMC, OMG, BPMI, W3C, and OASIS. The *WfMC* (Workflow Management Coalition) has been the first organization to promote workflow standards. Its Workflow Reference Model distinguishes five interfaces of a workflow system [Hol94]. From WfMC's set of specifications[1] the XPDL standard for process definition (interface 1) is the most prominent (see [Wor05]). The *BPMI* (Business Process Management Initiative) started off in 2000 as an industry consortium to promote business process management standards. In 2002 BPMI published BPML [Ark02], an XML-based language for the specification of executable processes with web service interaction, and in 2004 BPMN [Whi04], a corresponding visual notation for business processes. The *OMG* (Object Management Group) first got involved with workflow technology as they accepted the Workflow Management Facility specification as a standard in 1998. In 2005 OMG and BPMI agreed to merge their business process related activities. As a consequence, BPMN is now an OMG standard. The *W3C* (World Wide Web Consortium) has published several standards for web service choreography. Choreography describes the interaction of distributed processes from a global point of view. WS-CDL [KBR+05] is the most recent specification in this area. It is meant to be utilized in conjunction with process definition languages that define the private implementation of processes. *OASIS* (Organization for the Advancement of Structured Information Standards) is an in-

[1] see http://www.wfmc.org/standards/docs/Stds_diagram.pdf for an overview of WfMC workflow standards and associated documents.



dustry group that defines XML-based standards for web services and business integration. OASIS participates e.g. in the specification of the ebXML framework. For further details on business process related standards see [MzMP05].

Since 2003, OASIS is also responsible for the standardization of *BPEL*[2]. The work on BPEL started with a merger of IBM's WSFL process definition specification with Microsoft's XLANG which resulted in the first version of BPEL [CGK+02]. In 2003 BEA, SAP, and Siebel joined in to extend BPEL to version 1.1 [ACD+03]. Currently, the second version of BPEL is in the final phase of standardization[3].

2 Main Concepts of BPEL

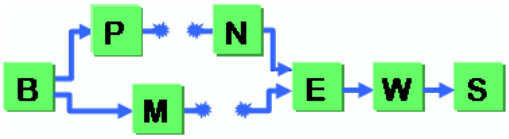
BPEL is an XML-based language that models a business process as a composition from a set of elementary web services. A so-called BPEL engine is a dedicated software component that is able to execute BPEL process definitions. Each BPEL process can be accessed as a web service of the BPEL engine, too. The BPEL specification depends on the W3C standards WSDL for web service description, XML Schema for the definition of data structures, and XPath for retrieval of XML elements. Six of BPEL's most important concepts are briefly presented in the following, i.e., partner links, variables, correlation, basic activities, structured activities, and handlers. We will use the element names of BPEL 2.

- *Partner links:* A partner link provides a communication channel to remote web services which are used in the BPEL process. A respective partner link type must be defined first to specify the required and provided WSDL port types.
- *Variables:* Variables are used to store both message data of web service interactions and control data of the process. A variable must be declared in the header of a BPEL process by referencing a WSDL or an XML Schema data type.
- *Correlation:* As BPEL supports long-running business processes, there may be several process instances waiting for web service messages at a certain point of time. A correlation set specifies so-called properties, i.e. XPath statements to retrieve message parts that are unique for a specific process instance. According to a certain property value, like e.g. $ordernumber = 1002006$, a message is handed to the matching process instance.
- *Basic activities:* The basic steps of a BPEL process are performed by basic activities. There are activities to send and receive messages from web services (receive, invoke, reply), to change the content of variables (assign), to wait for a certain period or up to a certain point in time (wait), or to terminate the process (exit, formally called terminate)[4]. The second version of BPEL introduces an activity to check conformance to a Schema (validate) and the possibility to add proprietary activities

[2]The old acronym is *BPEL4WS* (Business Process Execution Language for Web Services), the new one *WSBPEL* (Web Service Business Process Execution Language). The acronym *BPEL* can be used for both.

[3]The Committee Draft is available at http://www.oasis-open.org/committees/download.php/16024/wsbpel-specification-draft-Dec-22-2005.htm.

[4]Basic Activities in BPEL 2 are: receive, invoke, reply, assign, validate, empty, throw, rethrow, exit, wait, compensate, compensateScope, and extensionActivity.



(extensionActivity).

- *Structured activities:* The control flow of basic activities can be defined in two different styles: block-oriented or graph-based. Both styles can be mixed. Block-oriented control flow can be defined with structured activities. BPEL offers activities to specify parallel execution (flow), conditional branching based on data (if-else) or on receipt of a message (pick), sequential execution (sequence), and different loops (while, repeatUntil, forEach). Structured activities can be nested. Scopes are special structured activities. They mark-off the scope of local variables and handlers. Control flow can also be defined graph-based, but without introducing cycles, using so-called links. A link represents a synchronization between two activities.
- *Handlers:* BPEL provides handlers to deal with unexpected or exceptional situations. Event handlers wait for messages or time events. They can be used to specify deadlines on the process level. Fault handlers catch internal faults of the BPEL process. If the fault cannot be cured, the compensation handler can be triggered to undo the effects of already completed activities. Finally, the termination handler offers a mechanism to force a process to terminate, e.g. due to external faults.

Even though BPEL supports a rich set of primitives to specify executable processes, there are still some features missing towards full-fledged business process specification. The extension activity of BPEL 2 is a useful anchor point to fill these gaps. Currently, there are several BPEL extensions in progress of development, in particular BPELJ[5] for Java inline code, BPEL4People[6] for human worklists, and BPEL-SPE[7] for sub-processes.

3 BPEL Support

Several major software vendors support the standardization of BPEL[8]. Several of these companies already provide BPEL support in their products. Furthermore, there are also open source implementations of BPEL including ActiveBPEL, bexee, MidOffice, and Twister. Therefore, it should be expected that BPEL will soon become not only a de-iure, but a de-facto standard for the definition of executable business processes.

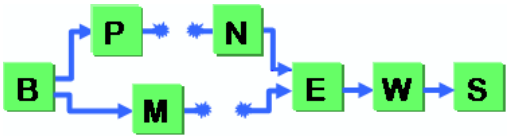
For vendors, there are basically two options to align with BPEL, either to develop a BPEL engine and related tools from scratch or to implement BPEL import and export for existing systems. Oracle is one of the few vendors who offers a generic implementation of BPEL called Oracle BPEL Process Manager. Several other companies have chosen to extend their systems with import and export. In this case, the BPEL process has to be mapped to the object structure of the target system. The mapping between BPEL and graph-based control flow, in particular with unstructured loops, is an interesting challenge for both academia and practice. So-called transformation strategies [MLZ06] can serve as

[5] ftp://www6.software.ibm.com/software/developer/library/ws-bpelj.pdf

[6] ftp://www6.software.ibm.com/software/developer/library/ws-bpel4people.pdf

[7] https://www.sdn.sap.com/irj/servlet/prt/portal/prtroot/docs/library/uuid/5cbf3ac6-0601-0010-25ae-ccb3dba1ef47

[8] WSBPEL Technical committee participants at OASIS are Adobe, BEA, EDS, Hewlett-Packard, IBM, IONA, JBoss, Microsoft, NEC, Oracle, Sterling Commerce, Sun, Tibco, and webMethods



a blue print for that. Ouyang et al. propose a transformation of unstructured loops to event-condition-action rules that are implemented via BPEL event handlers [OvdADtH06]. Another option, but not in the general case, is to derive structured from unstructured loops [ZHB+06]. The simplest solution to this problem for the vendors is to prohibit the definition of unstructured cycles in their process design tool. Then all import and export transformations between BPEL and internal graph-based representation can be implemented without loss of information.

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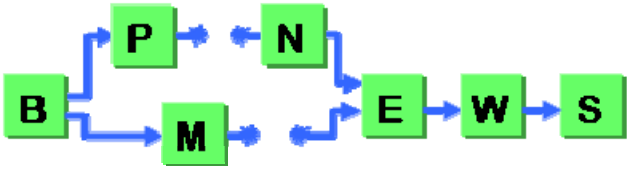


Veranstaltungsberichte

1st IEEE Workshop on Flexibility in Process-aware Information Systems (ProFlex'2006)

Manchester, UK, 26.06.2006

http://wi.wu-wien.ac.at/home/mendling/proflex/

Workshop report provided by

Barbara Weber (Uni Innsbruck)
Manfred Reichert (Universiteit Twente)
Jan Mendling (WU Wien)

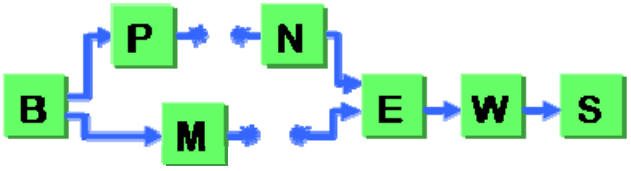
Summary. *The goal of the ProFlex workshop was to bring together practitioners and researchers from different communities who share an interest in flexibility of process-aware information systems and team support. This workshop report gives an overview of the presented papers that address various flexibility issues of process-aware information systems.*

Introduction. The economic success of an enterprise more and more depends on its ability to flexibly and quickly react to changes, e.g., in its market, technology, or legal environment. For this reason companies are developing a growing interest in new concepts, systems, and solutions which help them to flexibly align their organization and their business processes to new requirements and to optimize interactions with customers and business partners. While there has been major progress in disciplines that are interested in structured and unstructured business processes, the agile enterprise is still a vision. Agility in this context refers to the ability of an enterprise to rapidly set up new business processes and projects in order to quickly adapt to changes in the environment and aligning its existing information systems to support them. In order to meet its business objectives, the agile enterprise continuously re-aligns its business processes as well as the interactions with its partners and customers to meet the current requirements.

The goal of the ProFlex workshop was to bring together practitioners and researchers from different communities such as business process management (BPM), software engineering, artificial intelligence, computer supported cooperative work (CSCW), and Groupware who share an interest in flexibility of process-aware information systems and team support. The workshop aimed at discussing the current state of ongoing research, sharing practical experiences, and demonstrating advanced research prototypes. Workshop topics included adaptive processes, agile management of business processes, case handling, configurable processes, dynamic composition of processes, emergent workflows, knowledge-intensive processes, process-aware groupware, process evolution, workflow escalation and compliance management, process mining and learning, workflow flexibility.

Overview of Workshop Papers

- H. Reijers (TU Eindhoven): Workflow Flexibility: The Forlorn Promise (Invited Paper)
- M. Minor, A. Koldehoff, D. Schmalen, R. Bergmann (University of Trier): Flexible Workflows for Digital Design in the Nanoera
- W. Wild, R. Wirtensohn, B. Weber (University of Innsbruck): Dynamic Engines - A Flexible Approach to the Extension of Legacy Code and Process-Oriented Application Development
- C. Seel, P. Delfmann, T. Rieke (University of Saarbürcken & University of Münster): Enterprise System Introduction with Controlling Enabled Configurative Information Models



- A. Freßmann (University of Trier): Adaptive Workflow Support for Search Processes within Fire Service Organisations
- S. Rinderle, U. Kreher, M. Lauer, P. Dadam, M. Reichert (University of Ulm & University of Twente): On Representing Instance Changes in Adaptive Process Management Systems

The invited paper by Reijers discusses what the author calls the flexibility promise of workflow management systems. Since workflow systems capture coordination logic separated from applications, it has been argued that this design facilitates a flexible adaptation. In contrast to that, the practice of workflow usage shows that once a workflow definition is operational, it is hardly touched. Organizations benefit from reduced cycle time, better resource utilization, and other logistic parameters rather than from an assumed flexibility of workflow systems.

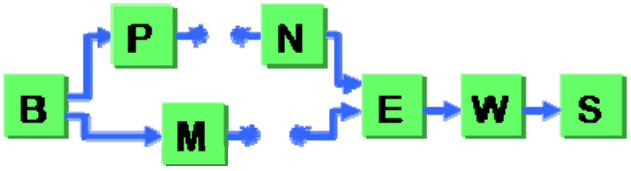
The paper by Minor, Koldehoff, Schmalen, and Bergmann presents ongoing work on an adaptive workflow management system for digital design projects. This work is motivated in particular by the difficulty to balance tight time to market requirements with the need to set up an error free production process which still allows flexible adaptation to meet customer needs. The authors propose to create a process instance from a default workflow definition and offer an adaptation in three ways: add or delete a task, split or bundle instances, and reschedule an instance. In this context, only deviations from the standard process are modelled. The context model allows to assign attribute-value-pairs to the process for efficient retrieval, risk management, and monitoring.

The paper by Wild, Wirtensohn, and Weber presents Dynamic Engines as an approach to flexible process-oriented application development by combining rule engine and workflow technology. At the core of Dynamic Engines the so-called dynamic logic engine supports the execution of process logic and business rules. Several further engines provide calculation, data storage, and security services. In Dynamic Engines users define so-called bricks that capture process semantics and which are executed by the dynamic logic engine. Versioning of bricks permits a flexible adaption to process changes. As such, Dynamic Engines supports high- and low-level process logic as well as business rules.

The paper by Seel, Delfmann, and Rieke introduces a concept for the introduction of enterprise systems with controlling enabled configurative models. The need for efficient and effective customization of enterprise systems stems from major consulting costs both for adapting the system and the organization. In this context, configurable reference models are promising to streamline customization, e.g., based on model projections. The authors extend the reference model life cycle with a controlling phase and identify what extensions to the meta-model of model projections are needed to support controlling.

The paper by Freßmann discusses user requirements of fire service organizations and how adaptive workflow technologies can be tailored to support them. In fire service organizations incident commanders play a central role in dynamic decision making under time pressure and risk considerations. User requirements comprise information support, mobility of work, easy to use technology, consolidation of different information sources, search facilitation, and dynamic adaptation of best practices. On a technical level, the CAKE system meets these requirements by combining computer supported collaborative work (CSCW) speech dialogue and search technology and by offering adaptive workflows that can be reused using case based reasoning.

The paper by Rinderle, Kreher, Lauer, Dadam, and Reichert presents an approach to represent process changes in adaptive process management systems and a respective implementation in the ADEPT2 system. Changes to process templates and process instances have to be captured in a way which avoids inconsistencies between them. So called unbiased process instances (i.e., instances that have not been subject to changes) can be migrated by creating a copy of the old process template. So called biased process

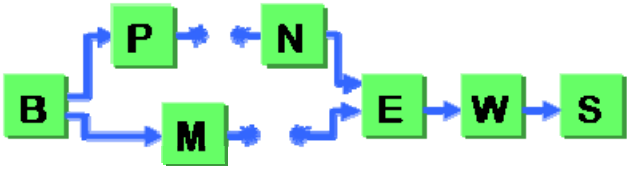


instances (i.e., instances that have been changed, e.g., because of exceptional situations) are migrated using a delta layer that represents the changes to the original template. These two migration concepts have been implemented in the ADEPT2 system as a proof-of-concept.

Conclusion and Future Research Topics. The papers illustrate various flexibility needs of process-aware information systems. Flexibility issues arise at the level of process definition or process model, at the level of process instances, and regarding the interrelation of both. Furthermore, adaptation blurs the tight association between both run-time and process instance as well as build-time and process model:

- The case based reasoning concepts used in the work of Freßmann show how workflow instances become a template for new instances as best practice recommendations.
- Model configuration such as discussed in Seel et al. takes a configurable model to build a design-time, company-specific model which is then utilized to instantiate individual cases of a process.
- The work of Rinderle et al. highlights how changes of an instance have impact on the template and vice versa and how these changes have to be represented at the system level.
- The work of Wild et al. and of Minor et al. raise the question whether a distinction between process template and process instance is necessary.

Following these arguments, it appears as if the relationships between run-time and build-time as well as between process model and process instance have to be rethought in order to provide the degree of process flexibility which is needed in practice. This conclusion is also supported by the paper of Reijers. The inflexibility that he identifies is caused by a strict association of build-time with process models and run-time with process instances. Future research should investigate the relationship between these two poles in more detail by leaving behind the classical separation of process design and process execution as introduced by the workflow reference model of the Workflow Management Coalition.



1st Int'l Workshop on Technologies for Collaborative Business Process Management (TCoB'2006)

Paphos, Cyprus, 23.05.2006
http://www.iceis.org/workshops/tcob/tcob2006-cfp.html

Workshop report provided by

Shazia Sadiq (University of Queensland, Brisbane, Australia)

Manfred Reichert (University of Twente, The Netherlands)

Stefanie Rinderle (University of Ulm)

Preface. Business process management (BPM) has become an extensive area of research with several specialized aspects. BPM is viewed from highly diverse angles ranging from a management strategy to a software system. It is widely acknowledged that process enforcement technologies hold the potential to provide the so called missing middle that can assist in overcoming the notorious business-IT divide. BPM technologies are considered as one of the key success stories in providing process control and monitoring functions, and addressing complex integration requirements in enterprise systems. However, the expectation of what this technology must deliver is a moving target. Whereas the success of coordinative processes depends upon the conformance to the prescribed control flow, the success of the collaborative process depends upon the ability to detect and react to changing conditions. What was true for workflow systems is no longer acceptable in the dynamic and cross organizational requirements for management of collaborative processes.

The intention of this workshop was to provide a forum wherein challenges in modelling and deployment of specifically collaborative business processes can be debated. Areas of interest to this workshop included: Technologies for modeling and analysis of collaborative processes, E-service coordination and composition models, Cross-organizational process management, Event driven process management, Adaptive process management, Context-aware collaborative processes, Ontological aspects of collaborative processes, Knowledge management in collaborative processes, Middleware for collaborative process management, Architectures and implementations for collaborative processes, EAI and B2B technologies, Usability and technology adoption of BPM solutions, Business Process Scenarios: Description, Analysis, Classification.

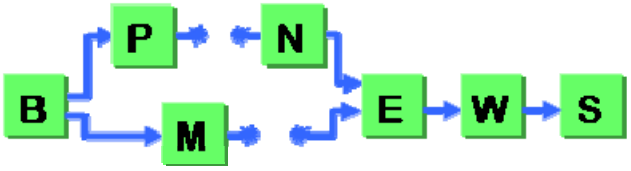
The workshop papers deal with innovative technology solutions related to these challenges. Selected papers have identified three main research streams emerging from current activity in collaborative business process technology research. These relate to (1) modelling of collaborative processes; (2) technology infrastructure for deployment of collaborative processes; and (3) dealing with semantics in collaborative process management. The papers presented provide valuable contribution to one or more of the above broad research streams.

Panel Discussion. The workshop panel discussion mainly focused on three questions:

1) What are Collaborative Business Processes (CBP)?
2) Are we ready for CBP?
3) What are the relevant technologies in the context of CBP?

These questions aimed at finding a "definition" for CPB, at discussing the main research challenges, and at summarizing the current state of the art as well as the current state of commercial systems and technologies.

What are Collaborative Business Processes (CBP)? – The term CBP Business Processes basically consists of two parts, i.e., collaboration and business process. Therefore CBPs can be defined over their business process related aspects (e.g., control flow between observable activities or interactions) and by the collaboration supported by a CBP. A collaboration is taking place between multiple partners within a distributed environment which exchange messages during process execution. Furthermore it is important to specify which business value is generated by the collaboration, i.e., for which reason the partners communicate with each other. Additionally, the distinction between short and long-running CBPs was discussed, in particular with



respect to possible changes arising during CBP execution (i.e., CBPs are not stable and the interactions may change quite frequently). Summarizing the discussion the following definition of a CBP can be derived: A CBP is a business process which reflects a collaboration between different partners by exchanging messages in order to achieve a certain business goal / value.

Since an essential part of CBPs is formed by the business process aspect (i.e., a CBP can be seen as an development of business processes towards partner collaborations) it is interesting to see whether or not the challenges in the context of business processes (i.e., verification, change, etc.) are already solved before we start to talk about CBPs. This led to the second question of the panel discussion:

Are we ready for CBP? – First of all, we can distinguish between open questions regarding the BP part of a CBP and the collaboration part again. Regarding the BP part there are still many challenging topics (e.g., process modeling, process change, exception handling, etc.) which the business process community struggles with. Clearly, these challenges will arise for CBP as well and is has to be investigated whether or not the results from business process research can be (directly) applied for CBP as well.

Focusing on the collaboration aspect there is still no common state-of-the art. Problems identified in this context comprise the unclear definition of process granularity, the data flow (or message) centered instead of control flow centered view on CBPs, the definition of messages, and the structural as well as semantic heterogeneity of CBPs. Could a global standard or industrial standards be helpful in order to solve these "interoperability problems"? From a practical point of view a global standard for CBP is not possible. The development of industrial standards is difficult due to a lack of formalization of CBP so far.

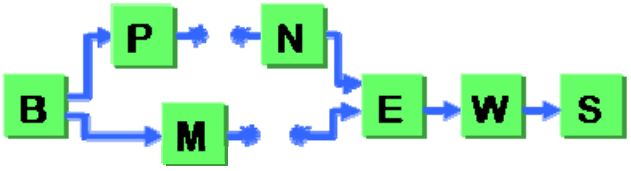
In order to meet the challenges of CBP, first of all, it would be useful to seek a "killer application" within this field. Currently, there is no commercial system which drives the idea of CBP.

Finally, a wrap-up of the relevant technologies on the area of CPB was developed.

What are the relevant technologies in the context of CBP? – Along the red line of splitting the term CBP into "business process" on the one hand and "collaboration" on the other hand the technologies can be classified as well. Accordingly, all technologies within the fields of business process management, workflow and process management are relevant for CBP. For collaboration support, generally all technologies related to services, SOA, service composition, service orchestration, and service choreography are important (e.g., SOAP, WSDL, BPEL). In particular, developments towards standard service description and resultant loose-coupling in application integration is promising for practical applicability of CBP. Currently however, the hype surrounding SOA is somewhat hiding the real complexity and problems.

Abgeschlossene Dissertationen

- Andreas Wombacher: *Decentralized establishment of consistent, multi-lateral collaborations*. TU Darmstadt, Fachbereich Informatik, 2005
- Marek Lehmann: *Data access in workflow management systems*. Universität Klagenfurt, Juni 2005.



BPM Veranstaltungskalender	
September 2006	
05.09. – 07.09.	**BPM 2006**, 4th International Conference on Business Process Management, Wien [http://bpm2006.tuwien.ac.at/] Begleitende Workshops: • **BPD'06** – 2nd Int'l Workshop on Business Process Design [http://workshop.process-redesign.org] • **BPI'06** – 2nd Int'l Workshop on Business Process Intelligence [http://is.tm.tue.nl/bpi06/] • **ENEI'06** – 2nd Int'l Workshop on Enterprise and Networked Enterprises Interoperability [http://www.loria.fr/%7Enacer/ENEI06.htm] • **GPWW'06** – 2nd Int'l Workshop on Grid and Peer-to-Peer based Workflows [http://www.ict.swin.edu.au/conferences/gpww/] • **DPM'06** – Int'l Workshop on Dynamic Process Management [http://www.cs.utwente.nl/~wombachera/dpm_06/] • **Semantics4WS'06** – Int'l Workshop on Semantic Web Service in Business Processes [http://events.deri.at/semantics4ws2006/]
06.09	**I-Know'06,** 6th Int'l Conf. on Knowledge Management, Graz [http://www.i-know.at/] Special Track: • **BPOKI'06** - Business Process Oriented Knowledge Infrastructures 2006
28.09-29.09	NEU: Seminar der Dt. Informatik Akademie (DIA) in Mannheim: Geschäftsprozesse explorieren, modellieren und optimieren (Peter Dadam, Stefanie Rinderle) [**http://www.dia-bonn.de**]
Oktober 2006	
17.10. – 18.10.	**EMISA'06**, Methoden, Konzepte und Technologien für die Entwicklung von dienstebasierten Informationssystemen, Hamburg [**http://bpt.hpi.uni-potsdam.de/twiki/bin/view/EMISA2006/**]
23.10. – 26.10.	**WISE'06**, 7th Int'l Conf. on Web Information Systems Engineering, Wuhan, China [**http://www.sklse.org:8080/wise06/**]
November 2006	
01.11 – 03.11	**CoopIS'06** – 14th Int'l Conf. on Cooperative Information Systems, Montpellier (im Rahmen der OTM'06 - On the Move Federated Conferences and Workshops) [**http://www.cs.rmit.edu.au/fedconf/**] Begleitende Workshops (in Zusammenhang mit Business Process Management): o **MIOS-CIAO'06** – Int'l Workshop on Modeling Inter-Organizational Systems focusing on Collaboration and Interoperability, Architectures and Ontologies [**http://www.cs.rmit.edu.au/fedconf/mios2006cfp.html**] o 3rd OTM Academy Doctoral Consortium [**http://otm2006phd.fzi.de/home.html**]
23.11. – 24.11.	NEU: Seminar der Dt. Informatik Akademie (DIA) in Heidelberg: Service-orientierte Implementierung von Prozessen: Paradigmen, Konzepte, Technologien (P. Dadam, M. Reichert) [**http://www.dia-bonn.de**]
Dezember 2006	
04.12. – 07.12.	**ICSOC'06** – 4th Int'l Conf. on Service Oriented Computing, Chicago [**http://icsoc.org/**]