COVER SHEET

This is an early version of a paper that is to be submitted. An updated version will be loaded to QUT e_prints after acceptance notification.

TITLE:
'Bibliography of process modeling: An Emerging research field'

AUTHOR DETAILS:

Wasana Bandara, School of Information systems, Queensland University if Technology, w.bandara@qut.edu.au
Hui Min Tan, School of Information systems, Queensland University if Technology, h.tan@qut.edu.au
Jan Recker, School of Information systems, Queensland University if Technology, j.recker@qut.ed.au
Marta Indulska, UQ Business School, University of Queensland, m.indulska@business.uq.edu.au
Micheal Rosemann, School of Information systems, Queensland University if Technology, m.rosemann@qut.edu.au

BIBLIOGRAPHY OF PROCESS MODELING: AN EMERGING RESEARCH FIELD

Abstract

Business process modeling has emerged as an immensely popular purpose of conceptual modeling in practice. Research on business process modeling is based on diverse topics of research methods and covers a wide area including modeling techniques, methodologies, methods and tools, but increasingly also empirical studies related to success factors, complexity drivers, experience reports and success measures. This paper contributes to the related body of knowledge by providing a first consolidated annotated bibliography of process modeling with a focus on Information Systems-related research. The paper discusses the overall article extraction method and gives a snap shot of the current research trends, reporting on different publication outlets and of the rigor of the published work. Moreover, it provides a detailed analysis of the specific content of the papers. As such, it provides not only important references for researchers in this field, but also contributes to the design of a research agenda.

Keywords*: Business process modeling, conceptual modeling, annotated bibliography*

1 INTRODUCTION

Conceptual modeling has an established track record as a core activity within the requirements engineering phase of Information Systems analysis and development project [Karimi, 1988, Wand and Weber, 2002, Garda *et al.*, 2004].

Recently it could be observed that conceptual modeling gained popularity for purposes beyond traditional systems analysis and design. Increasingly, conceptual models are used to capture *business* requirements with a focus on business processes. In fact, a recent survey on the conceptual modeling in practice showed that four of the top six reasons why organizations conduct conceptual modeling are related to areas typically associated with business process management, viz., to process modeling [Davies *et al.*, 2006]. This significant attention on process modeling has motivated a fast increasing body of research. The incremental increase in process modeling related publications in IS outlets (as we will show later in this paper), and the increase in the proliferation of modeling projects in practice (justified by the continued interest in business process management-related practices [Gartner Group, 2007] and the vast number of employment vacancies related to analysts equipped with process modeling skills, is evidence of this claim. Despite growing interest, publications on process modeling, within the IS academic community, as reflected by contributions to journals and international conferences, have only recently begun to proliferate. Consequently, it is still a major task for process modeling scholars and practitioners to identify seminal papers and relevant resources related to process modeling. Accordingly, our interest is to provide a contemporary ‘one-stop’ resource on the current status of literature related to the emerging research field of process modeling. Similarly, established IS journals such as MIS Quarterly have increased their efforts to encourage IS scholars to improve knowledge sharing through

communicating and disseminating extant knowledge as captured in domain-specific literature [Watson, 2001].

This paper provides an annotated bibliography on process modeling-related publications published in the main IS journal and conference outlets over the years to 2005. More specifically, the explicit aims of this paper are:

- To identify the primary outlets for research related to process modeling
- To identify the primary research methods applied in process modeling studies
- To identify the main domain areas in which process modeling research is conducted in
- To identify studies that provide insights into *how to* conduct process modeling organized across the process modeling project lifecycle phases
- To identify the critical success factors of a process modeling initiatives and
- To identify how to evaluate (measure the success) of a process modeling initiative
- To provide a research agenda detailing future research opportunities

As such, this is a detailed and IS-specific consolidation of literature related to process modeling. We proceed as follows. The next section describes the literature review method applied in our research. Section 3 then discusses the evolution of process modeling and its position within the Information Systems discipline. Section 4 presents the findings of our literature analysis. We discuss the selection of research methods in process modeling-related studies, the primary outlets in which these studies have been published and discuss type and content of these papers. This paper concludes in section 5 with a summary of its contributions and a research agenda on process modeling based on the conclusions from our research.

2 LITERATURE EXTRACTION AND ANALYSIS METHOD

The first phase in any research project should be a thorough assessment of the literature to find studies related to the research question(s) being addressed [Jenkins, 1985]. An effective review of prior, relevant literature creates a firm foundation for advancing knowledge [Webster and Watson, 2002]. It facilitates theory development, closes areas where a plethora of research exists, and uncovers areas where research is needed. Together, this is deemed essential for establishing and maintaining a cumulative tradition [Kuhn, 1962, Keen, 1980].

Recently, some efforts have been made to provide researchers with guidance for literature review analysis [Cooper, 1982, 1998, Leedy and Ormrod, 2001, Webster and Watson, 2002]. Also, a number of published literature reviews exists [Malone and Crowston, 1994, Klaus *et al.*, 2000, Robey *et al.*, 2000, Dias, 2001, Esteves and Pastor, 2001, Esteves and Bohorquez, 2007] from which guidance can be drawn.

In our study, we followed the operational guidelines provided by Leedy and Ormrod [2001] as well as [Cooper, 1998], as will be discussed below. First, we will discuss the search method; articulating the rationale and method applied to extract relevant studies. Second, we will discuss the analysis approach used to synthesize and analyze the articles that were extracted from the first phase.

2.1 Search Method

In defining the search method for a literature review, three main criteria have to be identified and clarified, following Leedy and Ormrod [2001] and [Cooper, 1998]:

1. the *Domain* (disciplinary area in which the search is conducted in);

2. the *Sources* (which outlets are to be targeted within that selected domain); and

3. the *Search Strategy* (what search terms to utilize during the article extraction process).

The domain selected for this study was Information Systems (IS). This was due to two main reasons. First, the researchers' original discipline is from IS. Second, process modeling has an indisputable relationship with generic IS studies [Seddon *et al.*, 1999]. They argue that 'any aspect of a system development methodology' (process modeling is often used as a system development and analysis technique) will also fall into the broader domain of Information Systems. Literature specifically described how process modeling *is applied* within general Information Systems projects (*e.g.* [Curtis *et al.*, 1992]) and specific IS projects such as Business Process Reengineering projects (*e.g*; [Amoroso, 1998, Scheer, 1998, 2000]) and ES initiatives (*e.g.* [Rosemann, 1998, Wreden, 1998, Gulla and Brasethvik, 2000]). Third, an inclusion of related literature from disciplines such as Requirements Engineering and Software Engineering would have led to an incomprehensible scope for this research. Hence we limited our search within the IS context.

The two main categories; Journals and Academic Conferences were sought, as sources to search for studies within the selected domain. The IS journal ranking, available via the 'ISWorld NET' web site[1] was used, as the list of target journal sources. The IS conferences to target were determined based on those that were

[1] Available at:http://www.bus.ucf.edu/csaunders/newjournal.htm, last accessed November 2nd, 2005.

supported by the Association of Information Systems (AIS)[2]; the premier global organization for academics specializing in Information Systems. Thus, the proceedings of the International Conference on Information Systems (ICIS), European Conference on Information Systems (ECIS), Pacific Asian Conference on Information Systems (PACIS), Australasian Conference of Information Systems (ACIS), and Americas Conference on Information Systems (AMCIS) were reviewed. Our goal was to derive a bibliography that was as complete as possible. Hence these sources were searched from their incipience, with the attempt to extract all related studies published till end of 2005.

In terms of the search strategy, the key words[3]; 'process model*' and 'process map*'[4] were searched for in the title and abstract of the Journal proceedings. Only a title search was conducted when there was no access to article abstracts; which was the case with most of the conference proceedings.

A total of 99 papers that had the term 'process model' within the abstract or title were extracted, which were specific to the IS context. However, during the literature analysis phase, it was noted that a number of papers that were extracted from this search were not related to the business process modeling domain. The terms "process model" was often used in different contexts and referred to other things. For example, some papers described overall methods or procedures that presented a

---

2 For further details, please visit the AIS web site available at: http://www.aisnet.org/, last accessed June 13, 2007.

3 Please note that the key words; 'process modeling', 'business process model' and 'reference model' were used at times when further refinement of the search string was deemed required. A complete search log was maintained and can be provided upon request.

4 The asterisk (*) here is the truncation symbol which allows one to truncate the word root stem to allow for variation in word endings. That way the search pulls up from the database any matching variation on the keyword used in the search.

descriptive model of the process of building or using something, e.g., [Rolland *et al.*, 1995, Shanks *et al.*, 1997, Flynn and Hussain, 2004], which has no relevance to business process modeling. Others, e.g., [Joyce and Winch, 2004] described some form of business model[5] with the term 'process model'. These articles were removed from the collection due to their irrelevance.

In addition to this approach, the guidelines of Webster and Watson [2002] were also followed to include in the search method articles from beyond the primary search domain. Accordingly, articles cited within already extracted studies, peer recommended articles and articles extracted from random non-systematic searches were also included within our literature analysis so as to increase the scope of coverage and pay justification to the inter-disciplinary nature of the IS discipline [Lee, 2001]. Figure 1 summarizes the scope of the overall search conducted.

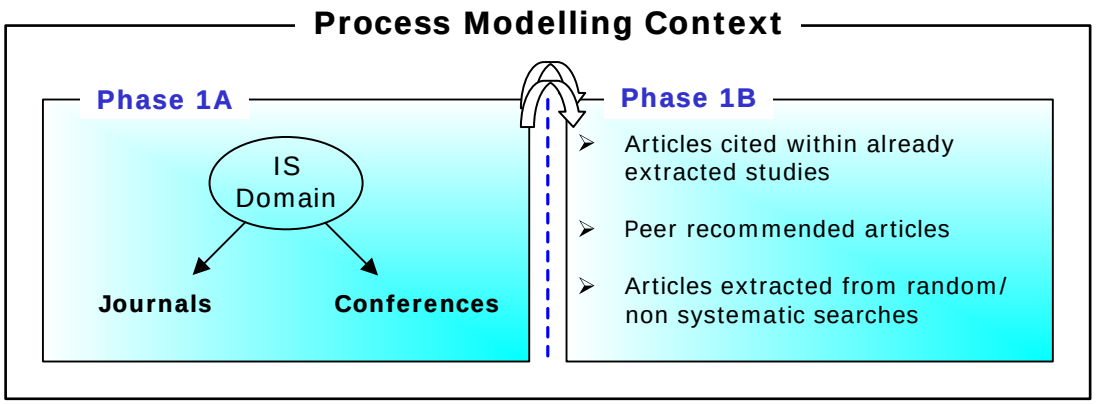

Figure 1: Summary of literature search method

5 In this context, a 'business model' is a description of the roles and relationships among the different stakeholders of an organization (i.e., customers, allies and suppliers), which describes from a very high conceptual level major information flows and benefits to participants [Joyce and Winch, 2004].

2.2 Article Analysis Approach

In organizing, classifying, coding and analyzing the extracted literature, the qualitative data analysis tool NVivo[6] was utilized as a documentation and synthesis tool to codify and classify the widely dispersed literature on business process modeling which has been extracted. The advantages of using such a tool were: (a) the ability to maintain a single digital repository of the articles and the annotations, (b) the inbuilt functionalities of the tool that assisted with the maintenance of article attributes (i.e., source, year) and the ability to search for specific queries (i.e., via matrix intersection searches etc), and (c) to assist the researchers in maintaining close links between the information analyzed and the overall goals of this effort [Bandara, 2006]. There are other tools, such as Endnote, to support the bibliographic management aspect of a literature review. But qualitative software tools such as NVivo, can furthermore be used for the synthesis process; thus, they complement bibliographic management software.

All the articles extracted (from phase 1A – see Figure 2.1) were entered and saved within NVivo as text documents. Separate memos[7] and/or proxy documents[8] were created for those that were not available in plain text form. A set of nodes[9] were predefined prior to the article analysis, based on the study objectives mentioned above. This set of nodes was later re-specified as deemed relevant as the analysis

---

6 For further details on the tool, please see its web page, available at http://www.qsrinternational.com/products/productoverview/product_overview.htm, last accessed June 13, 2007.

7 A 'memo' within NVivo is any document containing comments on another document or a node. Any NVivo project document can be flagged as a memo.

8 A proxy document is simply a representation of a particular piece of work (i.e. like a set of summary notes resulting after reading an article; with page numbers, sample quotes etc).

unfolded. Two researchers coded the articles. In the first phase, one researcher did the complete set of coding and the other conducted coding for a selected small sample (30 random articles) to ensure the suitability of the nodes and attributes being created and defined. Annotations were maintained within these nodes and as memos (when extra self notes were created). Once the database was set up and the articles coded, different queries, based on the simple and advanced search facilities embedded within the tool, were performed. Section 4 discusses the results from this analysis. Yet, in order to enable the reader to develop a comprehensive appreciation of the phenomenon of process modeling, we will in the following briefly discuss the evolution of process modeling and its role in the Information Systems discipline.

3 EVOLUTION AND ROLE OF PROCESS MODELING

The current role of process modeling is influenced by, and intertwined with, both the information systems and the business process management perspectives and approaches that are being widely adopted by organizations.

Traditional forms of conceptual modeling in the process of information systems analysis and design accounted only for the organization's data and, if at all, that portion of its processes that interacted with data. Newer uses of information systems, however, extend deployment beyond transaction processing into communication and coordination, viz., a process-aware perspective on information systems [Dumas *et al.*, 2005]. This gave rise to the exercise of conceptual modeling of business processes. Process modeling is widely used within organizations as a method to increase awareness and knowledge of business processes, and to deconstruct

---

9 Nodes are 'folders', within NVivo where one can store ideas and categories.

organizational complexity [Bandara *et al.*, 2005]. More specifically, process modeling is used for a wide range of tasks [Hammer, 1990, Davenport, 1993, Hammer and Champy, 1993, Keller and Meinhardt, 1994, Tsalgatidou and Junginger, 1995, Gulla and Brasethvik, 2000, Peristeras and Tarabanis, 2000, Supply Chain Council, 2001, Rosemann, 2003, Dreiling *et al.*, 2006, van der Aalst *et al.*, 2007], including

- model-based identification of process weaknesses,
- adapting best business practices,
- designing and communicating new business blueprints,
- end-user training,
- compliance and risk management, and
- designing and configuring software systems

Many studies have shown the relevance of process modeling to both BPM initiatives [Davenport, 1993, Rosemann, 2006] as well as Information Systems-related endeavors. For instance, process modeling denotes a requirement for a number of ISO 9000 quality programs [Ould, 1995] and is also the basis of information system implementations, such as Enterprise Systems [Robinson and Dilts, 1999, Dreiling *et al.*, 2006] and Workflow Management Systems [van der Aalst *et al.*, 2003, Dumas *et al.*, 2005]. The literature also reports how process modeling has been employed in a range of different applications within an operating business, including: activity based costing, supply chain management, customer relationship management, total quality management, workflow management, knowledge management and business

simulation, e.g., [Curtis *et al.*, 1992, Georgakopoulos *et al.*, 1995, Kim and Kim, 1997, Kiepuszewski *et al.*, 2003, Sierhuis *et al.*, 2003, Dehnert and van der Aalst, 2004].

In simple terms, process modeling is an approach for visually describing how businesses conduct their work [Davenport, 2005]. It typically includes graphical depictions of at least the activities, events/states, and control flow logic that constitute a business process [Curtis *et al.*, 1992]. Additionally, many process models also include information regarding the involved data, organizational/IT resources and potentially other artifacts such as external stakeholders, performance metrics, etc [Tsalgatidou and Junginger, 1995].

Process models are specified using a *grammar*, or language or technique, (i.e., a set of constructs and rules to combine those constructs), a *method* (i.e., procedures by which the grammar can be used), a *script* (i.e., the product of the modeling process), and a *context* (i.e., the setting in which the modeling occurs), in accordance to Wand and Weber's [2002] framework for conceptual modeling.

Process modeling was originally incepted in the manufacturing industry as a means of analyzing material flow and activities in order to improve the product quality and to reduce manufacturing cycle time [Scheer, 1994]. Advancements in the development of business process modeling, however, have also been influenced from other areas including, for example, CSCW and groupware [Ellis, 1991], office automation [Holt, 1988], software engineering [Curtis *et al.*, 1992], requirements specification [Yadav *et al.*, 1988], conceptual modeling [Brodie *et al.*, 1984] and transaction management [Reuter and Wächter, 1991].

4 FINDINGS

4.1 Primary Process Modeling Study Outlets

This section summarizes process modeling studies across the two main sources (IS journals and IS conference proceedings), across different years, specifically pertaining to the IS domain. Table 1 illustrates the count of papers extracted for each main source across the years.

	Process modeling papers published in IS journals by year												
	MISQ	ACM	IEEE	JMIS	IJMS	IM	DSS	JSS	IS	AMR	SMR	SIGOIS	**Total**
1985	0	0	0	0	0	0	0	0	0	0	0	0	0
1986	0	0	0	0	0	0	0	0	0	2	0	0	2
1987	0	0	0	0	0	0	0	0	0	0	0	0	0
1988	0	0	0	0	0	0	0	0	0	0	0	0	0
1989	0	0	0	0	0	0	0	0	0	0	0	0	0
1990	0	0	0	0	0	0	0	0	0	0	0	0	0
1991	0	0	0	1	0	0	0	0	0	0	0	0	1
1992	1	1	0	0	0	0	0	0	0	0	0	0	2
1993	0	0	0	0	0	0	0	0	0	0	0	0	0
1994	0	0	0	0	0	0	0	0	0	0	0	0	0
1995	0	0	0	1	0	0	0	0	1	0	0	3	5
1996	0	0	1	0	0	0	1	0	0	0	0	0	2
1997	1	0	1	0	0	1	0	0	1	0	0	0	4
1998	0	0	2	0	0	1	0	0	0	0	1	0	4
1999	0	0	0	1	0	1	1	0	2	0	0	0	5
2000	0	0	1	0	0	0	1	1	2	0	0	0	5
2001	0	0	0	0	1	1	0	0	1	0	0	0	3
2002	0	0	0	0	0	1	1	0	2	0	0	0	4
2003	0	0	1	0	0	0	1	0	1	0	0	0	3
2004	0	0	0	0	0	0	0	0	0	0	0	0	0
2005	1	0	3	0	0	0	0	4	0	0	0	0	8
Total	3	1	9	3	1	5	5	5	10	2	1	3	**48**

Process modeling papers published in IS conferences by year						
ACIS	ECIS	AMCIS	PACIS	ICIS	**Total**
0	0	0	0	1	1
0	0	0	0	1	1
1	0	1	1	0	3
0	0	3	0	0	3
3	0	3	0	1	7
2	1	3	1	1	8
0	0	3	2	0	5
2	2	0	1	1	6
0	1	1	1	0	3
2	3	0	3	1	9
0	1	3	1	0	5
10	8	17	10	6	**51**

Table 1: Process modeling papers published in IS journals and conferences by year

Figure 2 graphs the data from Table 1 in a longitudinal display and shows the growing nature of the field. Process modeling related literature first appeared in IS Journals in 1986, and was very scarce till the mid 1990s. A total of 51 conference papers were extracted, the very first conference paper was published ten years ago by

Kim [1995] at the International Conference on Information Systems (ICIS). Kim argued in 1995 the critical role that process modeling plays, particularly in business process redesign projects, and points out the need for more formalized modeling approaches.

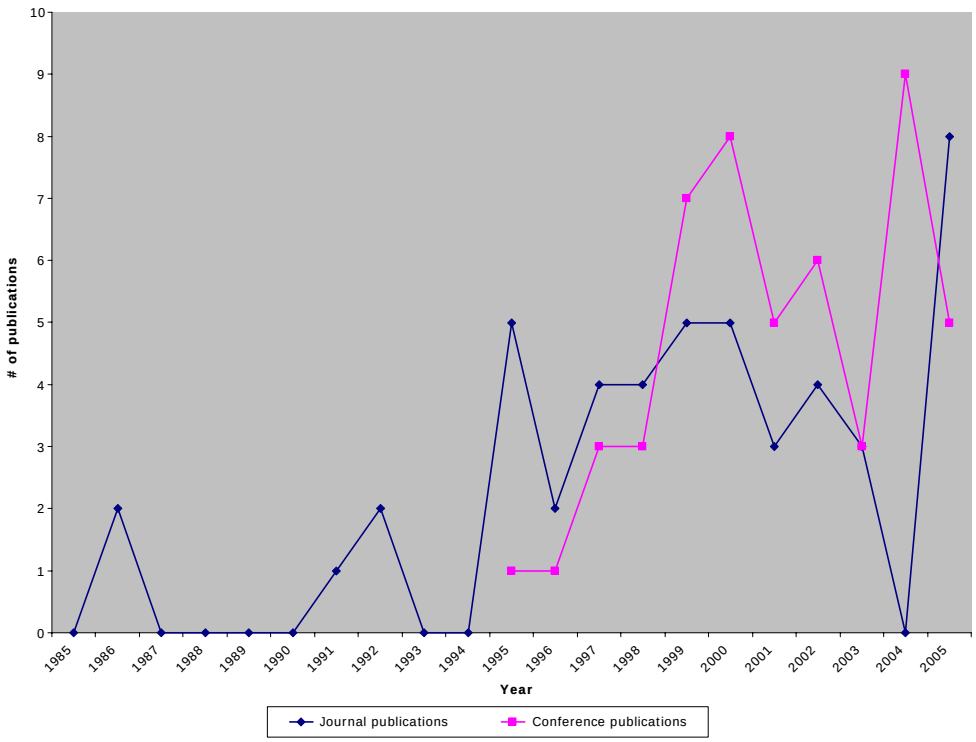

Figure 2: Longitudinal display of number of publications in journals and conferences per year

4.2 Primary Research Methods Applied within Process Modeling Studies

This section reports on an analysis of the extracted literature based on the different types of research techniques that have been applied. The IS research design framework used by Orlikowski and Baroudi [1991] was used to classify the different research methods reported within the extracted process modeling studies. Following Orlikowski and Baroudi [1991], the articles were grouped into three broad categories: 'practical experience', 'conceptual' and 'empirical'. The 'empirical' articles were further categorized into six (6) sub-categories, viz., survey, experiment,

case study, multi-method, action research, and instrument development & protocol analysis.

We tried to define these groups as clearly as possible. For clarification purposes, the categories as used for our classification are introduced and described in Table 2.

Research Method Classification	**Description**
1. Practical Experience papers	The *practical experience* approach refers to reports or descriptions of a project or initiative within industry in narrative form with no empirical data collection efforts. These are non-research papers presented mostly by practitioners.
2. Conceptual Research	The *conceptual research* approach refers to studies that formulate emerging concepts, models and frameworks. Studies categorized under this report findings at a proposed conceptual level which have not been empirically tested (please note that some work-in-progress research work that claimed to apply more rigorous research methods, but reports only on preliminary findings prior to the application of the proposed research method, has also been categorized under this).
3. Empirical Research	All studies that were reported with some form of empirical data collection and analysis were included in this category and were further classified into one of the six (6) sub-categories below.
3.A Survey	The *survey* approach refers to an empirical investigation where data for a large number of organizations is collected through methods such as questionnaires, telephone interviews or from published statistics, which will be analyzed using statistical techniques [Pinsonneault and Kraemer, 1993].
3.B Experiment	The *experiment* approach, refers to a set of actions and observations performed to support or falsify a hypothesis or research concerning phenomena, exerting some form of control over the phenomenon (please note that the term 'actions' can also refer to the experimental implementation of conceptual models) [Cook and Campbell, 1979].
3.C Case Study	The *case study* approach is an empirical investigation into the contemporary events within the real-life context with an emphasis on qualitative analysis [Yin, 2003]. Data can be collected from a small number of organizations through methods including participant-observation, in-depth interviews and longitudinal studies.
3.D Multi-method	A mixed-method approach refers to the use of more than one method, using both qualitative and quantitative data gathering techniques [Gable, 1994].
3.E Action Research	The *action research* method is a cognitive process where the observations made from the respective actors is used in a cyclical process. The aim is to contribute both to the practical concerns of people in an immediate problematic situation and to increase the understanding of change processes in social systems [Baskerville and Wood-Harper, 1996].
3.F Instrument Development and Protocol Analysis	This category included papers that solely reported information about the derivation of a survey instrument or the testing of a detailed protocol. For example, Research in progress papers that consisted of articles that merely described the design of a pilot study (e.g., a survey or case study) and when the findings were used primarily to refine the instrument or protocol.

Table 2: Definitions of the categories used for analyzing the research methods used in process modeling studies

Since the research methods used in the literature were not always explicitly stated in papers, in our categorization we included only those that specifically mentioned the

research method. Table 3 displays a summary of this analysis and indicates which study reported on what research method.

Practical Experience	Conceptual Research		Empirical Research					
			Case Study	**Survey**	**Action Research**	**Multi-method**	**Experiment**	**Instrument development and protocol analysis**
Kim [1995]	Abraham and De [1999]	Lin et al. [Lin *et al.*, 2004]	Abu et al. [2005]	Brash [1999]	<none were found>	Kettinger, Teng and Guha [1997]	Bi and Zhao [2004]	Davies, Rosemann and Green [2004]
Stewart and Rosemann [Stewart and Rosemann, 2001]	Beck and Schornack [2005]	Liu and Shen [2003]	Chan and Rosemann [2002]	Green and Rosemann [2000b]			Dobson et al. [2005]	
Stewart, Rosemann and Hawking [2000]	Caetano et al. [2005]	Loos and Allweyer [1998]	Djohan, Churilov & Wassertheil [2002]	Dennis, Daniels and Robert [1999]d			Hwang and Yang [2002]	
	Chen, Ling and Xu [2004]	Neiger and Churilov [2002]	Greasley [2000]	[2002]			Kavakli and Loucopoulos [1999]	
	Dori [2000]	Okonski and Parker [2003]	Holden and Wilhelmij [1995]				Mendes et al. [2003]	
	Eljabiri and Deek [2001]	Rohloff [1996]	Keung and Kawalek [1997]				Murtaza, Gupta and Shah [1999]	
	Ellis et al. [2004]	Rojas and Peréz [1998]	Kim and Kim [1998]				Polan [1998]	
	Georgakopoulos et al. [1999]	Sadiq and Orlowska [2000]	McGrath [2003]					

	Green and Rosemann [2000a]	Shin and Holden [2000]	Newman and Sabherwal [1989]					
	Heiskanen, Newman and Similä [1996]	Soffer, Golany and Dori [2003]	Paul and Serrano [2004]					
	Jablonski [1995]	Sundstrom [1997]	Phalp and Shepperd [2000]					
	Johannesson and Perjons [2001]	Snyder et al. [1998]	Pulkkinen and Hirvonen [2005]					
	Kemper and Wolf [2002]	Teufel and Teufel [1995]	Coleman [2005]					
	Kim and Kim [1997]	Tsalgatidou and Junginger [1995]	Sutanto et al. [2004]					
	Kitjongthawonkul and Khosia [1999]	Turk and Vaishnavi [1998]						
	Koch [1999]	Turk and Vaishnavi [1999]						
	Koubarakis and Plexousakis [2002]	Weigand, Verharen and Dignum [1997]						
	Kwahk and Kim [1999]							

Table 3: Primary research methods applied within process modeling studies

Figure 3 provides a graphical view of this analysis and depicts that most process modeling studies reported work at a conceptual level. Our findings provide evidence for the arguments of Moody [2005] who lamented a lack of empirical work in the area of conceptual modeling in general and process modeling in particular. We concur with Moody that this indicates an early or premature stage of maturity in this research discipline. Moves towards more empirical work in this area would be a pre-requisite for an evolving research discipline with a cumulative tradition that builds on the existing body of knowledge, has an awareness for the remaining open challenges, and is guided by a methodological procedure in its future research efforts [Keen, 1980, Weber, 1997].

The lack of empirical research in the area of process modeling can also partly be attributed to the fact that process modeling attracts many researchers from non-classical IS disciplines (e.g., software engineering, requirements engineering) that traditionally exhibit a much stronger focus on non-empirical work. Amongst the empirical work that is being conducted, case study and experiments are the most popular within the process modeling field.

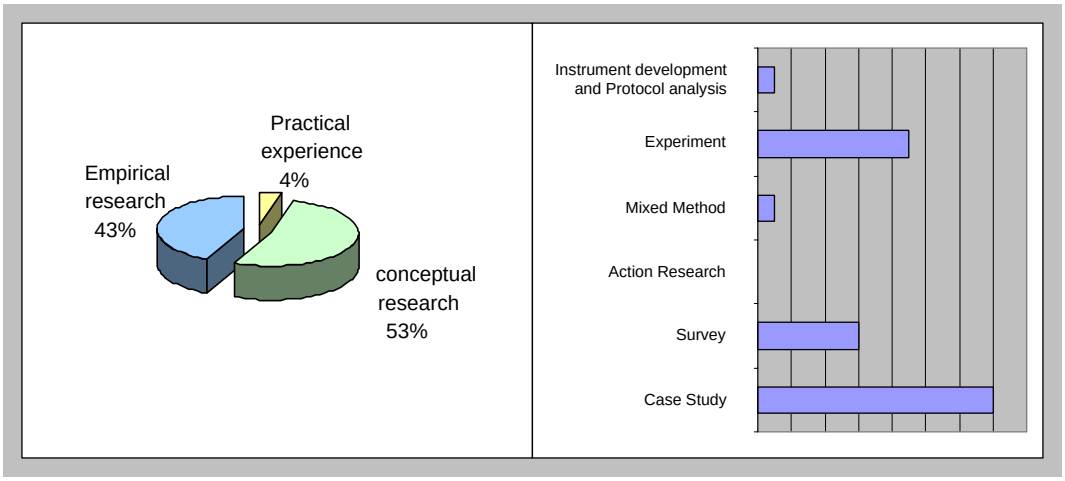

Figure 3: Overview of the research methods applied in the process modeling domain

4.3 Reported process modeling research contexts

Process modeling occurs before the background of an organizationally and information technology-supported setting in which process models are created to fulfill multiple purposes. Wand and Weber [2002, p. 317] note in their research agenda for conceptual modeling that "we need to understand better how the context affects modeling work and, in turn, how modeling and use of models affect elements of the context."

Accordingly, an overview on the type of contexts in which current process modeling research is mostly prevailing, is useful (a) as a reference to point to studies conducted within certain contexts, and (b) to identify gaps (and hence areas for potential research).

There were no prior established frameworks that could be used to capture the relevant contexts within which process modeling related research is conducted. Hence, a bottom-up approach was applied from the collated studies themselves, based on the primary domain in which the studies directly referred or were related to, to derive this classification. We went through two rounds of coding. The first round was to explore and identify potential candidate classification categories. New categories were identified when a coder was unable to relate the study with any of the existing categories. Furthermore, if an aspect of an existing category was continuously mentioned with further emphasis on one or more of its elements, a new sub-category was created.

During the second round of the coding process, we attempted to re-categorize the papers based on the new structure and made the necessary amendments. In the case where two or more research contexts were being mentioned, we then made a decision based on the category that resonates more dominantly in the paper. Figure 4 shows an excerpt of papers that were categorized under various identified process modeling purposes (as reported above). It can be observed that studies which are specifically related to process modeling are scarce. Most of

the process modeling studies reported in the IS field are within the context of software development. This observation can also be found in prior literature. Kim [1995, p. 109], for instance, observes that “on the research front, much of the research on process modeling has been conducted on the software development process [e.g., Curtis *et al.*, 1992], thus being too formal and engineering-oriented to be useful for modeling business processes from the customer's perspective as required in BPR.”

It can be observed that studies that specifically relate to process modeling are scarce. Most of the process modeling studies reported in the IS field are within the context of software development. Business process reengineering, business process management and workflow engineering are the next to follow. The most prevalent theory in use appears to be ontology.

It should be acknowledged that there is a much larger pool of literature that is published in various other outlets (e.g., books or outlets specific to different disciplinary areas such as Software Engineering, Workflow, etc.) that relates to how process modeling is applied in these different contexts. A good example for these types of contributions that we do not discuss in great detail in this paper is work related to the workflow patterns framework [van der Aalst *et al.*, 2003]. This framework strives to bring insights into the expressive power of the process modeling languages implemented in leading workflow management systems and hence outline similarities and differences between the analyzed systems. It covers control flow [van der Aalst *et al.*, 2003], data [Russell *et al.*, 2005a], resource [Russell *et al.*, 2005b]and exception handling patterns [Russell *et al.*, 2006a] and has been used to evaluate a wide variety of tools and techniques [e.g., Wohed *et al.*, 2003a, Wohed *et al.*, 2003b, Russell *et al.*, 2006b, Wohed *et al.*, 2006].

However, in the interest of brevity (as explained earlier), this literature review limited its scope to the IS domain – in particular to major journals and conferences.

Figure 4: Process modeling contexts

4.4 Studies that provide process modeling procedural guidelines

This section reports on those studies that provide procedural guidance on how to conduct a process modeling project from beginning to end. Literature relating to this topic can be broadly categorized into two areas: (i) those that provide a generic overview on how to conduct process modeling, and (ii) those that provide specific guidelines on how to conduct a specific phase(s) of the process modeling lifecycle. In the following, first an overview on those papers that provide a generic overview will be given and then the contributions made by

different papers for each of the modeling lifecycle phases will be discussed. All literature extracted from this search was analyzed in search of any process modeling procedural guidelines.

Generic Procedural Guidelines for Process Modeling

Only limited work has established general guidelines for process modeling. Amongst the early attempts in this area are the guidelines of process modeling proposed by Becker et al. [2000], a framework that defines six general guidelines, viz., correctness, relevance, economic efficiency, clarity, comparability and systematic design. This approach proposes the differentiation of different abstraction layers for ensuring high-quality process modeling. On a first layer, for instance, generic general modeling guidelines are suggested. These guidelines are then refined for certain views, e.g., models for business processes, and finally broken down to fully specified guidelines for certain modeling techniques (e.g., Event-driven Process Chains). The approach, however, lacks a sound theoretical methodology, and provides only limited empirical proof as to its feasibility as a quality framework [Rosemann *et al.*, 2001b].

Turk and Vaishnavi [1999] present two general process modeling frameworks. The first one focuses on the potential issues that can come up in a modeling project and presents an “issues list” as a checklist for practitioners to try to address (in order to avoid problems) prior to a modeling project. These issues are broadly categorized into six dimensions, viz., core process modeling issues, sequencing or constraint issues, goal issues, process improvement issues, enactment issues and miscellaneous issues. Their second framework presents a number of general principles that should be given consideration when creating a process model – they name it a solution framework. This solution framework suggests to first create a broad set of models (such as meta-models, application models, domain model, etc.) and then to pay close

attention to key process modeling concepts (such as multileveled modeling, process improvement opportunities etc).

Procedural Guidelines for Process Modeling – Across Specific Modeling Lifecycle phases

There are six core phases that exist in any process modeling initiative, these being goal identification, process identification, information gathering, process model generation, analysis, and continuous improvement [Jacka and Keller, 2002].

The following subsections summarizes the studies that contribute to each of these different phases.

- Goal identification

This phase relates to identifying the primary purpose or intention of process modeling and articulating it. Tsalgatidou and Junginger [1995] discuss the criticality of defining goals, specifically within a BPR context and state that re-engineering goals influence the selection of the modeling approach. Kavakli and Loucopoulos [1999] discuss how process modeling can be used to depict business goals. They argue that business processes constitute the means to fulfil strategic business goals. They go on to argue that a business process is essentially a purposeful system in itself. Thus, each actor involved in the process intends to achieve one or more defined goals. The authors discuss a hierarchical structure in how one can present business goals via process models. Koubarakis and Plexousakis [2002] discuss enterprise goals and organizational goals and how they can be described either formally or informally using process models. They also discuss how these goals can be reduced into alternative combinations of sub-goals. Teufel and Teufel [1995] describe a strategic alignment model that serves as a planning framework to setting innovation- and improvement-goals.

Recently, further efforts were made in the area of combining goals with process models. Soffer and Wand [2004, 2005, 2007] discuss the importance of goal identification and goal

representation for assessing the adequacy or validity of process models and propose an approach for formally integrating goal concepts within process models based on the General Process Model [GPM, Soffer *et al.*, 2001].

- Process Identification

This phase relates to identifying which processes to target within a process modeling project and in which order these processes should be modeled, analyzed or improved. Hwang and Yang [2002] state that in general, practices for identifying a process to model are usually performed in an ad hoc manner, involving numerous meetings and discussions with authorized and knowledgeable persons. Along similar lines, Tsalgatidou and Junginger [1995] state that regardless of what the literature suggests on best practices, usually an organization's strategic management unit selects the business process(es) that should be re-engineered and hence modeled.

Cowan [1986] proposes the value chain method introduced by Porter and Millar [1985] as a useful technique for delineating business processes in an organization. He uses the 'upstream' and 'downstream' metaphors to illustrate how the process flows can be followed. He then proposes another method for process identification, namely the Core Process Technique, which views a company's business as consisting of three or four core processes critical to the strategic directions and key problems in competitiveness. Furthermore, he argues that strategic management techniques such as the Critical Success Factors method can be applied to evaluate each identified process as to its strategic relevance, which would help to identify a set of candidate processes for reengineering that are critical to the firm's performance.

Curtis, Kellner and Over [1992] argue that the selection of the modeling scope will depend on the uses to which the model will be put. They also discuss the challenge of finding the right level of detail to model. Determining that a process element is a process step depends, in the

view taken by the authors, in part on whether any further de-composition of the element's structure would contribute to support the objectives of the process model.

Greasley [2000] states that the selection of which processes to model entails identifying those process elements that require redesign in order to meet the strategic objectives of the business unit and further describes how the Balanced Scorecard [Kaplan and Norton, 1996] can be incorporated as a 'balanced' set of performance indicators for this purpose. Greasley [2000, p. 2004] also states that "once a suitable level has been found it is necessary to identify the critical success factors (CSF) across the core perspectives which identify 'what needs doing well' in order to meet the unit's strategic objectives. The next stage is to identify the internal business processes which impact on these CSF's, which can then be mapped and redesigned." He goes on to propose that the identification of the relevant business processes can be undertaken using a scoring system such as the performance/importance matrix [Martilla and James, 1977] on which processes can be plotted in terms of how well the organization performs them and how important they are.

Kavakli and Loucopoulos [1999] critique existing approaches in that they offer little guidance for identifying business processes. They propose an activity-oriented approach. Here, the main mechanism for grouping activities into processes is that of composition/de-composition. However, the authors also admit that this mechanism does not offer a unique way to identify a process.

Kim and Kim [1998] state that in order to identify candidate business processes, one should start with the critical success factors (CSF) of the organization, based on which candidate business processes can be derived that are responsible for creating, affecting or monitoring these CSFs. Liu and Shen [2003] state how a modeler can define various process abstractions without being restricted by original process definitions since process-views are derived from a

base process by bottom-up aggregation. Teufel and Teufel [1995] promote a strategic alignment model as a primary framework for the

identification of critical business processes.

- Information Gathering

This phase relates to gathering the critical information that is essential for creating process models. Despite improvement in various aspects of process modeling, the elicitation and analysis of the required information, is one of the least explored [Richards, 2000].

Dennis, Hayes and Daniels [1999] argue the importance of the information gathering phase and state that the methods for capturing the information for use in process models have received virtually no research attention. They note that only little formal empirical research exists that examines the process by which model information is collected. They suggest interviews and joint application design (JAD) as two commonly used information capturing methods. They further state that the technique of interviewing individuals with expert knowledge of processes has been common, in both process modeling and information requirements determination. In their study, Dennis, Hayes and Daniels [1999] then examine and describe the advantage of using Group Support Systems (GSS) over more traditional information gathering techniques such as interviews and JAD sessions. They report that usage of GSS reduced the time to build models by 75% and that the quality of the models were equal or better to those that were created from interviews and JAD sessions.

Kettinger, Teng and Guha [1997] observe that consultants sometimes use simple depiction techniques such as process flow charts or more structured techniques such as role activity diagramming and workflow modeling to assist them in gathering and confirming the information. They also propose speech interaction modeling (which involves analyses of communication and information flows using the metaphor of speech-action).

Kim and Kim [1998] suggests forms and the fields within them as a good starting point for data gathering when designing process models for Business Process Re-engineering and elaborate on the use of forms for this purpose.

- Model Generation, Analysis and Continuous Improvement

Procedural guidelines to support these later phases were very scarce. In fact, no studies extracted contributed to the process model generation or analysis procedures, and only a few briefly talked about the continuous improvement phase suggested by Jacka and Keller [2002]. Kavakli and Loucopoulos [1999] advocate that change management should be an integral part of the process modeling lifecycle. It should be integrated within the phases of identifying business goals and relating business processes to these goals. Im, El Sawy and Hars [1999] discuss the role of continuous improvement and note that lack of training is one of the main reasons for project failure. Furthermore, the authors state that CASE (Computer-aided Systems Engineering) tools encounter organizational resistance from system developers due to the required changes in their way of working induced by the change from artist to engineer. They discuss how most organizations have found it difficult to implement CASE tools because of costs, resistance by systems developers and unacceptable learning curves.

4.5 Identification of critical success factors (CSFs) of process modeling initiatives

While the section above identified studies that illustrate the different phases related to conducting a process modeling project, this section summarizes those critical elements that have been implicitly or explicitly reported as essential ingredients for the successful conduct of a process modeling project. Again, a bottom-up approach was applied here to derive these critical success factors from the literature itself.

Coleman [2005], Curtis, Kellner and Over [1992], Rosemann, Sedera and Gable [2001a], Bandara et al. [2005], Sedera, Rosemann and Doebeli [2003] as well as Bandara [2005], Sedera, Rosemann and Gable [2002] and Tsalgatidou and Junginger [1995] all discuss critical success factors in general. However, they do not discuss individual factors in detail. In the following, the existing literature is examined in respect to the specifically identified critical success factors.

Modeling tool as a critical success factor: Im, El Sawy and Hars [1999] reports on a study conducted on CASE tool implementation and report on related difficulties in the implementation namely; resistance from analysts and programmers, lack of training, lack of user support, and lack of tool competence.

Management support as a critical success factor: Bhatt and Stump [2001] argue that it is widely recognized that IS development related projects require considerable commitment from top management in terms of physical, financial, and personnel resources. In their paper they discuss management support in a view that reflects the market-pull (also referred as top-down) approach of how IS networks develop.

Modeling method as a critical success factor: Kim and Kim [1997] state that the "lack of a disciplined method to model business processes has been a problem in many BPR efforts", thus indicating it necessity for success. Koubarakis and Plexousakis [2002] states that the vast majority of business process modeling efforts that lack formal methods for verifying properties of processes is a inhibiter for success.

Sense of ownership as a critical success factor: Chan and Rosemann [2002] discuss that model users had a higher appreciation for semantic quality when they had strong ownership and responsibility of the model.

4.6 Identification of Process Modeling Evaluation Approaches

While widely practiced in industry, process modeling initiatives can be very resource intensive. Hence, the evaluation of such projects is vital for the justification of modeling tasks and for future enhancements of the field. In general, evaluative studies related to process modeling can be grouped into three main clusters; (i) those that focus on only the outcome: the model [e.g., Krogstie *et al.*, 2006]; (ii) those that focus on modeling techniques or languages [e.g., Rosemann *et al.*, forthcoming], and (iii) those that focus on the overall modeling effort. This section summarizes what existing IS literature reports on the evaluation of process modeling projects.

Curtis, Kellner and Over [1992], Greasley [2000], Kim and Kim [1997], Rosemann, Sedera and Gable [2001a], Sedera, Rosemann and Gable [2002] all discuss the need to evaluate process modeling initiatives in general. However, none of these studies discuss the specific evaluation procedure of process modeling projects. Some (e.g., Sedera et al. [2002] and Bandara et al. [2005, 2005]) propose certain constructs to measure process modeling project success at a conceptual and theory building level and also on an empirical test of these [Bandara *et al.*, 2006].

These findings go hand-in-hand with the overall discipline of evaluating conceptual modeling initiatives which is believed to reside still in its infancy, see [Poels *et al.*, 2003, Moody, 2005].

Erikson 2000 (cited in Ying et al., 2004) states some characteristics that need to be there for a good process model such as validity, comprehensibility, flexibility, multiple perspectives, suitability, expressiveness, coherence, efficiency, effectiveness, formality, etc. (see Ying et al., p. 4 for further details). Ying et al. (2004) present a framework for evaluating business

process modeling techniques across multiple dimensions, within a BPR context. Still this is limited to the BPR context and the framework has not been operationalized.

However, reasonably mature research has emerged over the last decade with a focus on the representational capabilities and expressive power of process modeling languages. It could be witnessed how ontology-based theories of representation [e.g., Wand and Weber, 1990, 1993, Wand and Weber, 1995] have emerged as well-established evaluation frameworks in the field of process modeling. [Green and Rosemann, 2004, Rosemann *et al.*, 2006b, Rosemann *et al.*, forthcoming] all present overviews of the numerous theoretical and empirical studies of process modeling languages and techniques that have been evaluated in light of the BWW representation model, including the leading process modeling techniques EPCs [Green and Rosemann, 2000a, 2001], BPMN [Recker *et al.*, 2005, 2006], Petri nets [Recker and Indulska, 2007], BPML [Green *et al.*, 2007], Flowcharts [Keen and Lakos, 1996] and others.

Another framework potentially relevant and useful for the process modeling context is the Guidelines of Modeling (GoM) framework [Becker *et al.*, 2000]. It presents six dimensions of quality that can be used to evaluate a process model. However, only limited empirical testing of the framework has been reported to date [Rosemann *et al.*, 2001b].

5 CONCLUSION

5.1 Contributions

This is the *first* reported attempt to collect and synthesize process modeling related literature, as a single source of reference for future related work. However, this work is not without its limitations. The article extraction was limited to IS outlets. One may also argue that the selected journal and conference sources are biased to the researchers' individual opinions.

Furthermore, text books or web sources were not included. While considerable effort was put into maintaining the rigor and reliability of the article extraction process, the completeness of the articles extracted would have been effected by the 'fit' of the search term and the effectiveness of the individual search engines used. Furthermore, while two coders were involved in the coding, only one conducted the complete coding phase, hence leaving room in the resulting analysis for interpretation bias.

In conclusion, this paper reported on the attempt to provide a consolidated biography and critical review of IS studies on phenomena nominally ascribed to process modeling. The paper discussed the overall study extraction method and gave a snap shot of the current research trends, reported on different publication outlets, gave detailed analysis of the specific content, and also described applied research techniques in the field as reported within the papers. This comprehensive analysis provides a useful reference for future work and also contributes to the overall design of future research and process modeling practices. A bibliography is never ending; hence we would also like to invite fellow colleagues to inform us of any suggestions for improvement or if they wish to add any further literature on business process modeling that are not listed in this paper.

5.2 Outlook: A Research Agenda for Process Modeling

In 1998, Rosemann [1998] summarized the status of process modeling, and stated that:

- process models are used for a variety of purposes (such as Business Process Reengineering, Total Quality Management, Activity Based Costing, customizing of software, workflow specification, Knowledge Management, etc.)
- the availability of many different modeling techniques, yet no indication for the establishment of a quasi standard (for example, Chen's standard for ER modeling),

- a growing number of model designers with no dedicated methodological knowledge are creating process modeling due to the ease of design, and
- a significant number of model users exist working with process models that are often offered and distributed to them via the company's intranet.

Eight years later, the status of process modeling still remains quite the same. More and more business process modeling initiatives have grown in size and complexity, with some organizations conducting process modeling enterprise-wide, even globally [Gulla and Brasethvik, 2000, Scheer *et al.*, 2003, Gartner Group, 2007]. Still most of the published work pertaining to process modeling is limited to describing how to use certain modeling tools [e.g., Scheer, 2000] or the application of modeling languages [e.g., zur Muehlen and Rosemann, 1998]. Some articles provide descriptions in the form of case narratives based on reflective learning from past projects [Scheer *et al.*, 2002]. Yet, a dearth of empirical research in the process modeling arena still exists, especially in terms of procedural guidelines on how to conduct modeling effectively and on the evaluation of these resource intensive modeling efforts.

> *"Process modeling work is young, and the span of the research agenda is still being formulated. […] Since the field is young, results have been scattered in localized areas and few methods have been applied to large phenomena. A review of this literature in a few years may provide a much more definitive assessment of the research issues as the experience as the application base grows. Nevertheless, work to date holds promise for benefits in management, process-driven environments, and process reengineering."* [Curtis *et al.*, 1992, p. 88]

The literature review presented in this paper addresses this gap. In addition to extracting information pertaining to process modeling and providing an overview on the discipline's

current status, we want to conclude our work with the derivation of a research agenda for process modeling by identifying and justifying potential research opportunities. These are presented below as a reference tool for future research in this field. In our research agenda, we follow the framework presented by Wand and Weber [2002] for research on conceptual modeling in general (see Figure 5).

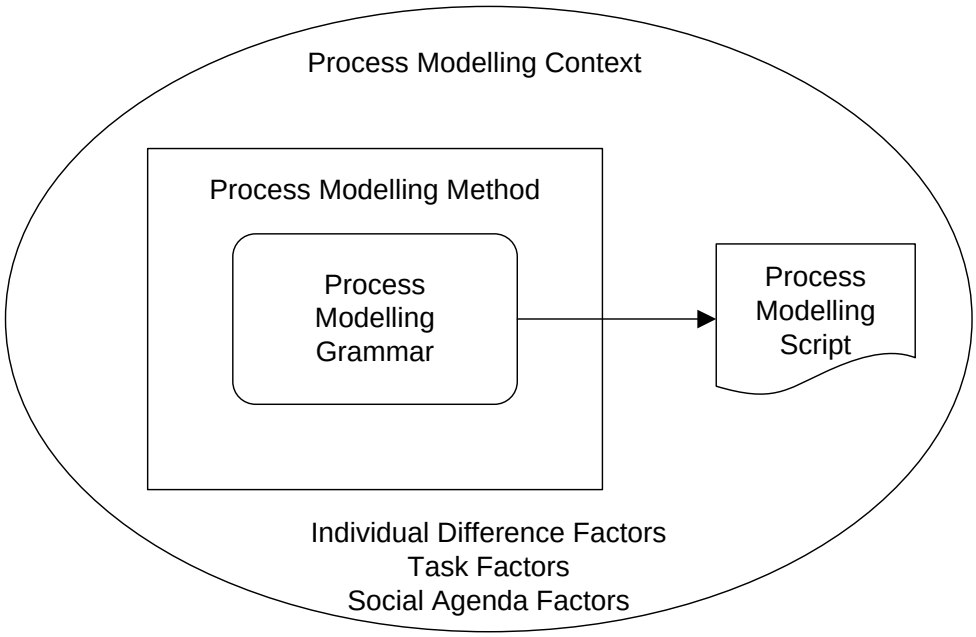

Figure 5: Framework for research on process modeling. Adapted from [Wand and Weber, 2002] to the process modeling domain

References

Abraham, D. M. and R. De. (1999) "Adapting a Process Model of Initial Representation Formation to a Knowledge Management Application." *5th Americas Conference on Information Systems, Milwaukee, Wisconsin, 1999*, pp. 450-452.

Abu, G., J. W. Cangussu, and J. Turi. (2005) "A Quantitative Learning Model for Software Test Process." *38th Hawaii International Conference on System Sciences, Big Island, Hawaii, 2005*, pp. 78b.

Amoroso, D. L. (1998) "Developing a Model to Understand. Reengineering Project Success." *31st Annual Hawaii International Conference on System Sciences, Kohala Coast, Hawaii, 1998*, pp. 500-509 6.

Bandara, W. (2006) "Using Nvivo As A Research Management Tool: A Case Narrative." *3rd International Conference on Qualitative Research in IT and IT in Qualitative Research, Brisbane, Australia, 2006*, pp. 6-19.

Bandara, W., G. G. Gable, and M. Rosemann (2005) "Factors and Measures of Business Process Modelling: Model Building Through a Multiple Case Study," *European Journal of Information Systems* (14) 4, pp. 347-360.

Bandara, W., G. G. Gable, and M. Rosemann. (2006) "Business Process Modelling Success: An Empirically Tested Measurement Model." *27th International Conference on Information Systems, Milwaukee, Wisconsin, 2006*, pp. 895-914.

Bandara, W. and M. Rosemann (2005) "What Are the Secrets of Successful Process Modeling? Insights From an Australian Case Study," *Systèmes d'Information et Management* (10) 3, pp. 47-68.

Baskerville, R. and A. T. Wood-Harper (1996) "A Critical Perspective on Action Research as a Method for Information Systems Research," *Journal of Information Technology* (11) 3, pp. 235-246.

Beck, C. E. and G. R. Schornack. (2005) "A Systems Model for Knowledge Management: A Rhetorical Heuristic Process." *38th Annual Hawaii International Conference on System Sciences, Big Island, Hawaii, 2005*, pp. 242c.

Becker, J., M. Rosemann, and C. von Uthmann (2000) "Guidelines of Business Process Modeling," in, vol. 1806 W. M. P. van der Aalst, J. Desel, and A. Oberweis (Eds.) *Business Process Management. Models, Techniques, and Empirical Studies*, Berlin, Germany: Springer, pp. 30-49.

Bhatt, G. D. and R. L. Stump (2001) "An Empirically Derived Model of the Role of IS Networks in Business Process Improvement Initiatives," *Omega* (29) 1, pp. 29-48.

Bi, H. H. J. and L. Zhao. (2004) "Process Logic for Verifying the Correctness of Business Process Models." *I25th International Conference on Information Systems, Washington D.C., 2004*, pp. 91-100.

Brash, D. (1999) "The Contributions of Participants to Enterprise Modeling." *10th Australasian Conference on Information Systems, Wellington, New Zealand, 1999*, pp. 100-109.

Brodie, M. L., J. Mylopoulos, and J. W. Schmidt (eds.) (1984) *On Conceptual Modelling: Perspectives from Artificial Intelligence, Databases, and Programming Languages*. *Topics in Information Systems*, New York, New York: Springer.

Caetano, A., M. Zacarias, A. R. Silva, and J. Tribolet. (2005) "A Role-Based Framework for Business Process Modeling." *38th Annual Hawaii International Conference on System Sciences, Big Island, Hawaii, 2005*, pp. 13c 1.

Chan, R. and M. Rosemann. (2002) "Integrating Knowledge into Process Models - Insights from Two Case Studies." *6th Pacific Asia Conference on Information Systems, Tokyo, Japan, 2002*, pp. 1187-1191.

Chen, Y., H. Ling, and Z. Xu. (2004) "An Evaluation Framework for Inter-organizational Business Process Modeling." *8th Pacific-Asia Conference on Information Systems, Shanghai, China, 2004*.

Coleman, G. (2005) "An Empirical Study of Software Process in Practice." *38th Annual Hawaii International Conference on System Sciences, Big Island, Hawaii, 2005*, pp. 315c.

Cook, T. D. and D. T. Campbell (1979) *Quasi-Experimentation: Design and Analysis Issues*. Boston, Massachusetts: Houghton Mifflin.

Cooper, H. M. (1982) "Scientific Guidelines for Conducting Integrative Research Reviews," *Review of Educational Research* (52) 2, pp. 291-302.

Cooper, H. M. (1998) *Synthesizing Research: A Guide for Literature Reviews*, 3rd edition. Thousand Oaks, Califorina: Sage.

Cowan, D. A. (1986) "Developing a Process Model of Problem Recognition," *Academy of Management Review* (11) 4, pp. 763-776.

Curtis, B., M. I. Kellner, and J. Over (1992) "Process Modeling," *Communications of the ACM* (35) 9, pp. 75-90.

Davenport, T. H. (1993) *Process Innovation: Reengineering Work Through Information Technology*. Boston, Massachusetts: Harvard Business School Press.

Davenport, T. H. (2005) "The Coming Commoditization of Processes," *Harvard Business Review* (83) 6, pp. 100-108.

Davies, I., P. Green, M. Rosemann, M. Indulska et al. (2006) "How do Practitioners Use Conceptual Modeling in Practice?," *Data & Knowledge Engineering* (58) 3, pp. 358-380.

Davies, I., M. Rosemann, and P. Green. (2004) "Exploring Proposed Ontological Issues of ARIS with Different Categories of Modellers." *15th Australasian Conference on Information Systems, Hobart, Australia, 2004.*

Dehnert, J. and W. M. P. van der Aalst (2004) "Bridging The Gap Between Business Models And Workflow Specifications," *International Journal of Cooperative Information Systems* (13) 3, pp. 289-332.

Dennis, A. R., G. Hayes, and R. M. Daniels (1999) "Business Process Modeling with Group Support Systems," *Journal of Management Information Systems* (15) 4, pp. 115-142.

Dias, C. (2001) "Corporate Portals: A Literature Review of a New Concept in Information Management," *International Journal of Information Management* (21) 4, pp. 269-287.

Djohan, V. I., L. Churilov, and J. Wassertheil. (2002) "Business Integration in an Acute Emergency Department in Australia: A Clinical Process Modelling Perspective." *6th Pacific-Asia Conference on Information Systems, Tokyo, Japan, 2002*, pp. 65-80.

Dobson, I., B. A. Carreras, and D. E. Newman. (2005) "Branching Process Models for the Exponentially Increasing Portions of Cascading Failure Blackouts." *38th Annual Hawaii International Conference on System Sciences, Big Island, Hawaii, 2005*, pp. 64a 2.

Dori, D. (2000) "Object-Process Methodology as a Business-Process Modelling Tool." *8th European Conference on Information Systems, Vienna, Austria, 2000*, pp. 181-186.

Dreiling, A., M. Rosemann, W. M. P. van der Aalst, L. Heuser et al. (2006) "Model-based Software Configuration: Patterns and Languages," *European Journal of Information Systems* (18) 6, pp. 583-600.

Dumas, M., W. M. P. van der Aalst, and A. H. M. ter Hofstede (eds.) (2005) *Process Aware Information Systems: Bridging People and Software Through Process Technology*, Hoboken, New Jersey: John Wiley & Sons.

Elkabiri, O. and F. P. Deek. (2001) "Drivers For Software Process Modeling Evolution." *7th Americas Conference on Information Systems, Boston, Massachusetts, 2001*, pp. 1461-1468.

Ellis, C. A. (1991) "Consistency within Concurrent Groupware Systems," *IEEE Data Engineering Bulletin* (14) 1, pp. 9-13.

Ellis, T. J., W. Hafner, and F. Mitropoulos. (2004) "eCAD: A Knowledge-Based Course Engineering System." *37th Annual Hawaii International Conference on System Sciences, Big Island, Hawaii, 2004*, pp. 10.

Esteves, J. and V. Bohorquez (2007) "An Updated ERP Systems Annotated Bibliography: 2001-2005," *Communications of the AIS* (19) 18, pp. 386-446.

Esteves, J. and J. Pastor (2001) "Enterprise Resource Planning Systems Research: An Annotated Bibliography," *Communications of the AIS* (7) 8.

Flynn, D. J. and Z. Hussain. (2004) "Seeking Legitimation for an Information System: A Preliminary Process Model." *12th European Conference on Information Systems, Turku, Finland, 2004*.

Gable, G. G. (1994) "Integrating Case Study and Survey Research Methods: An Example in Information Systems," *European Journal of Information Systems* (3) 2, pp. 112-126.

Garda, J. A., J. A. Casal, R. G. Vázquez, J. Pazos et al. (2004) "A Methodological Framework for Generic Conceptualisation: Problem-Sensitivity in Software Engineering," *Information and Software Technology* (46) 10, pp. 635-649.

Gartner Group (2007) "Creating Enterprise Leverage: The 2007 CIO Agenda", *EXP Premier Report January2007*, Gartner, Inc, Stamford, Connecticut

Georgakopoulos, D., M. Hornick, and A. Sheth (1995) "An Overview of Workflow Management: From Process Modeling to Workflow Automation Infrastructure," *Distributed and Parallel Databases* (3) 2, pp. 119-153.

Georgakopoulos, D., H. Schuster, A. Cichocki, and D. Baker (1999) "Managing Process and Service Fusion in Virtual Enterprises," *Information Systems* (24) 6, pp. 429-456.

Greasley, A. (2000) "Effective Uses of Business Process Simulation." *32nd Conference on Winter Simulation, Orlando, Florida, 2000*, pp. 2004-2009.

Green, P. and M. Rosemann (2000a) "Integrated Process Modeling. An Ontological Evaluation," *Information Systems* (25) 2, pp. 73-87.

Green, P. and M. Rosemann. (2000b) "Ontological Analysis of Integrated Process Modeling: Some Initial Insights." *11th Australian Conference on Information Systems, Brisbane, Australia, 2000b*.

Green, P. and M. Rosemann (2001) "Ontological Analysis of Integrated Process Models: Testing Hypotheses," *The Australian Journal of Information Systems* (9) 1, pp. 30-38.

Green, P. and M. Rosemann. (2002) "Perceived Ontological Weaknesses of Process Modelling Techniques: Further Evidence." *10th European Conference on Information Systems, Gdansk, Poland, 2002*, pp. 312-321.

Green, P. and M. Rosemann (2004) "Applying Ontologies to Business and Systems Modeling Techniques and Perspectives: Lessons Learned," *Journal of Database Management* (15) 2, pp. 105-117.

Green, P., M. Rosemann, M. Indulska, and C. Manning (2007) "Candidate Interoperability Standards: An Ontological Overlap Analysis," *Data & Knowledge Engineering* (62) 2, pp. 274-291.

Gulla, J. A. and T. Brasethvik. (2000) "On the Challenges of Business Modeling in Large-Scale Reengineering Projects." *4th International Conference on Requirements Engineering, Schaumburg, Illinois, 2000*, pp. 17-26.

Hammer, M. (1990) "Reengineering Work: Don't Automate, Obliterate," *Harvard Business Review* (68) 4, pp. 104-112.

Hammer, M. and J. Champy (1993) *Reengineering the Corporation: A Manifesto for Business Revolution*. New York, New York: Harpercollins.

Heiskanen, A., M. Newman, and J. Similae. (1996) “Software Contracting: A Process Model Approach.” *17th International Conference on Information Systems, Cleveland, Ohio, 1996,* pp. 51-62.

Holden, T. and P. Wilhelmij (1995) "Improved Decision Making through Better Integration of Human Resource and Business Process Factors in a Hospital Situation," *Journal of Management Information Systems* (12) 3, pp. 21-41.

Holt, A. W. (1988) "Diplans: A New Language for the Study and Implementation of Coordination," *ACM Transactions on Information Systems* (6) 2, pp. 109-125.

Hwang, S.-Y. and W.-S. Yang (2002) "On the Discovery of Process Models from their Instances," *Decision Support Systems* (34) 1, pp. 41-57.

Im, I., O. A. El Sawy, and A. Hars (1999) "Competence and Impact of Tools for BPR," *Information & Management* (36) 6, pp. 301-311.

Jablonski, S. (1995) "On the Complementarity of Workflow Management and Business Process Modelling," *ACM SIGOIS Bulletin* (16) 1, pp. 33-38.

Jacka, J. M. and P. J. Keller (2002) *Business Process Mapping: Improving Customer Satisfaction*. New York, New York: John Wiley & Sons.

Jenkins, A. M. (1985) “Research Methodologies and MIS Research,” in E. Mumford, R. Hirschheim, and A. T. Wood-Harper (Eds.) *Research Methods in Information Systems*, New York, NY: North-Holland, pp. 103-117.

Johannesson, P. and E. Perjons (2001) "Design Principles for Process Modelling in Enterprise Application Integration," *Information Systems* (26) 3, pp. 165-184.

Joyce, P. and G. Winch. (2004) “Developing and Codifying Business Models and Process Models in E-Business Design.” *13th European Conference on Information Systems, Turku, Finland, 2004*.

Kaplan, R. S. and D. P. Norton (1996) *The Balanced Scorecard: Translating Strategy into Action*. Boston, Massachusetts: Harvard Business School Press.

Karimi, J. (1988) "Strategic Planning for Information Systems: Requirements and Information Engineering Methods," *Journal of Management Information Systems* (4) 4, pp. 5-24.

Kavakli, V. and P. Loucopoulos (1999) "Goal-Driven Business Process Analysis - Application in Electricity Deregulation," *Information Systems* (24) 3, pp. 187-207.

Keen, C. D. and C. Lakos. (1996) “Analysis of the Design Constructs Required in Process Modelling.” *International Conference on Software Engineering: Education and Practice, Dunedin, Ireland, 1996*, pp. 434-441.

Keen, P. G. W. (1980) “MIS Research: Reference Disciplines and a Cumulative Tradition.” *1st International Conference on Information Systems, Philadelphia, Pennsylvania, 1980,* pp. 9-18.

Keller, G. and S. Meinhardt (1994) *SAP R/3 Analyzer: Business Process Reengineering based on the R/3 Reference Model*. Philadelphia, Pennsylvania: SAP North-America.

Kemper, H.-G. and E. Wolf. (2002) “Iterative Process Models for Mobile Application Systems: A Framework.” *23rd International Conference on Information Systems, Barcelona, Spain, 2002,* pp. 401-413.

Kettinger, W. J., J. T. C. Teng, and S. Guha (1997) "Business Process Change: A Study of Methodologies, Techniques, and Tools," *MIS Quarterly* (21) 1, pp. 55-80.

Keung, P. and P. Kawalek. (1997) “Process Models: A Help or a Burden?” *3rd Americas Conference on Information Systems, Indianapolis, Indiana, 1997*, pp. 676-678.

Kiepuszewski, B., A. H. M. ter Hofstede, and W. M. P. van der Aalst (2003) "Fundamentals of Control Flow in Workflows," *Acta Informatica* (39) 3, pp. 143-209.

Kim, H.-W. and Y.-G. Kim (1997) "Dynamic Process Modeling for BPR: A Computerized Simulation Approach," *Information & Management* (32) 1, pp. 1-13.

Kim, K.-H. and Y.-G. Kim (1998) "Process Reverse Engineering for BPR: A Form-based Approach," *Information & Management* (33) 4, pp. 187-200.

Kim, Y.-G. (1995) “Process Modeling For BPR: Event-Process Chain Approach.” *16th International Conference on Information Systems, Amsterdam, The Netherlands, 1995*, pp. 109-121.

Kitjongthawonkul, S. and R. Khosla. (1999) “Modeling Information Systems Using Objects, Agents and Task-Based Problem Solving Adapters.” *10th Australiasian Conference on Information Systems, Wellington, New Zealand, 1999*, pp. 474-483.

Klaus, H., M. Rosemann, and G. G. Gable (2000) "What is ERP?," *Information Systems Frontiers* (2) 2, pp. 141-162.

Koch, S. (1999) “Using Weakest Precondition for Software Process Model Reuse.” *5th America's Conference on Information Systems, Milwaukee, Wisconsin, 1999*, pp. 741-743.

Koubarakis, M. and D. Plexousakis (2002) "A Formal Model for Business Process Modeling and Design," *Information Systems* (27) 5, pp. 299-319.

Krogstie, J., G. Sindre, and H. D. Jørgensen (2006) "Process Models Representing Knowledge for Action: a Revised Quality Framework," *European Journal of Information Systems* (15) 1, pp. 91-102.

Kuhn, T. S. (1962) *The Structure of Scientific Revolutions*. Chicago, Illinois: Chicago University Press.

Kwahk, K.-Y. and Y.-G. Kim (1999) "Supporting Business Process Redesign using Cognitive Maps," *Decision Support Systems* (25) 2, pp. 155-178.

Lee, A. S. (2001) "Editor's Comments: MIS Quarterly's Editorial Policies and Practices," *MIS Quarterly* (25) 1, pp. iii-vii.

Leedy, P. D. and J. E. Ormrod (2001) *Practical Research: Planning and Design*, 7th edition. Upper Saddle River, New Jersey: Prentice Hall.

Lin, F.-r., S.-m. Lin, and P.-w. Hsueh. (2004) “Dynamic Business Process Formation by Integrating Simulated and Physical Agent Systems.” *37th Annual Hawaii International Conference on System Sciences, Big Island, Hawaii, 2004* 3.

Liu, D.-R. and M. Shen (2003) "Workflow Modeling for Virtual Processes: an Order-Preserving Process-View Approach," *Information Systems* (28) 6, pp. 505-532.

Loos, P. and T. Allweyer. (1998) “Object-Orientation in Business Process Modeling through Applying Event Driven Process Chains (EPC) in UML.” *2nd International Workshop on Enterprise Distributed Object Computing, La Jolla, California, 1998*, pp. 102-112.

Malone, T. W. and K. Crowston (1994) "The Interdisciplinary Study of Coordination," *ACM Computing Surveys* (26) 1, pp. 87-119.

Martilla, J. A. and J. C. James (1977) "Importance-Performance Analysis," *Journal of Marketing* (41) 1, pp. 77-79.

McGrath, G. M. (2003) “Business Process Modelling Using System Dynamics: Reflections on Some Field Applications.” *7th Pacific-Asia Conference on Information Systems, Adelaide, Australia, 2003*, pp. 728-742.

Mendes, R., J. Mateus, E. Silva, and J. Tribolet. (2003) “Applying Business Process Modeling to Organizational Change.” *9th American Conference on Information Systems, Tampa, Florida, 2003*, pp. 452-465.

Mendling, J. and M. Nüttgens (2006) "EPC Markup Language (EPML) - An XML-Based Interchange Format for Event-Driven Process Chains (EPC)," *Information Systems and e-Business Management* (4) 3, pp. 245-263.

Moody, D. L. (2005) "Theoretical and Practical Issues in Evaluating the Quality of Conceptual Models: Current State and Future Directions," *Data & Knowledge Engineering* (15) 3, pp. 243-276.

Murtaza, M. B., V. Gupta, and J. R. Shah. (1999) “Fuzzy Analytic Hierarchy Process Model For Determination of Service Quality in Telecom Networks.” *5th Americas Conference on Information Systems, Milwaukee, Wisconsin, 1999*, pp. 64-66.

Neiger, D. and L. Churilov. (2002) “Towards Decision-Enabled Business Process Modelling Tools: from e-EPC to de-EPC.” *13th Australasian Conference on Information Systems, Melbourne, Australia, 2002*, pp. 1-12.

Newman, M. and R. Sabherwal. (1989) “A Process Model for the Control of Information System Development Projects.” *10th International Conference on Information Systems, Boston, Massachusetts, 1989*, pp. 185-197.

Okonski, Z. and E. Parker (2003) "Enterprise Transforming Initiatives," *IEEE Power and Energy Magazine* (1) 3, pp. 32-35.

Orlikowski, W. J. and J. J. Baroudi (1991) "Studying Information Technology in Organizations: Research Approaches and Assumptions," *Information Systems Research* (2) 1, pp. 1-28.

Ould, M. A. (1995) *Business Processes: Modelling and Analysis for Re-Engineering and Improvement*. Chichester, England: John Wiley & Sons.

Paul, R. J. and A. Serrano. (2004) “Collaborative Information Systems and Business Process Design Using Simulation.” *37th Annual Hawaii International Conference on System Sciences, Big Island, Hawaii, 2004*, pp. 10009a 1.

Peristeras, V. and K. Tarabanis (2000) "Towards an Enterprise Architecture for Public Administration Using a Top-Down Approach," *European Journal of Information Systems* (9) 4, pp. 252-260.

Phalp, K. T. and M. Shepperd (2000) "Quantitative Analysis of Static Models of Processes," *Journal of Systems and Software* (52) 2-3, pp. 105-112.

Pinsonneault, A. and K. L. Kraemer (1993) "Survey Research Methodology in Management Information Systems: An Assessment," *Journal of Management Information Systems* (10) 2, pp. 75-105.

Poels, G., H. J. Nelson, M. Genero, and M. Piattini (2003) “Quality in Conceptual Modeling - New Research Directions,” in, vol. 2784 A. Olivé (Ed.) *Advanced Conceptual Modeling Techniques*, Berlin, Germany: Springer, pp. 243-250.

Polan, R. (1998) “Impedance Mismatch of Business Process Modeling and Object-Oriented. Implementation.” *International Conference on Software Engineering: Education & Practice, Dunedin, New Zealand, 1998*, pp. 370-372.

Porter, M. E. and V. E. Millar (1985) "How Information Gives You Competitive Advantage," *Harvard Business Review* (63) 4, pp. 149-160.

Pulkkinen, M. and A. Hirvonen. (2005) “EA Planning, Development and Management Process for Agile Enterprise Development.” *38th Annual Hawaii International Conference on System Sciences, Big Island, Hawaii, 2005*, pp. 223c 8.

Recker, J. and M. Indulska (2007) "An Ontology-Based Evaluation of Process Modeling with Petri Nets," *Journal of Interoperability in Business Information Systems* (2) 1, pp. 45-64.

Recker, J., M. Indulska, M. Rosemann, and P. Green. (2005) “Do Process Modelling Techniques Get Better? A Comparative Ontological Analysis of BPMN.” *16th Australasian Conference on Information Systems, Sydney, Australia, 2005*.

Recker, J., M. Indulska, M. Rosemann, and P. Green. (2006) “How Good is BPMN Really? Insights from Theory and Practice.” *14th European Conference on Information Systems, Goeteborg, Sweden, 2006*.

Reuter, A. and H. Wächter (1991) "The Contract Model," *Data Engineering* (14) 1, pp. 39-43.

Richards, D. (2000) “A Process Model for Requirements Elicitation.” *11th Australasian Conference on Information Systems, Brisbane, Australia, 2000*.

Robey, D., M.-C. Boudreau, and G. M. Rose (2000) "Information Technology and Organizational Learning: A Review and Assessment of Research," *Accounting, Management and Information Technologies* (10) 2, pp. 125-155.

Robinson, A. G. and D. M. Dilts (1999) "OR & ERP: a Match for the new Millenium?," *OR/MS Today* (26) 3, pp. 30-35.

Rohloff, M. (1996) “Reference Model and Object Oriented Approach for Business Process Design and Workflow Management.” *Information Systems Conference of New Zealand, Palmerston North, New Zealand, 1996*, pp. 43-52.

Rojas , T. and M. Peréz. (1998) “The Impact of the Workflow Technology on the Software Development Process Model.” *4th Americas Conference on Information Systems, Baltimore, Maryland, 1998*, pp. 895-896.

Rolland, C., C. Souveyet, and M. Moreno (1995) "An Approach for Defining Ways-of-Working," *Information Systems* (20) 4, pp. 337-359.

Rosemann, M. (1998) “Managing the Complexity of Multiperspective Information Models using the Guidelines of Modelling.” *3rd Australian Conference on Requirements Engineering, Geelong, 1998*, pp. 101-118.

Rosemann, M. (2003) “Enterprise Systems Management with Reference Process Models,” in G. Shanks, P. B. Seddon, and L. P. Willcocks (Eds.) *Second-Wave Enterprise Resource Planning Systems. Implementing for Effectiveness*, Cambridge, MA: Cambridge University Press, pp. 315-334.

Rosemann, M. (2006) "Potential Pitfalls of Process Modeling: Part A," *Business Process Management Journal* (12) 2, pp. 249-254.

Rosemann, M., P. Green, M. Indulska, and J. Recker (forthcoming) "Using Ontology for the Representational Analysis of Process Modeling Techniques," *International Journal of Business Process Integration and Management* pp. in press.

Rosemann, M. and J. Recker (2006) “Context-aware Process Design: Exploring the Extrinsic Drivers for Process Flexibility,” in T. Latour and M. Petit (Eds.) *The 18th International Conference on Advanced Information Systems Engineering. Proceedings of Workshops and Doctoral Consortium*, Luxembourg, Grand-Duchy of Luxembourg: Namur University Press, pp. 149-158.

Rosemann, M., J. Recker, C. Flender, and P. Ansell. (2006a) “Context-Awareness in Business Process Design.” *17th Australasian Conference on Information Systems, Adelaide, Australia, 2006a*.

Rosemann, M., J. Recker, M. Indulska, and P. Green (2006b) “A Study of the Evolution of the Representational Capabilities of Process Modeling Grammars,” in, vol. 4001 E. Dubois and K. Pohl (Eds.) *Advanced Information Systems Engineering - CAiSE 2006*, Luxembourg, Grand-Duchy of Luxembourg: Springer, pp. 447-461.

Rosemann, M., W. Sedera, and G. G. Gable. (2001a) “Critical Success Factors of Process Modeling for Enterprise Systems.” *7th Americas Conference on Information Systems, Boston, Massachusetts, 2001a*, pp. 1128-1130.

Rosemann, M., W. Sedera, and D. Sedera. (2001b) “Testing a Framework for the Quality of Process Models – A Case Study.” *5th Pacific-Asia Conference on Information Systems, Seoul, Korea, 2001b*, pp. 978-991.

Rosemann, M. and M. zur Muehlen. (2005) “Integrating Risks in Business Process Models.” *16th Australasian Conference on Information Systems, Sydney, Australia, 2005*.

Russell, N., A. H. M. ter Hofstede, D. Edmond, and W. M. P. van der Aalst (2005a) “Workflow Data Patterns: Identification, Representation and Tool Support,” in, vol. 3716 L. M. L. Delcambre, C. Kop, H. C. Mayr, J. Mylopoulos et al. (Eds.) *Conceptual Modeling - ER 2005*, Klagenfurt, Austria: Springer, pp. 353-368.

Russell, N., W. M. P. van der Aalst, and A. H. M. ter Hofstede (2006a) “Workflow Exception Patterns,” in, vol. 4001 E. Dubois and K. Pohl (Eds.) *Advanced Information Systems Engineering - CAiSE 2006*, Luxembourg, Grand-Duchy of Luxembourg: Springer, pp. 288-302.

Russell, N., W. M. P. van der Aalst, A. H. M. ter Hofstede, and D. Edmond (2005b) “Workflow Resource Patterns: Identification, Representation and Tool Support,” in, vol. 3520 Ó. Pastor and J. Falcão e Cunha (Eds.) *Advanced Information Systems Engineering - CAiSE 2005*, Porto, Portugal: Springer, pp. 216-232.

Russell, N., W. M. P. van der Aalst, A. H. M. ter Hofstede, and P. Wohed (2006b) “On the Suitability of UML 2.0 Activity Diagrams for Business Process Modelling,” in, vol. 53 M. Stumptner, S. Hartmann, and Y. Kiyoki (Eds.) *Conceptual Modelling 2006: 3rd Asia-Pacific Conference on Conceptual Modelling*, Hobart, Australia: Australian Computer Society, pp. 95-104.

Sadiq, W. and M. E. Orlowska (2000) "Analyzing Process Models Using Graph Reduction Technique," *Information Systems* (25) 2, pp. 117-134.

Scheer, A.-W. (1994) "ARIS Toolset: A Software Product is Born," *Information Systems* (19) 8, pp. 607-624.

Scheer, A.-W. (1998) *Business Process Engineering: Reference Models for Industrial Enterprises. Study edition*. Berlin et al.: Springer.

Scheer, A.-W. (2000) *ARIS - Business Process Modeling*, 3rd edition. Berlin, Germany: Springer.

Scheer, A.-W., F. Abolhassan, W. Jost, and M. Kirchmer (eds.) (2002) *Business Process Excellence: ARIS in Practice*, Berlin, Germany: Springer.

Scheer, A.-W., F. Abolhassan, W. Jost, and M. Kirchmer (eds.) (2003) *Business Process Change Management: ARIS in Practice*, Berlin, Germany: Springer.

Seddon, P. B., D. S. Staples, R. Patnayakuni, and M. Bowtell (1999) "Dimensions of Information Systems Success," *Communications of the AIS* (2) 20.

Sedera, W., M. Rosemann, and G. Doebeli. (2003) “A Process Modelling Success Model: Insights From A Case Study.” *11th European Conference on Information Systems, Naples, Italy, 2003*.

Sedera, W., M. Rosemann, and G. G. Gable. (2002) “Measuring Process Modelling Success.” *10th European Conference on Information Systems, Gdansk, Poland, 2002*, pp. 331-341.

Shanks, G., P. O'Donnell, and D. A. Arnott. (1997) “Data Warehousing: A Preliminary Field Study.” *8th Australasian Conference on Information Systems, Adelaide, Australia, 1997*, pp. 350-365.

Shin, M. and T. Holden. (2000) “Exploring the Dimensions of Knowledge Flow: A Preliminary Process Model.” *6th Americas Conference on Information Systems, Longbeach, California, 2000*, pp. 1343-1348.

Sierhuis, M., W. J. Clancey, S. Chin, J. P. Trimble et al. (2003) "Modeling and Simulation for Mission Operations Work System Design," *Journal of Management Information Systems* (19) 4, pp. 85.

Snyder, C. A., L. T. Wilson, and D. J. McNanus. (1998) “Knowledge Management: A Proposed Process Model.” *4th Americas Conference on Information Systems, Baltimore, Maryland, 1998*, pp. 624-625.

Soffer, P., B. Golany, and D. Dori (2003) "ERP Modeling: A Comprehensive Approach," *Information Systems* (28) 6, pp. 673-690.

Soffer, P., B. Golany, D. Dori, and Y. Wand (2001) "Modelling Off-the-Shelf Information System Requirements. An Ontological Approach," *Requirements Engineering* (6) 3, pp. 183-199.

Soffer, P. and Y. Wand. (2004) “Goal-Driven Analysis of Process Model Validity.” *16th International Conference on Advanced Information Systems Engineering, Riga, 2004*, pp. 521-535. Lecture Notes in Computer Science 3084.

Soffer, P. and Y. Wand (2005) "On the Notion of Soft-Goals in Business Process Modeling," *Business Process Management Journal* (11) 6, pp. 663-679.

Soffer, P. and Y. Wand (2007) "Goal-Driven Multi-Process Analysis," *Journal of the Association for Information Systems* (8) 3, pp. 175-202.

Stewart, G. and M. Rosemann. (2001) “Process Modeling: A Teaching Approach for Developing Generic Skills in IT Students.” *7th Americas Conference on Information Systems, Boston, Massachusetts, 2001*, pp. 20-27.

Stewart, G., M. Rosemann, and P. Hawking. (2000) “Collaborative ERP Curriculum Developing Using Industry Process Models.” *6th Americas Conference on Information Systems, Long Beach, California, 2000*, pp. 960-965.

Sundstrom, G. A. (1997) “Business Process Modeling and Process Management: Concepts and Examples.” *International Conference on Systems, Man, and Cybernetics, Orlando, Florida, 1997*, pp. 227-231.

Supply Chain Council (2001) "Supply-Chain Operations Reference-Model. Overview of SCOR Version 5.0," Supply Chain Council, http://www.supply-chain.org/slides/SCOR5.0OverviewBooklet.pdf (2004-03-26, 2004).

Sutanto, J., C. W. Phang, A. Kankanhalli, and B. C. Y. Tan. (2004) “Towards a Process Model of Media Usage in Global Virtual Teams.” *13th European Conference on Information Systems, Turku, Finland, 2004*.

Tamma, V. A. M. and T. Bench-Capon. (2001) “An Enriched Knowledge Model for Formal Ontological Analysis.” *International Conference on Formal Ontology in Information Systems, Ogunquit, 2001*, pp. 81-92.

Teufel, S. and B. Teufel (1995) "Bridging Information Technology and Business - Some Modelling Aspects," *ACM SIGOIS Bulletin* (16) 1, pp. 13-17.

Tsalgatidou, A. and S. Junginger (1995) "Modelling in the Re-Engineering Process," *ACM SIGOIS Bulletin* (16) 1, pp. 17-24.

Turk, D. and V. Vaishanvi. (1998) “Process Modelers Need Models Too: Using Scenarios in Software Development Process Modeling.” *4th Americas Conference on Information Systems, Baltimore, Maryland, 1998*, pp. 900-902.

Turk, D. E. and V. K. Vaishnavi. (1999) “Problem and Solution Frameworks for Software Development Process Modeling.” *5th Americas Conference on Information Systems, Milwaukee, Wisconsin, 1999*, pp. 770-772.

van der Aalst, W. M. P., M. Rosemann, and M. Dumas (2007) "Deadline-based Escalation in Process-aware Information Systems," *Decision Support Systems* (43) 2, pp. 492-511.

van der Aalst, W. M. P., A. H. M. ter Hofstede, B. Kiepuszewski, and A. P. Barros (2003) "Workflow Patterns," *Distributed and Parallel Databases* (14) 1, pp. 5-51.

Wand, Y. and R. Weber (1990) "An Ontological Model of an Information System," *IEEE Transactions on Software Engineering* (16) 11, pp. 1282-1292.

Wand, Y. and R. Weber (1993) "On the Ontological Expressiveness of Information Systems Analysis and Design Grammars," *Journal of Information Systems* (3) 4, pp. 217-237.

Wand, Y. and R. Weber (1995) "On the Deep Structure of Information Systems," *Information Systems Journal* (5) 3, pp. 203-223.

Wand, Y. and R. Weber (2002) "Research Commentary: Information Systems and Conceptual Modeling - A Research Agenda," *Information Systems Research* (13) 4, pp. 363-376.

Watson, R. T. (2001) "Introducing MISQ Review - A New Department in MIS Quarterly," *MIS Quarterly* (25) 1, pp. 103-106.

Weber, R. (1997) *Ontological Foundations of Information Systems*. Melbourne, Australia: Coopers & Lybrand and the Accounting Association of Australia and New Zealand.

Webster, J. and R. T. Watson (2002) "Analyzing the Past to Prepare for the Future: Writing a Literature Review," *MIS Quarterly* (26) 2, pp. xiii-xxiii.

Weigand, H., E. Verharen, and F. Dignum (1997) "Dynamic Business Models as a Basis for Interoperable Transaction Design," *Information Systems* (22) 2-3, pp. 139-154.

Wohed, P., E. Perjons, M. Dumas, and A. H. M. ter Hofstede (2003a) “Pattern Based Analysis of EAI Languages - The Case of the Business Modeling Language,” in *Proceedings of the 5th International Conference on Enterprise Information Systems. Vol. 3*, Angers, France: Escola Superior de Tecnologia do Instituto Politecnico de Setubal, pp. 174-184.

Wohed, P., W. M. P. van der Aalst, M. Dumas, and A. H. M. ter Hofstede (2003b) “Analysis of Web Services Composition Languages: The Case of BPEL4WS,” in, vol. 2813 I.-Y. Song, S. W. Liddle, T. W. Ling, and P. Scheuermann (Eds.) *Conceptual Modeling - ER 2003*, Chicago, Illinois: Springer, pp. 200-215.

Wohed, P., W. M. P. van der Aalst, M. Dumas, A. H. M. ter Hofstede et al. (2006) “On the Suitability of BPMN for Business Process Modelling.” *Business Process Management - BPM 2006, Vienna, Austria, 2006*, pp. 161-176. Lecture Notes in Computer Science 4102.

Wreden, N. (1998) "Model Business Processes," *InformationWeek*) September.

Yadav, S. B., R. R. Bravoco, A. T. Chatfield, and T. M. Rajkumar (1988) "Comparison of Analysis Techniques for Information Requirement Determination," *Communications of the ACM* (31) 9, pp. 1090-1097.

Yin, R. K. (2003) *Case Study Research: Design and Methods*, 3 edition. Vol. 5. Thousand Oaks, California: Sage Publications.

zur Muehlen, M. and M. Rosemann (1998) "Evaluation of Workflow Management Systems - a Meta Model Approach," *Australian Journal of Information Systems* (6) 1, pp. 103-116.