1-2013

An Exploration of Enterprise Architecture Research

Daniel Simon

Department of Information Systems and Information Management, University of Cologne

Kai Fischbach

kai.fischbach@uni-bamberg.de

Detlef Schoder

Department of Information Systems and Information Management, University of Cologne

Follow this and additional works at: <https://aisel.aisnet.org/cais>

Recommended Citation

Simon, Daniel; Fischbach, Kai; and Schoder, Detlef (2013) "An Exploration of Enterprise Architecture Research," *Communications of the Association for Information Systems*: Vol. 32 , Article 1.

DOI: 10.17705/1CAIS.03201

Available at: <https://aisel.aisnet.org/cais/vol32/iss1/1>

This material is brought to you by the AIS Journals at AIS Electronic Library (AISeL). It has been accepted for inclusion in Communications of the Association for Information Systems by an authorized administrator of AIS Electronic Library (AISeL). For more information, please contact elibrary@aisnet.org.

Communications of the Association for Information Systems

An Exploration of Enterprise Architecture Research

Daniel Simon

Department of Information Systems and Information Management, University of Cologne

Kai Fischbach

Chair in Information Systems and Social Networks, University of Bamberg

kai.fischbach@uni-bamberg.de

Detlef Schoder

Department of Information Systems and Information Management, University of Cologne

Abstract:

Management of the enterprise architecture has become increasingly recognized as a crucial part of both business and IT management. Still, a common understanding and methodological consistency seems far from being developed. Acknowledging the significant role of research in moving the development process along, this article employs different bibliometric methods, complemented by an extensive qualitative interpretation of the research field, to provide a unique overview of the enterprise architecture literature. After answering our research questions about the collaboration via co-authorships, the intellectual structure of the research field and its most influential works, and the principal themes of research, we propose an agenda for future research based on the findings from the above analyses and their comparison to empirical insights from the literature. In particular, our study finds a considerable degree of co-authorship clustering and a positive impact of the extent of co-authorship on the diffusion of works on enterprise architecture. In addition, this article identifies three major research streams and shows that research to date has revolved around specific themes, while some of high practical relevance receive minor attention. Hence, the contribution of our study is manifold and offers support for researchers and practitioners alike.

Keywords: enterprise architecture, information technology management, survey, scientometrics

Volume 32, Article 1, pp. 1-72, January 2013

I. INTRODUCTION

My opinion is, we are on the verge of seeing Enterprise Architecture “come into its own,” and in the 21st Century, it will be the determining factor, the factor that separates the winners from the losers, the successful and the failures, the acquiring from the acquired, the survivors from the others [Zachman, 1997].

The discipline of enterprise architecture (EA) has evolved enormously since John Zachman ignited its flame in 1987 [Zachman, 1987]. Approaches to enterprise architecture (including, e.g., methods, artifacts, models) have sprung up in different forms since then, driven both by practitioners and academics. In particular, several dedicated frameworks have been created [Scheckerman, 2004a], all aimed at assimilating best practices in the field of enterprise architecture. First and foremost, “The Open Group Architecture Framework” (TOGAF) [The Open Group, 2009] has garnered the most attention for its contributions within the EA arena [Buckl, Ernst, Lankes, Matthes, and Schweda, 2009b]. Nevertheless, enterprise architecture still seems to be developing on its journey to a common understanding and greater methodological consistency.

In general, enterprise architecture can be considered as a structured and aligned collection of plans for the integrated representation of the business and information technology (IT) landscape of the enterprise, in past, current, and future states [Niemann, 2006]. However, a common definition is still far from being a reality [Buckl et al., 2009b]; in fact, consistent terminology has yet to be achieved [Schönherr, 2008]. This is despite the fact that the past years have seen the creation of a considerable number of patterns [Buckl, Ernst, Lankes, and Matthes, 2008] and method building blocks [Buckl, Dierl, Matthes, and Schweda, 2010d] for EA management, which have been found useful by experienced practitioners, and the adoption of which by different enterprises to tackle similar problems [Buckl et al., 2008] may contribute to greater consistency. EA management captures all those processes, methods, tools, and responsibilities necessary to build a holistic and integrated view of the enterprise and allow for a continually aligned steering of business and IT [Matthes, Buckl, Leitel, and Schweda, 2008; Niemann, 2008]. As such, EA management deals with different architectural layers, particularly the business, information, application, and technology architectures [Platt, 2002; The Open Group, 2009].

It is widely acknowledged that EA management should be established through an enterprise-specific and -situated approach [Buckl, Schweda, and Matthes, 2010a, 2010b; Leist and Zellner, 2008; Riege and Aier, 2008]. Nevertheless, building on generally accepted standards avoids pitfalls when establishing an EA function, which, to that end, requires further substantiation and consistency of EA. At the same time, EA needs to keep up with recent developments that have become crucial in practice, such as increased cloud computing, service orientation [Stamas, 2009], and hybrid value creation [Zellner, 2008]. This may also involve a need for EA to free itself from its IT focus [Buckl et al., 2009b] and spread further into the business so it can, for example, fulfill expectations of EA management as a facilitator of strategic planning and business transformation [Aier, Riege, and Winter, 2008]. Simply put, EA practice is required to move forward to a higher maturity level. This is where research may play a crucial role [Aier et al., 2008; Langenberg and Wegmann, 2004] and where an effective review can create a firm foundation for advancing knowledge and accelerating progress [Webster and Watson, 2002] within the EA field.

To this end, this article reflects on the past and details the status quo in EA research, which is based on a few hundred contributions since the late 1980s—more than have ever been considered in any appraisal of EA research. This comprehensive picture of the entire research field is analyzed with regard to the network positions of respective authors and publications as well as to content and principal themes. Unlike in past reviews, our primary tool for exploring the state of the art is bibliometric analysis—an established tool for the structural analysis of a given research field [Culnan, 1986; Teichert and Shehu, 2010]. This allows us both to substantiate findings that have thus far been rather hypothetical (e.g., the central role of frameworks) and to produce novel insights into EA research and its interconnections. Among others, the latter includes the identification and analysis of discourses/streams in the overall research field. This is based on a sound methodological basis that provides objective [Garfield, 1979] and uniquely precise measures [Westney, 1998] for this investigation (i.e., citation data), assuming that followers build their works “on the shoulders of giants” [Merton, 1965] and use correct references (without hidden agendas) to document this recourse to the body of knowledge, and resulting in data that is not limited by a priori assumptions about prominent works (cf. Phillips and Phillips, 1998) but speaks for itself and indicates past and present research activities in the field [Garfield, Malin, and Small, 1983]. Our findings thus serve to gauge and potentially counteract tendencies of dispersion in EA research, which is consistent with calls from several academics for making different

approaches converge (e.g., Mykhashchuk, Buckl, Dierl, and Schweda, 2011; Schönherr, 2008), and also help scholars assess certain contributions in relation to developments within the overall research field.

By combining quantitative analytical approaches with an extensive qualitative interpretation of the research field, we then indicate gaps in previous EA research and, in line with the notion of “analyzing the past to prepare for the future” [Webster and Watson, 2002], provide suggestions for future research and thus complement our retrospective analysis with a prospective view of what lies ahead (cf. Schwarz, Mehta, Johnson, and Chin, 2007). In doing this, we follow the major advice with respect to state-of-the-art reviews given by Fettke [2006]: we use mathematical-statistical analysis based on a set of explicated literature and, finally, derive issues for future research.

In simple terms, our aim is to encapsulate the large body of EA literature in a way that is concise and meaningful to both researchers and practitioners. In addition to providing descriptive statistics on EA research and crediting prominent authors and publications that have helped develop the field, our review thus aims to examine the following research questions in particular:

1. How do scholars in the field collaborate via co-authorships (in comparison to other fields), and what impact does this have on the diffusion of their contributions?
2. What are the main research streams in the field, how are they interlinked, and what are the major works to be assigned to these streams?
3. How does the focus of work spread within specific dimensions of EA research content (e.g., architectural layers)?
4. Based on the insights gained through the answers to the aforementioned questions (compared to main concerns of EA practice as documented in the literature), what are the opportunities for key contributions in the future and what measures can be taken to achieve further progress in the field?

The remainder of this article is structured as follows. The next section surveys past research on the state of enterprise architecture in the literature and in practice. The subsequent section is the central part of this work: we apply co-author, citation, co-citation (based on multivariate statistical and social network analysis methods), and content analysis to more than 600 research documents, exploring the state of the art through a combination of these different bibliometric and qualitative methods. By doing this, we derive answers to our first three research questions. The penultimate section builds on our analysis and turns to our fourth research question. It consolidates our previous results and, complemented by findings from the literature, charts the territory for future EA research. The article's final section summarizes our findings and “take-home messages” [Bem, 1995], which researchers and practitioners alike may find beneficial, and discusses potential further reviews of EA literature.

II. RELATED WORK

Several researchers have discussed the state of enterprise architecture in literature and practice. These reviews are generally different in their scope. Some concentrate on EA frameworks, some deal with both EA literature and practice, and others focus on either literature or practice specifically. Schekkermann [2004a] and Schönherr [2004], for example, provide detailed overviews of existing EA frameworks. Similarly, Esswein and Weiler [2008] compare different EA frameworks and emphasize their broad and comprehensive character, concluding that architectural methods need to be integrated closer with related methods, such as those from business process management. Leist and Zellner [2006] go further and propose different requirements that current architecture frameworks should meet to enable developing, describing, and maintaining an enterprise architecture. Their evaluation of some well-known frameworks concludes that these have different strengths and that, in general, there are several areas for methodological improvement.

Aier et al. [2008] provide an overview of EA literature (including frameworks), comparing different approaches found in the literature along the following criteria: the understanding of enterprise architecture (i.e., the degree of consideration of architectural layers); the representation of enterprise architecture (modeling languages, tool support); and the use of enterprise architecture (e.g., documentation, analysis, and planning). They also explore the state of enterprise architecture in practice. Their empirical study (based on sixty-one answered questionnaires) reveals that the EA function typically is embedded in the IT organization rather than in business management. Further, they show that applications, interfaces, data structures, projects, business goals, and software, network, and hardware components are the elements that most often find their way into enterprise architecture. In contrast, essential elements of a company's business model such as distribution channels, market segments, and the interaction with suppliers are found to be of lower significance and not equally represented in enterprise architecture.

The Aier et al. [2008] findings are mainly in line with Schönherr [2008], who analyzes a total of 126 references seeking common EA terminology and finds that more contributions in the EA field focus on the organization layer (as a sublayer of business architecture covering, e.g., business processes and organizational structure) and the application architecture rather than, for example, the strategy layer (as the second sublayer of business architecture). Langenberg and Wegmann [2004] also provide an evaluation of EA research, analyzing eighty papers; they find that far more researchers concentrate on the use of enterprise architecture (EA benefits/drivers, EA experiences, EA use in other disciplines) than on, say, frameworks and modeling issues. Among the frameworks, Zachman [1987] is the one referenced most often up to 2004, after which Buckl et al. [2009b] conclude that “The Open Group Architecture Framework” (TOGAF) has become the most prominent approach in practice.

Kappelman, McGinnis, Pettite, and Sidorova [2008] survey IT professionals to capture key functions and benefits of enterprise architecture. The great majority of respondents agree that EA provides a blueprint of the organization and also consider EA a tool for organizational planning. However, Winter, Buckl, Matthes, and Schweda [2010], in a more recent publication, illustrate that a great proportion of EA practices document only the as-is enterprise architecture. Business-IT-alignment is found to be the EA management goal of greatest importance. Schmidt and Buxmann [2011] search success determinants of EA management and find architecture governance to be the most important factor. Stakeholder participation and communication are identified to be of somewhat less importance.

While EA research and practice has been the subject of regular reviews, investigations of the state of the art in EA research do not provide a broad picture. First, these studies focus on only a specific fraction of the EA literature, e.g., on frameworks, or on works of specific research groups, or of those presented at certain conferences, although a complete review should generally not be confined to specific, potentially “top” publications [Webster and Watson, 2002]. Second, the analysis of the sources considered stops short of dealing with some of the core aspects of enterprise architecture in detail, such as architectural processes, the EA meta model (as the conceptual scheme of EA content) [Niemann, 2008], and the understanding of business architecture. Third, there is no work that actually looks into the network of EA research to allow for a well-founded identification of certain research streams and of those contributions that are particularly significant.

Schelp and Winter [2009] is one of the very few studies that identify different language communities in EA research. In a recent work, Mykhashchuk et al. [2011] investigate EA literature in terms of the temporal and regional distribution of publications, the number of references of these publications and the involved author groups to provide an overview of the current research occupation in the field of EA management. Among others, they find out that the most productive research groups are from Europe and that European scientists and practitioners seem to have taken over thought leadership in the field. Lucke, Krell, and Lechner [2010] also review the existing literature and identify critical issues in enterprise architecting by applying content analysis to seventy-one articles. Absent an in-depth investigation of the underlying network, though, these studies do not take advantage of a firmer foundation upon which to derive actual (and potentially invisible) discourses of major importance and achieve a common basis for future research. As Small and Griffith [1974] state in their pioneering work, “most scientists have intuitive notions about the subdivisions of their fields, but no observer, however broadly trained, can gain an overall perspective on the scientific mosaic.” In the analysis of EA research, we thus can learn from what has already become common in that of other research fields that build on different bibliometric methods, and from their use of the combined judgment of a large number of experts in the field, to examine the state of the art (see Table 1; further references include White and McCain [1998], Culnan [1986], and Cockcroft [2010]).

III. AN EXTENSIVE ANALYSIS OF EA RESEARCH

To provide a solid basis for a state-of-the-art analysis, we performed an extensive search for EA literature (which we here make transparent following the guidelines of vom Brocke et al. [2009]) using Google Scholar, the EBSCO Business Source Complete database, the AIS Electronic Library, the IEEE and ACM literature portals, and simple Google Web searches. In doing this, we followed the approach of, for example, Culnan [1987], Charvet, Cooper, and Gardner [2008], and Uysal [2010], rather than relying on a previously defined sample of journals or documents. Our inquiry focused on the explicit use of the term *enterprise architecture*, its German equivalent *Unternehmensarchitektur* (to account for the German-language research groups found by Schelp and Winter [2009] to be particular relevant), and related terms for enterprise architectural subsets (*business architecture*, *process architecture*, *information systems architecture*, *IT architecture*, *IT landscape*, *information architecture*, *data architecture*, *application architecture*, *application landscape*, *integration architecture*, *technology architecture*, *infrastructure architecture*) either in a document’s title, abstract, or body text. A single instance of such terms was considered insufficient to add the document to our analysis, so each such document was examined to verify that it was genuinely about enterprise architecture.

Assuming that practitioners also play an important role in EA research [Aier et al., 2008], we did not limit our search to scientific publications. We also considered several practitioner contributions (e.g., Beveridge and Perks, 2002;

Dern, 2006; Engels et al., 2008; Hanschke, 2010; Niemann, 2006; Schekkerman, 2004a), but excluded marketing material or other documents without references; thus, we did not include consultant and tool vendor “white papers” in our analysis. Instead, we considered English- and German-language journal articles, conference papers, books, book sections (that could be attributed to specific authors and included a dedicated reference section), and academic reports. In total, we identified 608 publications related to enterprise architecture published from 1987 to 2010 (9.5 percent in German), which we included in our analysis; however, we are aware that EA concepts may have already existed before, coined differently though (an inclusion of such research may have blurred the results of our study on designated EA research). Figure 1 shows the number of publications per year (but excludes 2010, since our document collection was in mid-2010 and thus did not yield an exhaustive list for that year).

Figure 1. Number of Included Publications per Year

These publications were input into a database that captured title, author(s), year of publication, and any references to other source documents we included. In addition, we collected a sample set of publications in related research areas to allow for an indication of the degree to which EA literature is linked to related fields and draws upon lessons learned in these areas, given the interdisciplinary character (cf. Webster and Watson, 2002) of the EA field. Our selection of related research fields was based on the management practices with which EA management has major touch points and with which it must be coordinated primarily, according to TOGAF [The Open Group, 2009]: business planning/business capability management, portfolio/project management, solution development, and operations management. Therefore, we included works from the following research fields (using associated search terms): strategic management/business engineering (including organizational management and business process management) (54), IT portfolio management (57), software/solution architecture (61), and enterprise application integration (as the field associated with operations management, which integrates and sustains deliverables within the corporate infrastructure [The Open Group, 2009]) (9). In addition, we included works from the research field of enterprise modeling/enterprise ontology (56), acknowledging that it shares fundamental ideas with enterprise architecture and similarly deals with conceptual enterprise models (cf. Dietz and Hoogervorst, 2008; Frank, 2002).

Aware that the above selection is not exhaustive and certain fields potentially associated with enterprise architecture may be missing, we drew the line there and did not include other fields (see Appendix A for the bibliography of included documents). In particular, this was to maintain a definite and manageable scope for analysis and to avoid adding noise and unlimited scope increase given the variety of concerns close to enterprise architecture. Service-oriented architecture, for example, would have definitely been another reasonable field for inclusion. However, since this represents a specific architectural concept, we would have equally needed to consider the fields of cloud computing, virtualization, and interoperability, for example. As a result, the references of each EA core document were extended with respect to the additional works from the above fields.

From the resulting data set, we generated three files (in both dl- and gefx-format), which were imported into UCINET 6, and Gephi 0.7, an open-source software tool for graph and network analysis that has been used successfully for semantic network case studies and social network analysis several times before [Bastian, Heymann, and Jacomy, 2009]. These files represented three different networks to be analyzed: co-authorship, document citation, and document co-citation.

The co-authorship network was supposed to provide the basis for exploring research collaboration [Liu, Bollen, Nelson, and Van de Sompel, 2005] within the vast terrain of enterprise architecture, since it basically shows what authors (nodes) publish with one another (represented by an edge in the network graph) and in what frequency (captured by the edge's weight). Since co-authorship represents a considerable indicator of collaboration [Glänzel and Schubert, 2004], the corresponding network may allow the identification of EA research communities. In addition, we were interested in how this was mirrored in the second network created—the document citation network. We speculated that potential differences in the focus of EA research might lead us to find isolated individuals in the co-authorship network who may nevertheless have made significant EA contributions as per their corresponding positions in the document citation network.

Citation networks generally exist in three different forms: journal citation, author citation, and document citation. Our focus on the citation network at the level of single publications [Teichert and Shehu, 2010] rather than on the aggregated journal or author level was so we could gauge the importance of single publications in the field, based on our careful selection of a sufficiently large sample (cf. Pilkington and Fitzgerald, 2006; Pilkington and Meredith, 2009). This is because frequently cited documents are likely to exert a stronger influence on a discipline than those less frequently cited [Teichert and Shehu, 2010], based on the rationale that articles tend to be cited when considered essential in supporting certain arguments. In fact, Case and Higgins [2000] have shown that critical citations are rather rare. Despite controversial discussions around the most appropriate measure of a publication's quality [Abramo, D'Angelo, and Di Costa, 2010], we thus follow the general assertion and common agreement that the number of received citations reflect a document's influence and, therefore, quality [Acedo, Barroso, Casanueva, and Galán, 2006; Wade, 1975]. The use of the main alternative indicator of quality, the journal impact factor, may have caused great difficulties in analysis due to the fact that such an impact factor does not exist for every journal and document type [Abramo et al., 2010; Dolfisma and Leydesdorff, 2010] and that our set of documents contains various books and book chapters for which such values also do not exist. Eventually, our focus on the document citation network also was supposed to provide a first indication of the existence of potential clusters around certain themes within EA research.

We made use of the co-citation network to take this even further and delve more deeply into the analysis regarding major research topics [Teichert and Shehu, 2009]. Basically, this mirrors the frequency with which two documents are cited together [Small, 1973]. As such, it is a complementary method to bibliographic coupling, which focuses on the sharing of one or more references between two documents [Small, 1973]. Again, we worked with the document co-citation network rather than the author co-citation network, although the latter is the one employed more often. However, we drew upon the fact that document co-citation analysis entails more biographical detail and precision and is a more direct way of assessing contributions to several research topics [Teichert and Shehu, 2010; Uysal, 2010]. In general, co-citation analysis is considered a technique to map the intellectual structure of a research domain by building on “the empirical consensus of hundreds of citers rather than the impressions of individuals” [White, 1990] and thereby identifying “invisible colleges” [Culnan, 1987] of research, with the most influential documents and the relational links between those documents [Teichert and Shehu, 2010; Uysal, 2010]. Ultimately, this may reveal “schools of thought” within a given field [Teichert and Shehu, 2009].

We applied a valuable tool for analyzing such networks [Oinas-Kokkonen, Lyytinen, and Yoo, 2010; Uysal, 2010]—social network analysis (SNA). Rooted in graph theory, SNA conceptualizes and visualizes structures that emerge from any interaction or connection as networks and allows a quantitative analysis of the relationships of the network's nodes [Cockcroft, 2010; Otte, 2002]. As such, it brings two main perspectives to the study of a research field: (1) the structural patterns of scientific collaboration/themes and (2) the distinctive position of an actor/study in the overall field, assuming that these reflect the dissemination of knowledge and a certain quality of contribution. In this study, we thus used different centrality measures to examine both the role of individual authors/publications within the overall network (micro level) and the characteristics of the network as a whole (macro level). Representing the number of relations a given node maintains [Dolfisma and Leydesdorff, 2010], degree centrality was used to measure the centrality and power of authors and EA contributions within the research field [Uysal, 2010]. Betweenness centrality, that is, the “number of shortest paths that pass through a given node” [Otte, 2002], was the measure for evaluating the node's “interdisciplinarity” [Dolfisma and Leydesdorff, 2010; Leydesdorff, 2007], indicating whether the author/document plays a bridging role in the network. Further, we employed closeness centrality to measure the “distance” of an author/document to other nodes in the network [Dolfisma and Leydesdorff, 2010] and eigenvector centrality to quantify the extent to which nodes are connected to other central nodes [Bonacich, 2007;

Costenbader and Valente, 2003]. Rounding out the network measures, we used overall graph density and modularity (as the number of edges falling within groups minus the expected number in an equivalent network with edges placed at random) [Newman, 2006], average path length (average number of intermediaries between all pairs of nodes), and clustering coefficient (average fraction of a node's neighbors who are also neighbors of one another) [Uzzi and Spiro, 2005].

Table 1: Use of Bibliometric Methods in Other Research Fields

Reference	Analyzed research field	Used bibliometric method	Findings
Acedo et al. [2006]	Management, organization	Co-authorship analysis using degree and betweenness centralities, clustering coefficient and network density	<ul style="list-style-type: none"> Co-authorship characteristics differ significantly from those in natural sciences with respect to main descriptors such as local clustering (found to be high) Multi-authored papers are likely to be cited more often than single-authored.
Chuo and Tseng [2010]	Tourism	Author citation analysis using degree centralities, author co-citation analysis using cluster and factor analysis	<ul style="list-style-type: none"> Most influential publications according to degree centralities Existence of research concentrations, e.g., impact of tourism and social aspects and authenticity of tourism, and a new focus on tourism demand forecasting
Culnan [1987]	Management information systems (MIS) (1980–1985)	Author co-citation analysis using factor analysis	<ul style="list-style-type: none"> Different intellectual clusters of research, e.g., foundations, MIS management, organizational approaches to MIS design and use, MIS curriculum MIS research shifted from a technological to an organizational and managerial focus. Publications assumed to be influential did not always prove to be so, according to the actual citation patterns.
Lin and Cheng [2010]	Strategic alliance	Document co-citation analysis using factor analysis and network visualization	<ul style="list-style-type: none"> Three main research themes: strategic alliance formation, learning and absorptive capability, relationships and characteristics of partnership success
Phillips and Phillips [1998]	Business logistics and transportation	Journal citation analysis using degree and betweenness centralities, multi-dimensional scaling and cluster analysis	<ul style="list-style-type: none"> Central journals according to degree and betweenness scores Groupings of journals according to multivariate statistics, revealing that a distinct break between business logistics and transportation disappeared over time
Teichert and Shehu [2009, 2010]	Conjoint analysis (CA)	Document citation analysis using degree centralities, document co-citation analysis using factor analysis and multidimensional scaling	<ul style="list-style-type: none"> Major research contributions (as per citation scores) Existence of seven research streams (through factor analysis), e.g., traditional CA for marketing applications, health care, and empirical CA, with close links between the streams (visualized via multidimensional scaling)
Uysal [2010]	Business Ethics	Document co-citation analysis using multidimensional scaling and degree, betweenness and closeness centralities	<ul style="list-style-type: none"> Core documents (as represented by degree, betweenness and closeness centralities) Existence of four research clusters (based on co-citations profiles visualized via multidimensional scaling)

In addition to these SNA techniques, we applied multivariate statistical methods to the co-citation network. This comprised factor and multidimensional scaling analysis, both of which are typically used in such bibliographic studies, as they have been proven suitable for identifying and interpreting themes and their relationships and mapping a research field's intellectual structure [Teichert and Shehu, 2010; Uysal, 2010]. To that end, we compiled a co-citation matrix of the thirty-seven most-cited core papers (all with more than twenty citations), representing the top 6 percent of cited papers (cf. Charvet et al., 2008; Teichert and Shehu, 2010). In line with White and Griffith [1981], we replaced the diagonal elements of this matrix by the sum of the three highest scores, divided by two (cf.

Ahlgren, 2003). We exported this matrix of raw data to SPSS to allow for multivariate analysis. Table 1 provides an overview of some main findings gained by the use of the above bibliometric methods to examine the state of the art in other research fields.

To draw as detailed a picture as possible of the EA research landscape, we complemented these network analyses with an in-depth content analysis of the 608 EA core documents, given the scientific standing attributed to this technique [Kassarjan, 1977]. Following the guidelines of Bem [1995] that such a review should be based on an adequate structure of the topic, we rated the documents' focus (cf. Lucke et al., 2010) with respect to EA layers, EA methodology, EA management tasks/processes, and EA lifecycle phases. This was to bring different perspectives into the analysis: ontological (the architectural content that is dealt with, as represented by respective EA layers); methodical (the method elements (cf. Leist and Zellner, 2006) in scope, e.g., procedures or roles); operating (the EA management tasks/processes studied); and functional (the basic architectural activities in scope, as captured by the general phases of the EA management cycle). Given that our examination did not deal with "highly latent" [Neuendorf, 2002] constructs, the potential subjectivity of content interpretation is not a critical concern in our analysis (cf. Potter and Levine-Donnerstein, 1999). Consequently, the results of our content analysis can be considered reliable, shedding light on whether research revolves around certain architectural layers, for example, and whether others remain entrenched in the background of research.

The results of our co-authorship, citation, co-citation, and content analysis follow.

Co-authorship Analysis

The co-authorship network comprises 752 nodes and 1549 edges. The average degree centrality is 2.06, indicating a rather low level of research collaboration throughout the EA author network. More specifically, it denotes moderate collaborative work across different university research groups, since most groups are likely to be of a greater size and collaboration is considered to occur primarily within the research groups themselves, mirrored by the average clustering coefficient (average fraction of an author's collaborators who are also collaborators with one another) of 0.608. This is a high value compared to other (potentially more established) fields, as Table 2 reveals. In fact, the networks studied by Newman [2001] and Acedo et al. [2006], although different in size, timeframe, and databases used, show a lower trend toward small groups than the EA network, except the management network. The lack of collaboration is evidenced by the overall graph density (indicator for the level of connectedness of a network) of 0.005 and the graph modularity (which can be either positive or negative, with a large positive value indicating the presence of community structure) of 0.838, suggesting a rather fragmented overall picture.

Table 2: Characteristics of the Co-authorship Network Compared to Other Fields

	EA	IT	Management and organization	Physics	Medicine
Authors	752	11.994	10.176	52.909	1.520.251
Authors per document	2.66	2.22	1.88	2.53	3.75
Clustering coefficient	0.608	0.496	0.681	0.430	0.066

Applying the algorithm of Fruchterman and Reingold [1991] allowed us to come to an untangled placement of nodes and thus visualize clusters within the overall network graph. This picture became even more clear when filtering nodes by a minimum degree of 10. As a result, we found one singleton and two pairs of nodes, one of which represents the works of the Technical University of Lisbon. We also found two clusters of at least three nodes. One is a clique—a subgraph in which any node is directly connected to any other node [Otte and Rousseau, 2002]—comprising those authors who have worked collaboratively on the research of Lankhorst et al. [2005]. This is where we found close resemblance to "Collaborative Innovation Networks" (COINs), "groups of self-motivated individuals from various parts of an organization or from multiple organizations ... who work together on a new idea, driven by a common vision" [Gloor, Laubacher, Dynes, and Zhao, 2003]. Interestingly, the authors in this cluster also possess the greatest eigenvector centrality scores within the overall network.

The second cluster comprises researchers at the Technical University of Munich, the University of St. Gallen, the Technical University of Berlin, and the KTH Royal Institute of Technology in Stockholm. It is thus made up of clique-like structures loosely tied to one another. Although there is some degree of collaboration between these major research groups within the EA field [Schelp and Winter, 2009], COIN-related criteria are far from met. In addition, collaboration may not be analyzed comprehensively by concentrating only on the number of neighbors (i.e., on whether there is any collaboration at all) and weighing every "contact" equally [Bonacich, 2007].

For this reason, we also calculated eigenvector centrality (see above). Moreover, we looked into the edge's weight to account for the frequency of collaboration (note that there may be a certain interdependency with the document

outlets, which may determine the required efforts to complete publication and thus the available capacity for other research projects). Consequently, we filtered the graph's edges by a minimum weight of 5 (i.e., five joint contributions of two individual authors), and then used the resulting graph and removed all isolated nodes (i.e., nodes without any edges remaining). In doing so, we arrived at a picture of the main research groups and the inherent strong ties, but any connections between them basically were lost (see Figure 2; an edge's width represents its weight). Notably, the use of a minimum weight of 3 yielded similar results. Against this background, a coherent research community with regular collaboration (at the authorship level) still appears to be in its infancy. This is due in particular to the moderate weight of the weak ties between different groups; these weak ties can provide access to nonredundant information. This is astonishing, given the diverse and skill-demanding nature of the EA discipline [Lucke et al., 2010] and the presumably costly advance of knowledge associated with this, which is generally held as a rationale for increased intellectual "mergers" [Laband and Tollison, 2000]. Although the community as a whole makes considerable use of multi-authorships (indicated by the authors per document in Table 2), the frequency of collaboration across different groups remains at a low level.

Figure 2. Co-authorship Network (Filtered by Min. Edge Weight of 5 and Min. Degree of 1)

It is interesting that there is quite a difference between the authors with the highest degree centrality scores and those with the highest betweenness centrality scores (see Table 3). All in all, the normalized betweenness centrality scores are quite low, despite the fact that we found a rather modular co-author network, but due to local clusters that are somehow connected. On the one hand, the scores may again indicate moderate "interdisciplinary" [Dolfsma and Leydesdorff, 2010; Leydesdorff, 2007] work within EA research. On the other hand, one may also argue that the network already exhibits some degree of small-world [Uzzi and Spiro, 2005] nature, with considerable local clustering (see above) and moderate global separation (average path length of 2.474)—that is, in terms of author collaboration, EA appears to be one discipline. This supports Schelp and Winter's [2009] thesis of a trend toward an overarching community, despite the appearance of relatively sparse intergroup collaboration.

The most between author is Stephan Aier. All of the main research groups identified find themselves represented among the most between authors (see Table 3). Therefore, each research group seems to have at least one member who (implicitly) plays a leading role in assuring at least some degree of intergroup collaboration.

Ultimately, it is also interesting to note that the co-authorship network has eighty-two isolated nodes, representing authors who have not yet collaboratively created any publication within the EA arena but rather publish only as single authors.

Table 3: Centrality Measures of EA Researchers (Top Ten)

Researcher	Betweenness centrality (norm.)	Researcher	Degree centrality
Aier, Stephan	0.0058	Proper, Erik	44
Buckl, Sabine	0.0045	Hoppenbrouwers, Stijn	37
Johnson, Pontus	0.0038	Buckl, Sabine	36
Schweda, Christian M	0.0037	Johnson, Pontus	34
Proper, Erik	0.0022	Matthes, Florian	33
Winter, Robert	0.0018	Lankhorst, Marc	33
Matthes, Florian	0.0017	Schweda, Christian M.	33
Ekstedt, Mathias	0.0016	Jonkers, Henk	31
Ullberg, Johan	0.0014	Wieringa, Roel	31
Krell, Sascha	0.0014	Iacob, Maria E.	30
		Van der Torre, L.	30
		Bonsangue, M.	30
		De Boer, F.	30

Citation Analysis

With 847 nodes and 4017 edges (including the sample set of documents from EA-related fields), the citation network is of greater density (0.011 for the overall network being interpreted as undirected; 0.019 for the EA network only) but lower modularity (0.323 [0.302]) than the co-authorship network. Likewise, there is less local clustering (average clustering coefficient of 0.185 [0.269]). All in all, this indicates that the citation behavior is different from author collaboration in that it shows a greater crossing of the boundaries of research communities. This overall higher density is also evidenced by the average out-degree (interpreted as the number of times a document is cited) of 4.742 (5.64).

The individual degree centrality scores (see Table 4) underline and pinpoint the central role of frameworks within EA research (note that we count all references to any version of a framework, which might be subject to regular updates, together). In fact, more than 40 percent of the EA publications analyzed refer to TOGAF [The Open Group, 2009] or Zachman [1987]. Remarkably, TOGAF [The Open Group, 2009] has closed the gap and even outranked Zachman [1987] only in recent years; as late as 2005, Zachman [1987] was still far ahead in terms of citations (sixty-eight as opposed to thirty-seven). It is also striking that only three of those publications with at least fifty citations are single-authored.

To shed further light on the relationship between the number of a document's citations and its co-authorship characteristics, we applied simple linear regression, including the number of authors and the year of publication as independent, and the number of citations as the dependent variable. The year of publication is associated with the number of citations in a reasonable direction, that is, the later a document is published, the less it is cited ($\beta = -0.451$). Of particular interest, however, is our finding that the higher the number of a document's authors, the more it is cited ($\beta = 0.248$). Together, the two variables explain 23.5 percent of the variance in the number of citations. In contrast, the incidence of co-authorship (i.e., whether a document is co-authored or single-authored) showed no statistically significant association with the number of citations.

Again, betweenness centralities, though on a rather low level, are somehow different (consider that some frameworks have no references). In terms of their interdisciplinary character, Lankhorst et al. [2005] and Niemann [2006] stand out, with highest betweenness centralities, followed by Dern [2006] and Aier et al. [2008]. It is interesting that one-third of those publications with the highest betweenness centralities are authored by individuals who are isolated within the co-authorship network (see preceding subsection). This is in line with the findings from the above regression analysis that single-authored documents may well obtain a central network position, although, in general, increased multi-authorship promises a greater number of citations.

Within the citation network, 251 nodes (from the 608 nodes representing EA research) are not referred to at all. Nearly 50 percent of these works were published in 2009 and 2010, so it may be too early to expect citations. As for the references to related fields, EA research shows a weak degree of integration (based on the aforementioned sample set of related research). In fact, only 22.53 percent of EA publications cite software/solution architecture works, while 15.79 percent refer to documents assigned to the business engineering/strategic management field.

The enterprise application integration and IT portfolio management fields find even less consideration, with values of 6.09 percent and 1.81 percent, respectively. Eventually, the enterprise modeling/enterprise ontology works, which are generally considered close to EA concerns [Kamogawa and Okada, 2005], are cited by 12.5 percent of our core documents (note that, however, some of our core documents also might be assigned equally to the enterprise modeling field).

Table 4: Centrality Measures of EA Publications (Citation Network)

Reference	Betweenness centrality (norm.) (top twelve)		Reference	Degree centrality (≥ 50)
	Overall network	EA network		
Lankhorst et al. [2005]	0.0119	0.0150	TOGAF [The Open Group, 2009]	246
Niemann [2006]	0.0054	0.0062	Zachman [1987]	244
Dern [2006]	0.0042	0.0054	FEAF [The Chief Information Officers Council, 1999]	125
Aier et al. [2008]	0.0041	0.0052	Lankhorst et al. [2005]	124
Johnson and Ekstedt [2007]	0.0032	0.0035	Sowa and Zachman [1992]	112
Buckl et al. [2008]	0.0031	0.0045	DODAF [Department of Defense U.S., 2009]	83
Engels et al. [2008]	0.0031	0.0042	Spewak and Hill [1993]	83
Schekkerman [2004a]	0.0031	0.0044	Schekkerman [2004a]	77
Langenberg and Wegmann [2004]	0.0031	0.0049	Bass, Clements, and Kazman [2003]	69
Schönherr [2008]	0.0028	0.0045	Ross, Weill, and Robertson [2006]	68
Sebis [2005]		0.0039	GERAM [IFAC-IFIP, 1999]	53
Keller [2007]	0.0024	0.0036	Niemann [2006]	53
McGovern et al. [2003]	0.0024		ZIFA [2001]	51
			Buckl et al. [2008]	50

All in all, this quantitative evaluation of individual research contributions, along with the identification of those of highest relevance, establishes the foundation for a more detailed analysis of the overall research field toward the derivation of structural patterns.

Co-citation Analysis

The co-citation network, representing the same document set as the citation network, not surprisingly also has 847 nodes, but 12988 edges. It is the densest (0.036 [EA network only: 0.053]) and least modular (0.248 [0.249]) of the three networks analyzed. The average clustering coefficient equals 0.412 (0.449). These figures suggest a fairly connected network of several clusters tied closely with one another, as opposed to strictly separate “schools of thought.” The publications’ centrality scores within the co-citation network mainly verify the above picture in terms of the most prominent and significant works in the EA literature. It provides particular evidence of the dominant role of EA frameworks and of comprehensive works such as Lankhorst et al. [2005], Ross et al. [2006], Schekkerman [2004a], Niemann [2006], Spewak and Hill [1993], Dern [2006], and Keller [2007] (see Table 5).

To gain further insights into the co-citation network, we applied multivariate statistical analysis techniques in the form of factor analysis, which supports the classification of co-citations in research discourses and enables a quantitative appraisal of the relative impact of individual articles within these discourses [Teichert and Shehu, 2010]. We used the raw co-citation matrix introduced above. To remove the scale influences originating from the citation frequencies of two given documents and to measure the similarity of their co-citation profiles, we normalized the raw co-citation matrix in SPSS using Pearson’s correlation coefficient (Pearson’s r) and thus converted it into a matrix of similarity values [Ahlgren, 2003; Uysal, 2010]. To evaluate its sampling adequacy, we computed the Kaiser-Meyer-Olkin (KMO) measure. Since our data set did not pass this test at first, we successively excluded items with “unacceptable” [Kaiser and Rice, 1974] sampling adequacy (cf. Hair, Black, Babin, Anderson, and Tatham, 2006). The resulting KMO score of 0.786 for the reduced data set, which can be considered nearly “meritorious” [Kaiser and Rice, 1974], proves its general adequacy for factor analysis. Pearson’s r ’s for each pair of the remaining twenty-nine documents were then factor analyzed using the principal component method with Varimax rotation. Based on a scree test (as a means to determine the number of factors to be extracted), we extracted three from four factors with eigenvalues above 1, accounting for 84.84 percent of the matrix’s variance. They are listed in Table 6 in order of the variance accounted for, Factor 1 being the highest. The variance extracted by a factor signals the relative breadth of

a discourse in relation to the overall research field. To test the reliability of the factor scale, we also calculated Cronbach's Alpha for each factor. The values listed in Table 6 indicate adequate reliability (cf. Hair et al., 2006).

Table 5: Centrality Measures of EA Publications (Co-citation Network)

Reference	Centralities (top ten)		
	Betweenness centrality (norm.)	Closeness centrality (norm.)	Eigenvector centrality
TOGAF [The Open Group, 2009]	0.0332	0.855	1.0
Zachman [1987]	0.0314	0.802	0.92
Lankhorst et al. [2005]	0.0162	0.748	0.90
Ross et al. [2006]	0.0118	0.699	0.84
Sowa and Zachman [1992]	0.0118	0.723	0.86
FEAF [The Chief Information Officers Council, 1999]	0.0099	0.689	0.76
Schekkerman [2004a]	0.0054	0.660	
DODAF [Department of Defense U.S., 2009]	0.0059	0.651	
Niemann [2006]	0.0052	0.652	
Spewak and Hill [1993]	0.0050		
Dern [2006]		0.659	0.79
Keller [2007]			0.77
Langenberg and Wegmann [2004]			0.76
Johnson, Ekstedt, Silva, and Plazaola [2004]			0.75

It was the documents' factor loadings that primarily allowed us to interpret the factors. This is because the key measures of factor analysis—factor loading (FL) and factor score (FS)—provide complementary information [Teichert and Shehu, 2009, 2010]: factor loadings denote how publications fit into the overall context of one discourse (factor); factor scores indicate, conversely, how much this discourse is influenced by these publications. In other words, the factor score indicates the importance of an article for a research discourse, while the factor loading suggests the extent to which the article can be explained by the factor. We thus assigned documents to the factor, for which they have the highest loading, with a minimum value of 0.5 [Hair et al., 2006]. Against this background, we were able to label the three discourses represented by the factors: EA frameworks, Design and operations of EA management, and EA conception and modeling.

The first factor, which comprises works that can be considered foundational structures of EA content, activities and deliverables (i.e., a set of models, principles, methods, visualizations, etc. [Schekkerman, 2004a]) and thus has a focus on EA frameworks, explains 46.7 percent of the entire variance (after Varimax rotation) and dominates the overall EA research field. This underlines the central position of EA frameworks. These frameworks have very different roots: governmental institutions, standards bodies, academia, and practitioners. Indeed, TOGAF [The Open Group, 2009] has evolved to be the foremost EA framework (its far-reaching influence is also evidenced by its high scores in the other factors), placing first-order attention on a method for architecture development complemented by, for example, descriptions of architectural deliverables, an underlying meta model, generic reference models, and guidelines with respect to architectural roles, responsibilities, and skills. In terms of the factor score, it is followed closely by the Zachman framework [Zachman, 1987], suggesting a two-dimensional scheme of the enterprise along perspectives (e.g., planner, owner, designer) and abstractions (e.g., questions of “what,” “how,” and “where”) (note that ZIFA [2001] represents another reference of this framework, but is typically cited together with Zachman [1987]), and the “Federal Enterprise Architecture Framework” (FEAF) [The Chief Information Officers Council, 1999], which primarily permeated U.S. government government agencies (cf. Saha, 2007). The work of Sowa and Zachman [1992] represents an extension of the original Zachman framework [Zachman, 1987] and is thus of similar importance; also Zachman [1997] elaborates on this framework. Likewise, Pereira and Sousa [2004] base their work on Zachman [1987], offering guidance on how to apply this framework. In addition, the U.S. “Department of Defense Architecture Framework” (DODAF) [Department of Defense U.S., 2009], which features a comprehensive set of architecture viewpoints, is present and has exerted influence on this stream, among others on the development of TOGAF [The Open Group, 2009] [Schekkerman, 2004a].

The work of Jonkers et al. [2004] provides an introduction into the ArchiMate modeling language, which has an acknowledged framework character as well (cf. Esswein and Weller, 2008). Another relevant work is that of Bernard [2005], who proposes an EA documentation framework along the three dimensions (thus being labeled EA³ Cube) architectural levels (ranging from strategic goals and initiatives to networks and infrastructure), segments (one or more lines of business), and artifacts (the documentation products). The GERAM framework [IFAC-IFIP, 1999] can be considered an attempt to provide existing frameworks with a common foundation [Aier et al., 2008] as a kind of meta-framework. Interestingly, there are also works not explicitly labeled or referred to as frameworks that may also need to be considered or are at least implicitly used as such Boar [1998]; Beveridge and Perks [2002]; Ross [2003];

Spewak and Hill [1993]. As already outlined, Schekkerman [2004a] offers a comprehensive overview of existing EA frameworks, which explains why it has found its place within this research stream. All in all, the extremely high factor loadings present (see Table 6) in this stream indicate an especially closed discourse.

Table 6: Factor Analysis of Co-citation Profiles

	Factor 1: EA frameworks		Factor 2: Design & operations of EAM		Factor 3: EA conception & modeling	
Explained Variance	46.7%		23.1%		14.9%	
Reference	FL	FS	FL	FS	FL	FS
TOGAF [The Open Group, 2009]	0.969	1.870	0.060	1.078	0.009	0.655
Zachman [1987]	0.957	1.797	-0.207	0.291	-0.133	0.239
FEAF [The Chief Information Officers Council, 1999]	0.943	1.365	-0.154	0.062	-0.167	-0.294
Sowa and Zachman [1992]	0.910	1.308	-0.117	0.307	-0.350	-0.858
Schekkerman [2004a]	0.897	1.278	0.283	1.012	-0.022	-0.019
Spewak and Hill [1993]	0.887	0.942	-0.402	-1.184	-0.117	-0.130
GERAM [IFAC-IFIP, 1999]	0.882	0.652	-0.314	-0.920	-0.093	-0.250
ZIFA [2001]	0.864	0.568	-0.146	-0.456	-0.341	-1.410
Beveridge and Perks [2002]	0.844	0.379	-0.313	-1.006	-0.332	-1.303
Pereira and Sousa [2004]	0.841	0.469	-0.366	-1.221	-0.026	0.043
DODAF [Department of Defense U.S., 2009]	0.832	0.869	-0.079	-0.033	-0.040	-0.101
Boar [1998]	0.818	0.303	-0.354	-1.155	-0.350	-1.497
Bernard [2005]	0.811	0.344	-0.408	-1.550	0.060	0.217
Zachman [1997]	0.751	0.162	0.015	-0.010	-0.478	-1.805
Jonkers et al. [2004]	0.595	0.188	-0.263	-1.042	0.383	1.040
Ross [2003]	0.520	-0.203	-0.166	-0.807	-0.080	-0.481
Dern [2006]	0.112	0.252	0.926	1.950	-0.086	-0.833
Keller [2007]	-0.158	-0.248	0.914	1.775	0.140	-0.467
Braun and Winter [2005]	-0.004	-0.346	0.802	1.043	0.243	-0.285
Matthes et al. [2008]	-0.549	-1.382	0.739	1.060	0.294	-0.260
Niemann [2006]	-0.335	-0.105	0.702	1.200	0.601	1.393
Buckl et al. [2008]	-0.622	-1.536	0.689	1.078	0.327	0.003
Langenberg and Wegmann [2004]	-0.522	-1.136	0.678	0.731	0.182	-0.451
Aier et al. [2008]	-0.581	-1.644	0.608	0.244	0.402	0.124
Buckl, Ernst, Lankes, Schneider, and Schweda [2007]	-0.699	-2.323	0.598	0.289	0.260	-0.566
Winter and Fischer [2007]	0.035	-0.221	0.246	-0.516	0.917	2.168
Johnson and Ekstedt [2007]	-0.167	-0.491	0.091	-0.846	0.913	2.113
Fischer, Aier, and Winter [2007]	-0.163	-0.421	0.564	0.377	0.654	1.235
Kurpjuweit and Winter [2007]	-0.498	-1.236	0.452	-0.131	0.641	1.178
Cronbach's Alpha	0.978		0.961		0.903	

The second-largest factor, accounting for a variance of 23.1 percent, captures two main themes. With the central position of Dern [2006] and Keller [2007], who offer detailed illustrations of EA processes, it focuses on EA operations, that is, the description of EA management activities. Also Niemann [2006]—another very influential work in this stream—provides a comprehensive guideline on how to execute tasks of the EA function. In addition, the factor comprises works that deal with the design of EA management, thus covering aspects of EA method engineering [Riege and Aier, 2008]. Meta modeling, which provides a conceptual scheme of the enterprise architecture and thus specifies its elements along with their relationships and attributes [Buckl et al., 2007; Kurpjuweit and Winter, 2007; Österle, Winter, Höning, Kurpjuweit, and Osl, 2007; Smith, 2011], seems of particular relevance in this context, since this is at the core of the works of Braun and Winter [2005] and Buckl et al. [2007]. Also, the selection of a tool to implement such a meta model and produce meaningful EA deliverables on this basis is of some relevance here, given the influential position of Matthes et al. [2008], who offer a detailed survey of EA management tools. With the two main themes in mind, we labeled the stream “design & operations of EA management.”

The significance of the design theme in the overall discourse can most probably be explained by the considerable risk of failure in establishing an EA function [Buckl, Ernst, Matthes, and Schweda, 2009d; Zink, 2009], for example,

one that does sufficiently address key stakeholder needs. Therefore, the discourse is to some extent dominated by the notion of patterns as “building blocks for the concept of an organization-specific support for EA Management” [Buckl et al., 2007]. This is promoted in particular by the work of Buckl et al. [2008]. Eventually, the stream also contains the review articles of Aier et al. [2008], who elaborate on fundamentals such as EA scope, entities, and analysis techniques, and of Langenberg and Wegmann [2004], who, as stated earlier, evaluate the targets of EA research by 2004. The fact that these reviews are assigned to this factor indicate that this is a field which continually aims to achieve progress, based on consolidated prior research in reviews (cf. Schwarz et al., 2007).

The last factor explains the smallest percentage of variance (14.9 percent) of the three factors extracted. Given their high factor loadings, the works of Winter and Fischer [2007] and Johnson and Ekstedt [2007] are almost perfectly representative for this stream. While Winter and Fischer [2007] suggest a set of essential EA layers and artifacts (architectural objects and their representation in models), Johnson and Ekstedt [2007] elaborate on how to use EA models for rational decision making and the effective contribution to business and information systems goals. With this focus on the fundamental EA structure and models, an appropriate label for this factor seems to be “EA conception & modeling.” The fact that modeling is a central theme in this stream is also evidenced by the additional works of Kurpjuweit and Winter [2007] and Fischer et al. [2007] assigned to this factor. These works are concerned with stakeholder-oriented meta model engineering [Kurpjuweit and Winter, 2007] and, having established such a meta model, a federated approach to EA model maintenance [Fischer et al., 2007].

Remarkably, all three factors involve significant works by both academics and practitioners (note that Niemann [2006] also loads considerably on factor 3), supporting the thesis of a tight academic-practical world link in the EA space [Aier et al., 2008] and suggesting that we should not underestimate the impact of individual publications of EA practitioners (as opposed to Schelp and Winter [2009]). Yet, the fact that the initial data set did not pass our test of sampling adequacy, thus indicating high multicollinearity (which would have resulted in a significantly lower variance explained by the extracted factors), and the close relationship between factor 2 and 3 indicated by works loading significantly on both factors support our initial conclusion based on the above network characteristics, that is, the existence of different clusters that exhibit high overlaps between one another. This may adequately explain the inconsistency in terminology, but may also simply reflect the abstract and wide nature of EA that can be interpreted differently and refined accordingly in its own “language communities” [Schelp and Winter, 2009]. Thus, a converging author community does not necessarily reflect the establishment of a common language and mutual understanding, as suggested by Schelp and Winter [2009], even if restricting the analysis to academic publications only.

The results of the factor analysis also provide some counter-intuitive findings regarding the role of some research topics that one might have expected to constitute central factors in the field due to their critical role for EA practice, on the one hand, and their specific characteristics, on the other hand. First, no factors are defined by research on EA planning, although this seems a core concern of EA practitioners [Kappelman et al., 2008], while at the same time being very complex and demanding (cf. Schmidt and Buxmann, 2011). In recent times, some researchers (e.g., Aier et al., 2009; Saat, Aier, and Gleichauf, 2009; Saat, 2010) have apparently shifted their attention to that topic, but this has not yet developed into a central research stream.

Second, from a systemic point of view (cf. Buckl, Matthes, and Schweda, 2009f), there is no factor concentrating on the integration of EA management with other management functions, which, however, seems crucial for efficiently maintaining the completeness, correctness, and topicality of EA content. According to Buckl et al. [2009b], this is indeed another concern of major importance for EA practitioners. Although specific works present in our analysis are concerned with model maintenance (e.g., Fischer et al., 2007), a major stream is again not yet visible.

Third, specific application scenarios of EA management have not emerged as core streams. For example, mergers and acquisitions [Mehta and Hirschheim, 2004] and outsourcing [Lacity, Khan, Yan, and Willcocks, 2010], both of which represent distinct situations in which EA management can be applied [Winter, Bucher, Fischer, and Kurpjuweit, 2007], have long been established as particular instruments of strategic management by many enterprises. Few works, though, explore the role of EA management in M&A (e.g., Freitag, Matthes, and Schulz, 2010; Mo and Nemes, 2009); the same applies to its role in outsourcing and to its application in the context of the increasingly used [Janssen and Joha, 2004; Schulz, Hochstein, Uebernickel, and Brenner, 2009] “internal” outsourcing option of a shared service center (e.g., Arnold, Op’t Land, and Dietz, 2005; Op’t Land, 2008; Versteeg and Bouwman, 2006). This is despite that in practice this scenario may require a very specific and complex EA model, that is, one which reflects greater service orientation and can be applied recursively to different parties in the role of both service provider and consumer.

To augment the above analysis, we also examined our data set using the ALSCAL multidimensional scaling routine of SPSS. ALSCAL illustrates proximities as distances on a map and allows the visualization of the correspondence between different documents [Uysal, 2010]. That is, the more closely two documents are represented on the map,

the more similarities they share in terms of their co-citation patterns [McCain, Verner, Hislop, Evanco, and Cole, 2005]. The resulting Stress I value of 0.10 coupled with the RSQ value of 0.95 represent a fairly good approximation of the underlying data [McCain, 1990].

Figure 3. Multidimensional Scaling Map of Document Co-citation Profiles

From an impressionistic point of view, moving from left to right along the X-axis (dimension 1) of the resulting map seems to describe the continuum from theoretical foundations to more practical issues and patterns of EA management, while the Y-axis mirrors a certain gradation of focus on specific subjects (i.e., from a wide scope at the bottom end to a rather narrow focus (e.g., Jonkers et al. [2003] examining a specific modeling language) at the top end). The co-citation map (see Figure 3) clearly reflects the three main research streams identified, with the “EA frameworks” populating the left-hand side and the documents belonging to “Design & operations of EA management” and “EA conception & modeling” situated on the right-hand side. As for the latter discourses, the rather dense placement of the corresponding documents evidence close mutual ties, that is, “Design & operations of EA management” and “EA conception & modeling” understandably share common themes, since developing, instantiating, and maintaining an EA model is an integral part of establishing and running an EA practice (also see the factor analysis results, with loadings of Niemann [2006] and Fischer et al. [2007] being above 0.5 for both discourses). For all of the discourses discovered, it is worth noting that these are not influenced predominantly by a single research group but can take advantage of balanced contributions.

Content Analysis

To move the state-of-the-art analysis along and gain more insights into particular aspects of the different streams (e.g., which architectural layers and method building blocks are discussed most), we conducted a detailed content analysis of the 608 core documents. We applied a classification scheme based on the dimensions EA layers, EA methodology, EA management tasks/processes, and EA lifecycle phases, defining for each the corresponding characteristics to be used for coding the documents (cf. Gable, 2010). Accordingly, we classified the EA publications using a multiple item coding system (cf. Langenberg and Wegmann, 2004) per dimension; for example, each publication was assigned to one or several EA layers addressed (except for works, in which a certain focus and corresponding contributions could not be identified, such as in general literature reviews). The comparative analysis [Neuendorf, 2002] enabled by this complemented the applied bibliometric methods and shed light on whether literature to date has revolved around very specific EA subjects.

EA layers represent conceptual domains [Jonkers et al., 2004] of enterprise architecture and make up the basic structure of an enterprise architecture model [Matthes et al., 2008] by capturing related entities [Janssen 2009;

Winter and Fischer, 2006]. The most prominent of these layers are business architecture, application architecture, information architecture, and technical architecture [Janssen, 2009; Matthes et al., 2008; Platt, 2002; The Open Group, 2009]. Beyond that, the “cross-cutting aspects” [Buckl, Matthes, and Schweda, 2010] transition (e.g., projects) and standards constitute separate domains. Knowing that it is common practice to differentiate enterprise architecture into various layers, we surveyed our EA source documents with respect to the layer(s) with which they deal. This resulted in 410 documents for which we could identify at least one EA layer covered. Application architecture is represented most often by some 83 percent of these publications, closely followed by business architecture at 78 percent (although some publications may not discuss business architecture management per se, but rather aspects of it in the context of application landscaping). In contrast, technical architecture (53 percent) and information architecture (45 percent) garner less attention, and transition (13 percent) and standards (10 percent) receive only minor attention (see Figure 4).

Business architecture can be divided further into business strategy and business organization [Winter and Fischer, 2006]. Potentially, there is even a third sub-layer—the business model. Capturing elements such as value proposition, customer segments, distribution channels, and revenue model, the business model provides a blueprint of the strategy as well as a link between abstract strategy and concrete organization [Hedman and Kalling, 2003; Osterwalder and Pigneur 2002, 2003; Osterwalder, Pigneur, and Tucci, 2005]. It is interesting that of the 320 publications that deal with business architecture, nearly 95 percent tackle the business organization, while only 41 percent are concerned with business strategy. The business model finds even less consideration (32 percent). The discourse on business organization [Schönherr, 2008] concentrates far more on business processes (93 percent) than on organizational structures (60 percent).

Defining the “how” of EA management [Bernard, 2005], EA methodology—the second coding dimension—essentially comprises the following core method elements of EA management: EA meta model (the conceptual scheme of EA content), processes, organization (e.g., roles, responsibilities, committees), tool, and modeling (the representation of EA content) [Bernard, 2005; Johnson, Johansson, Sommestad, and Ullberg, 2008; Leist and Zellner, 2006, 2008; Niemann, 2008; Simon, 2009b]. Accordingly, we analyzed our set of EA publications, from which 342 were classifiable. We concluded that modeling (66 percent) and the EA meta model (43 percent) far outrank processes (24 percent), tool (16 percent), and organization (14 percent) in terms of attention in the literature.

EA management tasks/processes was the third dimension analyzed; its main constituents are IT landscape management, business architecture management, standards management, solution architecture development, and EA inception (the establishment and advancement of EA methods) [Andresen, Gronau, and Schmid, 2005; Hanschke, 2010; Hafner and Winter, 2008; Hirvonen, Pulkkinen, and Valtonen, 2007; Kurpjuweit and Winter 2007; Simon, 2009a; Slot, Dedene, and Maes, 2009; Smith, 2011; The Open Group, 2009]. The figures based on the 281

In addition to the aforementioned tasks/processes, the literature also deals with the phases of documentation, analysis, planning, implementation, and governance. These terms are often misinterpreted. While some view them as together constituting the one and only EA management process (e.g., Buckl, Ernst, Matthes, and Schweda, 2009e), we consider them phases of the EA lifecycle through which elements and artifacts of enterprise architecture are driven [Niemann, 2006, 2008] and which can, therefore, be interpreted as having an orthogonal and cross-cutting character with respect to the different EA management processes (see Figure 5). The classification of our source documents (327 classifiable) reveals that literature concentrates primarily on documentation (54 percent), whereas the phases of analysis (37 percent), planning (33 percent), implementation (22 percent), and governance (28 percent) have not permeated literature to the same degree. Information gathering, considered an essential part of documentation [Simon, Fischbach, and Schoder, 2010], remains a minor research topic (10 percent of this discourse).

Volume 32 ■ ■ Article 1

are subject to a certain involvement of roles and boards of the EA organization, thus completing the EA method elements we investigated in literature and found to be dealt with to a significantly different extent.

Table 7: Findings for Research Questions 1, 2, and 3

	Research question	Main findings
1	How do scholars in the field collaborate via co-authorships (in comparison to other fields) and what impact does this have on the diffusion of their contributions?	<ul style="list-style-type: none"> • The co-authorship network is quite clustered and there is moderate collaborative work across different research groups in terms of its frequency. • Still, there is some degree of a small-world nature, since global separation is also only moderate. • Documents are cited more often the more authors they have, while the sole incidence of co-authorship has no statistically significant association with the number of citations.
2	What are the main research streams in the field, how are they interlinked and what are the major works to be assigned to these streams?	<ul style="list-style-type: none"> • There are three major research streams (according to the co-citation patterns): “EA frameworks,” “Design & operations of EA management,” and “EA conception & modeling” (see Table 6 for the assigned documents). • EA frameworks and other comprehensive works, including from individual practitioners, play a central role within the research field. • No major streams are defined by highly relevant topics like architectural planning, the integration of EA management with other practices, and specific application scenarios of EA management (e.g., M&A, outsourcing). • There is some gap between theoretical foundations and practical issues in EA research (as per the multidimensional scaling map and the closed character of the EA frameworks stream as suggested by the factor analysis results). • According to the citation patterns, the integration with related research fields seems rather moderate.
3	How does the focus of work spread within specific dimensions of EA research content (e.g., architectural layers)?	<ul style="list-style-type: none"> • EA layers: Application architecture is represented most often in EA research. At the business architecture layer, research is concerned more with the business organization than with the business strategy and model. • EA methodology: EA research focuses on (meta) modeling, while EA processes and organization receive less attention. • EA management tasks: IT landscape management occupies the center stage of research, far ahead of business architecture management, solution architecture development, and standards management, for example. • EA lifecycle phases: The literature concentrates primarily on documentation, whereas the other lifecycle phases find less consideration.

With the individual document profiles created through the above classification, we also obtained a reasonable justification for the identified central position of works such as Dern [2006], Keller [2007], Lankhorst et al. [2005], and Niemann [2006], since these profiles substantiated their comprehensive character indicated. It is also interesting to look into the focus of the main research groups mapped above. In general, this reflects the overall picture depicted above, but there are some fine differences. The TU Munich research group appears to concentrate on IT landscape management, particularly on documentation, while solution architecture development is not considered to be a subject of EA management [Buckl et al., 2009e]. Similarly, the KTH Stockholm research group addresses mostly IT landscape management, but apparently puts greater emphasis on the analysis and planning lifecycle phases. Only the University of St. Gallen research group takes business architecture management and corresponding analysis into greater account, attaching greater importance to the business strategy and business model part of business architecture.

As for the main research streams identified through our factor analysis, the content analysis supports the central role of EA modeling and also indicates clearly that the theme of EA management design as captured by the second factor thus far revolves around meta modeling. EA organization remains on the sideline, particularly in the most significant works. The theme of the operations of EA management is geared heavily toward IT landscape management, especially the documentation phase, but there is little research on standards management. This is also reflected in what we called “EA conception & modeling,” with the layers of standards and transition being of minor relevance within the discourse.

Table 7 summarizes the findings for our first three research questions, which we have gained through the above analyses. In the following section, we build on these findings and, complemented in particular by empirical

observations documented in the literature (cf. Webster and Watson, 2002), discuss future possibilities in EA research (corresponding to our fourth research question).

IV. DISCUSSION: A PROPOSED AGENDA FOR FUTURE EA RESEARCH

With an aggregated interpretation of the above findings on the terrain of enterprise architecture, there are a number of insightful conclusions that can be drawn with respect to research history, current state, and, most important, reasonable future research directions, for which we make use of different reasoning coming from theoretical explanations, past empirical findings, and practice or experience as suggested by Webster and Watson [2002] to highlight the differences between “what we know and what we need to know.”

Comparing the distribution of publications over time, it becomes evident that enterprise architecture (labeled as such) is still a relatively young but not as immature a research discipline as (identified by Langenberg and Wegmann [2004]) several years ago, and that the Internet hype, involving priorities other than enterprise architecting, may have indeed partially impeded faster adoption (as assumed by Langenberg and Wegmann [2004]) until the dot-com bubble burst in 2000. It can now be considered a very lively research field, in which academic efforts in particular have increased significantly since 2003 (see Figure 1). It is interesting that this is driven primarily by European researchers, and as more is published, the more EA research centers in Europe. This may be traced back to the findings of Schekkerman [2004b]. They indicate that EA management was already more embedded in U.S. companies at that time, which may have led to less interest in research by the time these studies proliferated. In line with Acedo et al. [2006], who in the field of management identified a smaller tendency toward joint publications in Europe than in the United States, the fact that in the past years research activities concentrated on Europe may in turn have at least partially led to the present fragmentation of the co-authorship network.

As all our methods applied have shown, a significant part of the development in the EA arena can be attributed to the frameworks. On the one hand, this is due to their influential role according to the citation patterns uncovered by our analysis. Most notably, this is the case for TOGAF [The Open Group, 2009], for which we found consistently high values in our factor analysis. On the other hand, frameworks themselves represent results of research activities to some extent (e.g., ArchiMate), integrating, summarizing, and conceptualizing knowledge [Schwarz et al., 2007], and thus constituting an advance in the research field itself. In addition to the designated frameworks, there are other comprehensive works (especially books) by both academics and practitioners that our analysis revealed as important contributions. Further enhancements of these works in the future, adopting new trends and developments, appear to remain valuable, since with the variety of considered EA facets (as identified by our content analysis) they evidently come close to providing a coherent picture of the overall EA concept.

At the same time, EA terminology must still become more consistent to assure the integratability of different approaches, especially that of designated frameworks and “customized” architectural methods. Given the huge initial efforts associated with the implementation and use of a framework [Röwekamp, 2010], which many practitioners consider to be too theoretical [Buckl et al., 2009b], this integration constitutes an apparently fruitful research avenue (although this is not meant to say that research should further increase its focus on frameworks). Specific attempts to achieve progress have already been made (e.g., Buckl, Ernst, Matthes, Ramacher, and Schweda, 2009c, who complement TOGAF with viewpoints patterns); however, further efforts should follow to continually close the gap between theoretical foundations and EA practice uncovered by our co-citation analysis (where we found a relatively closed stream of EA frameworks placed apart considerably from more practical issues of EA management in the multidimensional scaling map, and a certain desire of progress in research on operating issues of EA management indicated by the review articles assigned to this factor). Further, such efforts should concentrate on achieving a defragmentation of the research streams beyond the “EA frameworks,” “Design & operations of EA management,” “EA conception & modeling” (i.e., those streams that have not been extracted in the factor analysis) and a consolidation into dedicated focuses on, for example, architectural planning, the integration of EA management into the enterprise, and the application of EA management in specific scenarios such as M&A and outsourcing (cf. Leimeister, Leimeister, Fähling, and Krcmar, 2008) to account for the relevance in practice (see discussion above).

This appears to be one of the main challenges for the EA research community. Therefore, collaboration (beyond potential interactions at conferences or in program committees) across different research groups—especially intercontinental and cross-academic—may need to improve. For a small-world network to become a reality, research groups may consider establishing specific representatives who regularly participate in the research projects of other groups and thus facilitate identifying the most relevant research questions, the accelerated transfer of new ideas, and the gradual achievement of a common language. In a small-world network, clusters can be linked by persons who are members of multiple clusters, making it possible for even large communities comprising many separate clusters to be connected and cohesive. In particular, this collaboration should entail an increased number of, preferably internationally, co-authored publications, which have been shown to be more likely to be cited on average and to appear in high impact journals [Acedo et al., 2006; Glänzel and Schubert, 2004], both of which facilitate their

diffusion. This is also supported by the findings of our study, which indicate that this applies in a similar way to EA research, that is, the number of a publication's authors shows a positive impact on the number of citations it receives.

Of similar importance is a closer integration with related research fields, to account for the fact that EA management is not likely to work effectively if regarded as a stand-alone function and thus collaborates closely with other management functions in practice (as evidenced by Winter et al. [2010]), and to enable a mutual learning process and methodological substantiation (e.g., with portfolio assessment techniques). This could also be incorporated in university education, where EA management is still insufficiently represented [Buckl, Dierl, Matthes, Schulz, and Schweda, 2009a; Schmidt 2009] but where the foundation for a common understanding and effective communication with both business and IT stakeholders can be set.

Furthermore, the analysis reveals a range of specific topics that—in light of the significant role that research may play in progressing a field—deserve more in-depth investigation, for example, the exploration of EA management constituents other than IT landscape management. This is particularly the case for standards management and solution architecture development. With relatively scarce research on standards management, there is a unique opportunity for academics to substantiate a field that is an integral part of the most important success determinant of an EA function (according to Schmidt and Buxmann [2011])—architecture governance. In fact, there is strong evidence for both the significance of using EA standards in effectively managing IT resources [Boh and Yellin, 2006] and the positive impact of IT standardization on IT agility [Tiwana and Konsynski, 2010]. Likewise, EA-based solution architecture activities have been shown to be of considerable business value [Slot et al., 2009], which is also fostered by other research currently in progress by ourselves, indicating that solution architecture development is considered a primary field of relevance for an EA management function by practitioners. However, as the number of citations for software architecture works indicates, there is a low degree of integration between research on strategic and operational architecture management, both key aspects of EA management [Niemann, 2008]. Given the “ivory tower” syndrome and the lack of integration with operational activities from which many EA practices suffer, which may fundamentally jeopardize their success [van der Raadt, Schouten, and van Vliet, 2008], further research is required to progress toward achieving an integrated view of the discipline as a whole.

This also involves developing a more comprehensive approach to business architecture management, research into which most often centers on the implementation level, that is, the business organization. Conversely, both business strategy and business model (the latter having surged into the management vocabulary over the past years [Shafer, Smith, and Linder, 2005]), receive only minor attention. This is evidenced by relatively few references to business engineering works. With this research focus, the alignment of business and IT [Goeken, Johannsen, and Pfeiffer, 2008; Wieringa, Blanken, Fokkinga, and Grefen, 2003], which is one of the main benefits associated with EA management [Kappelman et al., 2008; Valorinta, 2011], is tackled only on an operational level. Further, research misses the opportunity to leverage the discipline's business design capability [Aitken, 2009] and the potential of the business model concept [Osterwalder et al., 2005; Österle et al., 2007] to facilitate the practical translation of strategy into business execution [Parker, 2009], contribute to a shared understanding between business and IT, and support IT portfolio management [Osterwalder et al., 2005]. This potential also seems widely acknowledged by many IT professionals, whose perception is that business architecture is implemented only to a small extent of what they really need [Leganza, 2010]. This is also in line with the findings of Franke, Ekstedt, Lagerström, Saat, and Winter [2010], who through a survey among European practitioners uncovered that currently EA methods are perceived to support business-IT-alignment only to a moderate extent, although this is considered a highly relevant issue in companies. In a recent study, Aier, Gleichauf, and Winter [2011] even showed that a balanced approach to EA management with respect to business and IT goals promises by far the greatest success. With a shift in their agenda, researchers could make a contribution that allows the EA discipline to increase its business focus. This is again where a closer collaboration is likely to be critical to allowing the integration of different knowledge and to operating successfully within the wide continuum EA management offers, for example, from strategy to execution, from business to technology, and from abstraction to detail. This collaboration should also include researchers from the enterprise modeling/enterprise ontology field, acknowledging that the enterprise ontology represents the highest-level constructional model of the enterprise [Dietz and Hoogervorst, 2008] and that the basic idea of enterprise modeling is to offer different views on the enterprise that allow for various levels of abstraction and can be integrated with one another [Frank, 2002].

Whether it is business architecture management, IT landscape management, or any other constituent of EA management, the results of our analysis, compared to findings from the literature, indicate that future research should put greater emphasis on activities other than documentation to prove that this is more than a paper-based science and to meet the expectations of many practitioners that enterprise architecture can be a decision-making tool [Kappelman et al., 2008; Schekkerman, 2004b]. Hence, another essential research step may be a deeper examination of the lifecycle phases of analysis (for which Aier et al. [2008] identified a need for greater methodical

support, for example) and planning (in line with our above conclusions derived from the results of our co-citation analysis). Among others, this also involves integration with research on IT portfolio management, which thus far hardly exists, to tap the full synergy potential (as depicted in Simon [2009b] and Simon et al. [2010]). Moreover, it implies directing greater focus on the temporality aspects [Aier et al., 2009; Buckl et al., 2009e; Saat, 2010; Saat et al., 2009] of EA management (cf. Aier et al., 2008), which relate to the transition layer (e.g., projects) of enterprise architecture and complex scenario planning, all of which are likely to increase in significance in future EA practice [Wolff, 2011].

Not to be forgotten, there seems to be a need to substantiate the moderately discussed lifecycle phase of governance. This is because it is a multi-faceted phase that captures a number of activities critical to success of the EA function, such as conformity and compliance checks, transformation monitoring, maturity assessments [Becker, Niehaves, Poeppelbuss, and Simons, 2010], and performance measurement [Lucke et al., 2010]. To quote Weill and Vitale [2004], "[T]he difference between management and governance is like the difference between a soccer team running harder and practicing longer and the team stepping back to analyze its composition and game strategy." The measurement of results thus is of particular importance, since this provides the basis for justifying and selling the value of an EA function in the long run—a challenge that EA practitioners increasingly face today [Schelp and Stutz, 2007].

The shift in focus within both EA management tasks and lifecycle phases may be reflected adequately in further explorations of the underlying EA methodology. Analysis and planning are more challenging than documentation and pose higher requirements to meta modeling, and this is where research can provide particular assistance. In general, however, the modeling aspects may take a back seat in the discourse to EA processes and organization, which are of great practical relevance (cf. Lucke et al., 2010; Schmidt, 2009) but only thus far rudimentarily substantiated thus far (cf. Strano and Rehmani, 2007). To close this discussion, we can conclude that the discipline of enterprise architecture has already been subject to impressive development, but there is still some way to go.

V. SUMMARY

Essentially, our study shows a growing interest in EA research. Nowhere does this come through more clearly than in the increasing number of publications since 2003, with European researchers being the major drivers. We were able to identify the most active research groups, which may be on their way to becoming a small world but not yet a common-language community. Further, we provide quantitative evidence of the significance of individual publications within the overall research field. Among other things, this supports the central role of EA frameworks and other comprehensive works, including from individual practitioners.

We also derived three main structural patterns: EA frameworks, design and operations of EA management, and EA conception & modeling. From our additional qualitative analysis with respect to specific subjects of research comes a whole range of insights—for example, the research focus on (meta) modeling and IT landscape management. In contrast, the suggested terrain for future research involves greater emphasis on business architecture management (at the strategic level), standards management, the integration with operational architecture management, and, in general, EA lifecycle phases beyond documentation. A shift of focus to EA processes and organization may provide the necessary basis and also facilitate giving more pragmatic advice, needed to attract practitioners.

In consequence, given the answers we provided for our main research questions, the contribution of our study is manifold. First, to our knowledge, it is the first to analyze collaboration in EA research and its impact on document citation. Compared to other fields, we have found a quite clustered network, and we have good evidence that documents are cited more often the more authors they have. This led us to the suggestion of using a higher frequency and level of (preferably international) co-authorship to complete a research document and establishing "research ambassadors" as representatives to fellow research groups in order to promote scientific exchange and make further progress in the field.

Second, our study provides a unique overview of the intellectual structure of the research field, that is, its main research streams according to prevalent co-citation patterns and the most influential works within these streams. On the one hand, this allows researchers to position themselves and their work within the overall research field; senior researchers in particular may benefit from this study's appreciation of their work. On the other hand, for both academics and practitioners, especially those new to this area, the description of the main streams and the most central work (e.g., designated EA frameworks) that has emerged from co-citation analysis offers orientation and guidance and hence facilitates entry into the research field (although there may be further important topics, e.g., EA principles, not captured by our analysis of the three largest factors according to the co-citation patterns). This study's results are thus also relevant from a practical point of view. Although practitioners typically do not study the scientific literature in detail, they may well work closely with academics. This also applies to the EA field, as indicated by central works present in our study that were developed in close collaboration between academia and practice (e.g.,

Buckl et al., 2008; Matthes et al., 2008). Our study may help practitioners identify scholars with whom they may find it interesting to work, and, in addition, central publications of other practitioners whose contributions we have found to be significant and that practitioners may want to read.

Third, the content analysis, which we used in addition to the bibliometric methods, provides further insights into the body of literature in terms of the specific focus adopted by individual works. The result is a comprehensive profile of the research field that contributes significantly to an understanding of the current self-conception of the discipline. Junior scholars who examine these results will gain a better understanding of the research tradition and, combined with the insights obtained through the bibliometric analysis, of the clusters of both authors and works that have predominantly influenced the field. The classification framework itself used for content analysis comes as another valuable result of our work, since this structure of the topic and the way in which the dimensions are brought in relation to one another help clarify previously confused constructs of EA management and thus facilitate communication and the achievement of a common understanding.

Eventually, the results of both bibliometric and content analysis in this study, set in contrast with issues in EA practice evidenced by the literature (as per our discussion in the penultimate section of this article), indicate areas where specific research is needed and thus open up myriad research possibilities. While the existing body of EA research has become meritorious, the field continues to face significant challenges and is likely to remain a rich field of inquiry. Therefore, the purpose of this study was not to criticize prior work; rather, it identifies and emphasizes the need for future academic work and alerts scholars to fruitful lines of research (which we do not claim to be exhaustive), given certain scientifically underexplored yet promising and challenging themes from a practical point of view. These lines involve not only a more balanced examination of certain architectural layers, method elements, EA management tasks, and lifecycle phases, but also an increased use of applied research to overcome potential gaps between theoretical foundations and the application of EA management. Indeed, it is remarkable that, in contrast to other fields (e.g., Culnan, 1986; Teichert and Shehu, 2010), our study does not identify any larger application-oriented research streams, such as the use of EA management in M&A and outsourcing. The same applies to highly practical challenges like architectural planning and the integration of EA management into the enterprise, which have similarly gained little attention so far, but where the further development of tool support constitutes a particularly interesting field of collaboration between research and practice. As for the dominant stream of EA frameworks, our study suggests putting greater emphasis on the practical use of these frameworks in the future. Also, our results may be valuable for the frameworks themselves, as they point to specific aspects that may need to be considered in further advancements of these works.

Our results have value despite the limitations of this study. First, there is no precise definition of what constitutes EA research, which is due in particular to the abstract and broad character of the concept as whole and other, more “modern” terms used as substitutes for “enterprise architecture.” Although we made every effort to draw a complete picture, there may still be some documents we have not included. In particular, some of the most recent papers may not have been adequately considered, given the retrospective nature of the bibliometric methods applied. The most recent research may not yet be published. Given the inherent time lag, a greater representation in leading journals could take several years. Further, there is no differentiation between whether an article is cited positively or negatively, since the citations are neither valued nor totaled according to the number of occurrences per paper. As indicated, there could be quite different motives behind the citing behavior of authors. Biased citing and both inadequate self-citation and reference of secondary sources may be the consequence [MacRoberts and MacRoberts, 1996]. In addition to the context of citation, journal prestige [Chua, Cao, Cousins, and Straub, 2002] and the importance of the citing documents [Ding, Yan, Frazho, and Caverlee, 2009] may be other factors to use when evaluating individual publications. A final limitation comes from the fact that we excluded from our analysis various sources lacking references, such as marketing material and white papers from EA consultancies and tool vendors. In doing so, we may have missed documents that provide significant guidance to EA practitioners in their everyday work and thus make an essential contribution to their overall body of knowledge; in fact, there may be further documents of high practical significance that include no references.

Given these limitations, our study could be extended in various ways. First, sentiment analysis may represent a way to value citations and thus account for the quality of a reference. Second, consideration of journal prestige measures could allow the examination of individual research contributions to be taken to an even more accurate level. Further, bibliographical coupling could be used as an additional instrument to complement co-citation analysis, not only to explore established research streams or tendencies but also those emerging most recently. With a deeper regional differentiation of contributions, it might also be possible to gain greater insights into the geographic distributions of overall research streams and the diffusion of specific concepts. In that context, it might be reasonable to collect further publications in languages other than English and German. For the co-authorship network, future research may also need to consider dynamic analysis, since one might argue that nodes and edges disappear over time when collaboration ends or when an actor leaves the research field. The classification approach used for content

analysis could potentially be bolstered in the future by adding further dimensions and by looking into the quality of contribution. To mirror the results to further developments and trends in practice, it also seems promising to conduct an additional survey among practitioners.

An essential future step would be to run the analysis again in a few years to review the further evolution of the research field and, specifically, any progress made in the future research topics we recommend. Enterprise architecture (as labeled as such) is still a relatively young discipline, and while a strong framework orientation has been characteristic of recent years, newer streams may achieve similar importance in the near future. In this respect, another interesting opportunity for future research is to bring practitioner documents lacking references into the focus of analysis and explore whether patterns similar to those summarized in Figure 4 emerge, that is, whether the overall body of practitioner literature, similar to our literature set dominated by scientific sources, also shows a strong focus on (among others) conceptual frameworks and modeling rather than on, for example, the use of EA management in M&A and outsourcing. While practitioners may find it interesting to see that the analysis in its current form already reflects some of their major issues, they may show even more interest in an extended analysis that considers further documents that belong to their practical frame of reference. Such an analysis might also include additional sources dealing explicitly with service-oriented architecture and cloud computing, acknowledging that service orientation has likely become a prevalent concept in most EA practices and that EA practitioners increasingly embrace the cloud as a natural extension of the enterprise architecture and thus associate it closely with what actually happens in architectural practice (cf. Berneaud et al., 2012).

All in all, we believe our approach of applying bibliometric analysis to EA literature, coupled with an in-depth, qualitative research investigation, is a unique way to capture the state of the art in the research area and, as indicated, offers ideas and advice for researchers and practitioners alike. With this in mind, our findings should assist those who wish to come to grips with the complex field of EA research, and equally those who will act as explorers of EA management in the future.

ACKNOWLEDGEMENTS

The authors would like to gratefully acknowledge the valuable comments and help provided by Rolf T. Wigand, Scott M. Cooper, and Thomas Hummel. They also appreciate the useful suggestions of the anonymous associate editor.

REFERENCES

Editor's Note: The following reference list contains hyperlinks to World Wide Web pages. Readers who have the ability to access the Web directly from their word processor or are reading the article on the Web, can gain direct access to these linked references. Readers are warned, however, that:

1. These links existed as of the date of publication but are not guaranteed to be working thereafter.
2. The contents of Web pages may change over time. Where version information is provided in the References, different versions may not contain the information or the conclusions referenced.
3. The author(s) of the Web pages, not AIS, is (are) responsible for the accuracy of their content.
4. The author(s) of this article, not AIS, is (are) responsible for the accuracy of the URL and version information.

Abramo, G., C.A. D'Angelo, and F. Di Costa (2010) "Citations versus Journal Impact Factor as Proxy of Quality: Could the Latter Ever Be Preferable?", *Scientometrics*, (84), pp. 821–833.

Acedo, F.J., C. Barroso, C. Casanueva, and J.L. Galán (2006) "Co-Authorship in Management and Organizational Studies: An Empirical and Network Analysis", *Journal of Management Studies*, (43)5, pp. 957–983.

Ahlgren, P., B. Jarneving, and R. Rousseau (2003) "Requirements for a Cocitation Similarity Measure, with Special Reference to Pearson's Correlation Coefficient", *Journal of the American Society for Information Science and Technology*, (54)6, pp. 550–560.

Aier, S., B. Gleichauf, J. Saat, and R. Winter (2009) "Complexity Levels of Representing Dynamics in EA Planning", *Proceedings of the 5th International Workshops CIAO! and EOMAS, The 21st International Conference on Advanced Information Systems*, Amsterdam, Netherlands, pp. 55–69.

Aier, S., B. Gleichauf, and R. Winter (2011) "Understanding Enterprise Architecture Management Design—An Empirical Analysis", *Proceedings of the 10th International Conference on Wirtschaftsinformatik*, Zurich, Switzerland, pp. 645–654.

Aier, S., C. Riege, and R. Winter (2008) "Unternehmensarchitektur—Literaturüberblick und Stand der Praxis", *Wirtschaftsinformatik*, (50)4, pp. 292–304.

- Aitken, C. (2009) "Enterprise Architecture, Strategic Management, and Information Management" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 121–155.
- Andresen, K., N. Gronau, and S. Schmid (2005) "Ableitung von IT-Strategien durch Bestimmung der notwendigen Wandlungsfähigkeit von Informationssystemarchitekturen", *Proceedings of the 7th International Conference on Wirtschaftsinformatik*, Bamberg, Germany, pp. 63–82.
- Arnold, B., M. Op't Land, and J. Dietz (2005) "Effects of an Architectural Approach to the Implementation of Shared Service Centers", *Proceedings of the 2nd International Workshop on Enterprise, Applications and Services in the Finance Industry*, Regensburg, Germany.
- Bass, L., P. Clements, and R. Kazman (2003) *Software Architecture in Practice*, Boston, MA: Pearson Education.
- Bastian, M., S. Heymann, and M. Jacomy (2009) "Gephi: An Open Source Software for Exploring and Manipulating Networks", *Proceedings of the 3rd International AAAI Conference on Weblogs and Social Media*, San Jose, CA, pp. 361–362.
- Becker, J., B. Niehaves, J. Poeppelbuss, and A. Simons (2010) "Maturity Models in IS Research", *Proceedings of the 18th European Conference on Information Systems*, Pretoria, South Africa.
- Bem, D.J. (1995) "Writing a Review Article for Psychological Bulletin", *Psychological Bulletin*, (118)2, pp. 172–177.
- Bernard, S.A. (2005) *An Introduction to Enterprise Architecture*, Bloomington, IN: AuthorHouse.
- Berneaud, M., S. Buckl, A. Diaz-Fuentes, F. Matthes, I. Monahov, A. Nowobilska, S. Roth, C.M. Schweda, U. Weber, and M. Zeiner (2012) *Trends for Enterprise Architecture Management and Tools*, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- Beveridge, T. and C. Perks (2002) *Guide to Enterprise IT Architecture*, New York, NY: Springer.
- Boar, B.H. (1998) *Constructing Blueprints for Enterprise IT Architectures*, Hoboken, NJ: Wiley.
- Boh, W. and D. Yellin (2006) "Using Enterprise Architecture Standards in Managing Information Technology", *Journal of Management Information Systems*, (23)3, pp. 163–207.
- Bonacich, P. (2007) "Some Unique Properties of Eigenvector Centrality", *Social Networks*, (29), pp. 555–564.
- Braun, C. and R. Winter (2005) "A Comprehensive Enterprise Architecture Metamodel and Its Implementation Using a Metamodeling Platform", *Proceedings of the 1st International Workshop on Enterprise Modelling and Information Systems Architectures*, Klagenfurt, Austria, pp. 64–79.
- Buckl, S., T. Dierl, F. Matthes, C. Schulz, and C.M. Schweda (2009a) *Teaching Enterprise Architecture Management: A Practical Experience*, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- Buckl, S., T. Dierl, F. Matthes, and C.M. Schweda (2010) "Building Blocks for Enterprise Architecture Management Solutions", *Proceedings of 2nd Working Conference on Practice-Driven Research on Enterprise Transformation*, Delft, Netherlands, pp. 17–46.
- Buckl, S., A.M. Ernst, J. Lankes, and F. Matthes (2008) *Enterprise Architecture Management Pattern Catalog*, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- Buckl, S., A.M. Ernst, J. Lankes, F. Matthes, and C.M. Schweda (2009b) *State of the Art in Enterprise Architecture Management*, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- Buckl, S., A.M. Ernst, J. Lankes, K. Schneider, and C.M. Schweda (2007) "A Pattern Based Approach for Constructing Enterprise Architecture Management Information Models", *Proceedings of the 8th International Conference on Wirtschaftsinformatik*, Karlsruhe, Germany, pp. 145–162.
- Buckl, S., A.M. Ernst, F. Matthes, R. Ramacher, and C.M. Schweda (2009c) "Using Enterprise Architecture Management Patterns to Complement TOGAF", *Proceedings of the 13th International EDOC Conference*, Auckland, New Zealand, pp. 34–41.
- Buckl, S., A.M. Ernst, F. Matthes, and C.M. Schweda (2009d) "How to Make Your Enterprise Architecture Management Endeavor Fail!", *Proceedings of the 16th Conference on Pattern Languages of Programs*, Chicago, IL.
- Buckl, S., A.M. Ernst, F. Matthes, and C.M. Schweda (2009e) "Visual Roadmaps for Managed Enterprise Architecture Evolution", *Proceedings of the 10th ACIS International Conference on Software Engineering, Artificial Intelligences, Networking and Parallel/Distributed Computing*, Daegu, South Korea, pp. 352–357.

- Buckl, S., F. Matthes, and C.M. Schweda (2009f) "A Viable System Perspective on Enterprise Architecture Management", *Proceedings of the IEEE International Conference on Systems, Man and Cybernetics*, San Antonio, TX, pp. 1483–1488.
- Buckl, S., F. Matthes, and C.M. Schweda (2010) "Conceptual Models for Cross-cutting Aspects in Enterprise Architecture Modeling", *Proceedings of the 14th IEEE International Enterprise Computing Conference*, Vitória, Brazil, pp. 245–252.
- Buckl, S., C.M. Schweda, and F. Matthes (2010a) "A Design Theory Nexus for Situational Enterprise Architecture", *Proceedings of the 14th IEEE International Enterprise Computing Conference*, Vitória, Brazil, pp. 3–8.
- Buckl, S., C.M. Schweda, and F. Matthes (2010b) "A Situated Approach to Enterprise Architecture Management", *Proceedings of the 2010 IEEE International Conference on Systems, Man, and Cybernetics*, Istanbul, Turkey, pp. 587–592.
- Case, D.O., and G.M. Higgins (2000) "How Can We Investigate Citation Behavior? A Study of Reasons for Citing Literature in Communication", *Journal of the American Society for Information Science and Technology*, (51), pp. 635–645.
- Charvet, F.F., M.C. Cooper, and J.T. Gardner (2008) "The Intellectual Structure of Supply Chain Management: A Bibliometric Approach", *Journal of Business Logistics*, (29)11, pp. 47–73.
- Chou, L.-Y., and H.-C. Tseng (2010) "Exploring the Intellectual Structure of Contemporary Tourism Studies", *Journal of Quality*, (17)2, pp. 159–177.
- Chua, C., L. Cao, K. Cousins, and D.W. Straub (2002) "Measuring Researcher-Production in Information Systems", *Journal of the Association for Information Systems*, (3)1, pp. 145–215.
- Cockcroft, S. (2010) "The Use of Social Network Analysis to Explore Relationships Between the Medical Informatics and Information Systems Literature", *Proceedings of the 16th Americas Conference on Information Systems*, Lima, Peru, p. 551.
- Costenbader, E. and T.W. Valente (2003) "The Stability of Centrality Measures When Networks Are Sampled", *Social Networks*, (25), pp. 283–307.
- Culnan, M.J. (1987) "Mapping the Intellectual Structure of MIS, 1980–1985: A Co-citation Analysis", *MIS Quarterly*, (11)3, pp. 341–353.
- Culnan, M.J. (1986) "The Intellectual Development of Management Information Systems, 1972–1982: A Co-citation Analysis", *Management Science*, (32)2, pp. 156–172.
- Department of Defense U.S. (2009) "The DoDAF Architecture Framework Version 2.0", <http://cio-nii.defense.gov/sites/dodaf20/index.html> (current Nov. 28, 2011).
- Dern, G. (2006) *Management von IT-Architekturen: Informationssysteme im Fokus von Architekturplanung und—entwicklung*, Wiesbaden, Germany: Vieweg.
- Dietz, J.L.G. and J.A.P. Hoogervorst (2008) "Enterprise Ontology in Enterprise Engineering", *Proceedings of the 2008 ACM Symposium on Applied Computing*, Fortaleza, Brazil, pp. 572–579.
- Ding, Y., E. Yan, A. Frazho, and J. Caverlee (2009) "PageRank for Ranking Authors in Co-citation Networks", *Journal of the American Society for Information Science and Technology*, (60)11, pp. 2229–2243.
- Dolfsma, W. and L. Leydesdorff (2010) "The Citation Field of Evolutionary Economics", *Journal of Evolutionary Economics*, (2010)20, pp. 645–664.
- Engels, G., A. Hess, B. Humm, O. Juwig, M. Lohmann, J.-P. Richter, M. Voß, and J. Willkomm (2008) *Quasar Enterprise*, Heidelberg, Germany: dpunkt.
- Esswein, W. and J. Weller (2008) "Unternehmensarchitekturen—Grundlagen, Verwendung und Frameworks", *HMD—Praxis der Wirtschaftsinformatik*, (262), pp. 6–18.
- Fettke, P. (2006) "State-of-the-Art des State-of-the-Art: Eine Untersuchung der Forschungsmethode 'Review' innerhalb der Wirtschaftsinformatik", *Wirtschaftsinformatik*, (48)4, pp. 257–266.
- Fischer, R., S. Aier, and R. Winter (2007) "A Federated Approach to Enterprise Architecture Model Maintenance", *Proceedings of 2nd International Workshop on Enterprise Modelling and Information Systems Architectures*, St. Goar/Rhine, Germany, pp. 9–22.

- Frank, U. (2002) "Multi-perspective Enterprise Modeling (MEMO)—Conceptual Framework and Modeling Languages", *Proceedings of the 35th Annual Hawaii International Conference on System Sciences*, Waikoloa, HI, pp. 1258–1267.
- Franke, U., M. Ekstedt, R. Lagerström, J. Saat, and R. Winter (2010) "Trends in Enterprise Architecture Practice—A Survey", *Proceedings of the 5th International Workshop on Trends in Enterprise Architecture Research*, Delft, Netherlands, pp. 16–29.
- Freitag, A., F. Matthes, and C. Schulz (2010) "A Method for Consolidating Application Landscapes During the Post-merger-integration Phase", *Proceedings of the International Multiconference on Computer Science and Information Technology*, Wisla, Poland, pp. 241–248.
- Fruchterman, T.M.J. and E.M. Reingold (1991) "Graph Drawing by Forcedirected Placement", *Software—Practice and Experience*, (21)11, pp. 1129–1164.
- Gable, G. (2010) "Strategic Information Systems Research: An Archival Analysis", *Journal of Strategic Information Systems*, (19), pp. 3–16.
- Garfield, E. (1979) "Is Citation Analysis a Legitimate Evaluation Tool?", *Scientometrics*, (1)4, pp. 359–375.
- Garfield, E., M.V. Malin, and H. Small (1983) "Citation Data as Science Indicators", *Essays of an Information Scientist*, (6), pp. 580–608.
- Glänzel, W. and A. Schubert (2004) "Analyzing Scientific Networks Through Co-Authorship" in Moed, H.F., W. Glänzel, and U. Schmoch (eds.) *Handbook of Quantitative Science and Technology Research*, Dordrecht, Netherlands: Kluwer Academics Publishers, pp. 257–276.
- Gloor, P., R. Laubacher, S.B.C. Dynes, and Y. Zhao (2003) "Visualization of Communication Patterns in Collaborative Innovation Networks: Analysis of Some W3C Working Groups", *Proceedings of the 12th International Conference on Information and Knowledge Management*, New Orleans, LA, pp. 56–60.
- Goeken, M., W. Johannsen, and J.C. Pfeiffer (2008) "Motivation einer IT-Governance-Geschäftsarchitektur zur Unterstützung des Business/IT-Alignments", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2008*, München/Garching, Germany.
- Hafner, M. and R. Winter (2008) "Processes for Enterprise Application Architecture Management", *Proceedings of the 41st Annual Hawaii International Conference on System Sciences*, Waikoloa, HI, p. 396.
- Hair Jr., J.F., W.C. Black, B.J. Babin, R.E. Anderson, and R.L. Tatham (2006) *Multivariate Data Analysis*, Upper Saddle River, NJ: Prentice Hall.
- Hanschke, I. (2010) *Strategic IT Management: A Toolkit for Enterprise Architecture Management*, Berlin, Germany: Springer.
- Hedman, J. and T. Kalling (2003) "The Business Model Concept: Theoretical Underpinnings and Empirical Illustrations", *European Journal of Information Systems*, (2003)12, pp. 49–59.
- Hirvonen, A., M. Pulkkinen, and K. Valtonen (2007) "Selection Criteria for Enterprise Architecture Methods", *Proceedings of the European Conference on Information Management and Evaluation*, Montpellier, France, pp. 227–236.
- IFAC-IFIP (1999) "GERAM: Generalized Enterprise Reference Architecture and Methodology, Version 1.6.3", <http://www.ict.griffith.edu.au/~bernus/taskforce/geram/versions/geram1-6-3/v1.6.3.html> (current Nov. 28, 2011).
- Janssen, M. (2009) "Framing Enterprise Architecture: A Meta-Framework for Analyzing Architectural Efforts in Organizations" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 99–119.
- Janssen, M. and A. Joha (2004) "Issues in Relationship Management for Obtaining the Benefits of a Shared Service Center", *Proceedings of the 6th International Conference on Electronic Commerce*, Delft, Netherlands, pp. 219–228.
- Johnson, P., M. Ekstedt, E. Silva, and L. Plazaola (2004) "Using Enterprise Architecture for CIO Decision-Making: On the Importance of Theory", *Proceedings of the 2nd Annual Conference on Systems Engineering Research*, Los Angeles, CA.
- Johnson, P. and M. Ekstedt (2007) *Enterprise Architecture: Models and Analyses for Information Systems Decision Making*, Pozkal, Poland: Studentlitteratur.

- Johnson, P., E. Johansson, T. Sommestad, and J. Ullberg (2008) "A Tool for Enterprise Architecture Analysis", *Proceedings of the 11th IEEE International Enterprise Computing Conference*, Annapolis, MD, pp. 142–156.
- Johnson, P., R. Lagerström, P. Närman, and M. Simonsson (2007) "Enterprise Architecture Analysis with Extended Influence Diagrams", *Information Systems Frontiers*, (9)2–3, pp. 163–180.
- Jonkers, H., R. van Buuren, F. Arbab, F. de Boer, M. Bonsangue, H. Bosma, H. ter Doest, L. Groenewegen, J.G. Scholten, S. Hoppenbrouwers, M.-E. Iacob, W. Janssen, M. Lankhorst, D. van Leeuwen, E. Proper, A. Stam, L. van der Torre, and G. Veldhuijzen van Zanten (2003) "Towards a Language for Coherent Enterprise Architecture Descriptions", *Proceedings of the 7th IEEE International Enterprise Computing Conference*, Brisbane, Australia, pp. 28–37.
- Jonkers, H., M. Lankhorst, R. van Buuren, S. Hoppenbrouwers, M. Bonsangue, and L. van der Torre (2004) "Concepts for Modelling Enterprise Architectures", *International Journal of Cooperative Information Systems*, (13)3, pp. 257–287.
- Kaiser, H.F. and J. Rice (1974) "Little Jiffy, Mark IV", *Educational and Psychological Measurement*, (34)1, pp. 111–117.
- Kaisler, S., F. Armour, and M. Valivullah (2005) "Enterprise Architecting: Critical Problems", *Proceedings of the 38th Annual Hawaii International Conference on System Sciences*, Waikoloa, HI, p. 224.
- Kamogawa, T. and H. Okada (2005) "A Framework for Enterprise Architecture Effectiveness", *Proceedings of the 2005 International Conference on Services Systems and Services Management*, Chongqing, China, pp. 740–745.
- Kappelman, L., T. McGinnis, A. Pettite, and A. Sidorova (2008) "Enterprise Architecture: Charting the Territory for Academic Research", *Proceedings of 14th Americas Conference on Information Systems*, Toronto, Canada, p. 162.
- Kassarjan, H.H. (1977) "Content Analysis in Consumer Research", *Journal of Consumer Research*, (4)1, pp. 8–18.
- Ke, W., K. Boerner, and L. Viswanath (2004) "Major Information Visualization Authors, Papers and Topics in the ACM Library", *Proceedings of the Symposium on Information Visualization*, Austin, TX, p. 216.
- Keller, W. (2007) *IT-Unternehmensarchitektur: Von der Geschäftsstrategie zur optimalen IT-Unterstützung*, Heidelberg, Germany: dpunkt.
- Kurpjuweit, S. and R. Winter (2007) "Viewpoint-based Meta Model Engineering", *Proceedings of 2nd International Workshop on Enterprise Modelling and Information Systems Architectures*, St. Goar, Germany, pp. 143–161.
- Laband, D.N. and R.D. Tollison (2000) "Intellectual Collaboration", *Journal of Political Economy*, (108)3, pp. 632–662.
- Lacity, M.C., S. Khan, A. Yan, and L.P. Willcocks (2010) "A Review of the IT Outsourcing Empirical Literature and Future Research Directions", *Journal of Information Technology*, (25), pp. 395–433.
- Langenberg, K. and A. Wegmann (2004) "Enterprise Architecture: What Aspects Is Current Research Targeting?", EPFL Technical Report IC/2004/77, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland.
- Lankes, J., F. Matthes, and A. Wittenburg (2005) "Softwarekartographie: Systematische Darstellung von Anwendungslandschaften", *Proceedings of the 7th International Conference on Wirtschaftsinformatik*, Bamberg, Germany, pp. 1443–1462.
- Lankhorst, M. et al. (2005) *Enterprise Architecture at Work—Modelling, Communication, and Analysis*, Berlin, Germany: Springer.
- Leganza, G. (2010) "Topic Overview: Information Architecture", Cambridge, MA: Forrester Research.
- Leimeister, S., J.M. Leimeister, J. Fähling, and H. Krcmar (2008) "Exploring Success Factors for IT Carve Out Projects", *Proceedings of the 16th European Conference on Information Systems*, Galway, Ireland, pp. 1764–1775.
- Leist, S., and G. Zellner (2006) "Evaluation of Current Architecture Frameworks", *Proceedings of the 2006 ACM Symposium on Applied Computing*, Dijon, France, pp. 1546–1553.
- Leist, S. and G. Zellner (2008) "Situational Architecture Engineering (SAE)—Improving Strategic Change Through Architecture Methods", *Proceedings of the International Conference on Information Systems 2008*, Paris, France, p. 2.
- Leydesdorff, L. (1987) "Various Methods for the Mapping of Science", *Scientometrics*, (11)5–6, pp. 295–324.

- Leydesdorff, L. (2005) "Similarity Measures, Author Co-Citation Analysis, and Information Theory", *Journal of the American Society for Information Science & Technology*, (56)7, pp. 769–772.
- Leydesdorff, L. (2006) "Co-occurrence Matrices and Their Applications in Information Science: Extending ACA to the Web Environment", *Journal of the American Society for Information Science & Technology*, (57)12, pp. 1616–1628.
- Leydesdorff, L. (2007) "'Betweenness Centrality' as an Indicator of the 'Interdisciplinarity' of Scientific Journals", *Journal of the American Society for Information Science and Technology*, (58)9, pp. 1303–1309.
- Lin, T.-Y., and Y.-Y. Cheng (2010) "Exploring the Knowledge Network of Strategic Alliance Research: A Co-citation Analysis", *International Journal of Electronic Business Management*, (8)2, pp. 152–160.
- Liu, X., J. Bollen, M.L. Nelson, and H. Van de Sompel (2005) "Co-authorship Networks in the Digital Library Research Community", *Information Processing and Management: An International Journal*, (41)6, pp. 1462–1480.
- Lucke, C., S. Krell, and U. Lechner (2010) "Critical Issues in Enterprise Architecting—A Literature Review", *Proceedings of the 16th Americas Conference on Information Systems*, Lima, Peru, p. 305.
- MacRoberts, M.H. and B.R. MacRoberts (1996) "Problems of Citation Analysis", *Scientometrics*, (36)3, pp. 435–444.
- Matthes, F., S. Buckl, J. Leitel, and C.M. Schweda (2008) *Enterprise Architecture Management Tool Survey 2008*, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- McCain, K. (1990) "Mapping Authors in Intellectual Space: A Technical Overview", *Journal of the American Society for Information Science*, (41)6, pp. 433–443.
- McCain, K., J.M. Verner, G.W. Hislop, W. Evanco, and V. Cole (2005) "The Use of Bibliometric and Knowledge Elicitation Techniques to Map a Knowledge Domain: Software Engineering in the 1990s", *Scientometrics*, (65)1, pp. 131–144.
- McGovern, J., S.W. Ambler, M.E. Stevens, J. Linn, V. Sharan, and E. Jo (2003) *A Practical Guide to Enterprise Architecture*, Upper Saddle River, NJ: Prentice Hall.
- Mehta, M. and R. Hirschheim (2004) "A Framework for Assessing IT Integration Decision-Making in Mergers and Acquisitions", *Proceedings of the 37th Annual Hawaii International Conference on System Sciences*, Island of Hawaii (Big Island), HI, pp. 264–274.
- Merton, R.K. (1965) *On the Shoulders of Giants: A Shandean Postscript*, New York, NY: The Free Press.
- Mo, J.P.T. and L. Nemes (2009) "Issues in Using Enterprise Architecture for Mergers and Acquisitions" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 235–262.
- Mykhashchuk, M., S. Buckl, T. Dierl, and C.M. Schweda (2011) "Charting the Landscape of Enterprise Architecture Management", *Proceedings of the 10th International Conference on Wirtschaftsinformatik*, Zurich, Switzerland, pp. 570–577.
- Newman, M.E.J. (2001) "Scientific Collaboration Networks", *Physical Review E*, (64), pp. 016131-1–8.
- Newman, M.E.J. (2006) "Modularity and Community Structure in Networks", *Proceedings of the National Academy of Sciences*, (103)23, pp. 8577–8582.
- Neuendorf, K.A. (2002) *The Content Analysis Guidebook*, Thousand Oaks, CA: Sage Publications.
- Niemann, K.D. (2006) *From Enterprise Architecture to IT Governance—Elements of Effective IT Management*, Wiesbaden, Germany: Vieweg.
- Niemann, K.D. (2008) "Enterprise Architecture Management and Its Role in IT Governance and IT Investment Planning" in Saha, P. (ed.) *Advances in Government Enterprise Architecture*, New York, NY: Information Science Reference, pp. 208–228.
- Oinas-Kukkonen, H., K. Lyytinen, and Y. Yoo (2010) "Social Networks and Information Systems: Ongoing and Future Research Streams", *Journal of the Association for Information Systems*, (11), pp. 61–68.
- Op't Land, M. (2008) *Applying Architecture and Ontology to the Splitting and Allying of Enterprises*, Delft, Netherlands: SIKS Dissertation Series.
- Österle, H., R. Winter, F. Höning, S. Kurpjuweit, and P. Osl (2007) "Business Engineering: Core-Business-Metamodell", *WISU—Das Wirtschaftsstudium* 2/07, pp. 191–194.

- Osterwalder, A. and Y. Pigneur (2002) "Business Models and their Elements", *Proceedings of the International Workshop on Business Models 2002*, Lausanne, Switzerland.
- Osterwalder, A. and Y. Pigneur (2003) "An Ontology for e-Business Models" in Currie, W. (ed.) *Value Creation from e-Business Models*, Oxford, England: Butterworth-Heinemann, pp. 65–97.
- Osterwalder, A., Y. Pigneur, and C.L. Tucci (2005) "Clarifying Business Models: Origins, Present, and Future of the Concept", *Communications of the Association for Information Systems*, (16) Article 1, pp. 1–25.
- Otte, E. and R. Rousseau (2002) "Social Network Analysis: A Powerful Strategy, Also for the Information Sciences", *Journal of Information Science*, (28)6, pp. 441–453.
- Parker, T. (2009) "The Strategic Dimension of Enterprise Architecture" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 157–178.
- Pereira, C.M. and P. Sousa (2004) "A Method to Define an Enterprise Architecture Using the Zachman Framework", *Proceedings of the 2004 ACM Symposium on Applied Computing*, Nicosia, Cyprus, pp. 1366–1371.
- Phillips, D.M. and J.K. Phillips. (1998) "A Social Network Analysis of Business Logistics & Transportation", *International Journal of Physical Distribution & Logistics Management*, (28)5, pp. 328–348.
- Pilkington, A. and R. Fitzgerald (2006) "Operations Management Themes, Concepts and Relationships: A Forward Retrospective of IJOPM", *International Journal of Operations & Production Management*, (26)1, pp. 1255–1275.
- Pilkington, A. and J. Meredith (2009) "The Evolution of the Intellectual Structure of Operations Management—1980–2006: A Citation/Co-citation Analysis", *Journal of Operations Management*, (27), pp. 185–202.
- Platt, M. (2002) "Microsoft Architecture Overview", <http://msdn.microsoft.com/en-us/library/ms978007.aspx> (current Nov. 28, 2011).
- Potter, W.J. and D. Levine-Donnerstein (1999) "Rethinking Validity and Reliability in Content Analysis", *Journal of Applied Communication Research*, (27)3, pp. 258–284.
- Riege, C. and S. Aier (2008) "A Contingency Approach to Enterprise Architecture Method Engineering", *Proceedings of the International Conference on Service-Oriented Computing Workshops*, Sydney, Australia, pp. 388–399.
- Ross, J.W. (2003) "Creating a Strategic IT Architecture Competency: Learning in Stages", *MIS Quarterly Executive*, (2)1, pp. 31–43.
- Ross, J.W., P. Weill, and D.C. Robertson (2006) *Enterprise Architecture as Strategy—Creating a Foundation for Business Execution*, Boston, MA: Harvard Business School Press.
- Röwekamp, P. (2010) "EAM Frameworks" in Keuntje, J.H., and R. Barkow (eds.) *Enterprise Architecture Management in der Praxis—Wandel, Komplexität und IT-Kosten im Unternehmen beherrschen*, Düsseldorf, Germany: Symposion Publishing, pp. 215–228.
- Saat, J., S. Aier, and B. Gleichauf (2009) "Assessing the Complexity of Dynamics in Enterprise Architecture Planning—Lessons from Chaos Theory", *Proceedings of the 15th Americas Conference on Information Systems*, San Francisco, CA, p. 808.
- Saat, J. (2010) "Zeitbezogene Abhängigkeitsanalysen der Unternehmensarchitektur", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2010*, Göttingen, Germany, pp. 119–130.
- Saha, P. (2007) "A Synergistic Assessment of the Federal Enterprise Architecture Framework Against GERAM (ISO15704:2000)" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture in Practice*, Hershey, PA: IGI Global, pp. 1–17.
- Schekkerman, J. (2004a) *How to Survive in the Jungle of Enterprise Architecture Frameworks—Creating or Choosing an Enterprise Architecture Framework*, Victoria, Canada: Trafford.
- Schekkerman, J. (2004b) "Trends in Enterprise Architecture: How Are Organizations Progressing?", Amersfoort, Netherlands: Institute for Enterprise Architecture Developments.
- Schelp, J. and M. Stutz (2007) "A Balanced Scorecard Approach to Measure the Value of Enterprise Architecture", *Proceedings of the 2nd Workshop on Trends in Enterprise Architecture Research*, St. Gallen, Switzerland, pp. 5–11.

- Schelp, J. and R. Winter (2009) "Language Communities in Enterprise Architecture Research", *Proceedings of 4th Conference on Design Science Research in Information Systems and Technologies*, Philadelphia, PA, pp. 1–10.
- Schmidt, C. (2009) *Management komplexer IT-Architekturen*, Wiesbaden, Germany: Gabler.
- Schmidt, C. and P. Buxmann (2011) "Outcomes and Success Factors of Enterprise IT Architecture Management: Empirical Insight from the International Financial Services Industry", *European Journal of Information Systems*, (20), pp. 168–185.
- Schönherr, M. (2004) "Enterprise Architecture Frameworks" in Aier, S., and M. Schönherr (eds.) *Enterprise Application Integration—Serviceorientierung und nachhaltige Architekturen*, Berlin, Germany: GITO, pp. 3–48.
- Schönherr, M. (2008) "Towards a Common Terminology in the Discipline of Enterprise Architecture", *Proceedings of the International Conference on Service-oriented Computing Workshops*, Sydney, Australia, pp. 400–414.
- Schwarz, A., M. Mehta, N. Johnson, and W.W. Chin (2007) "Understanding Frameworks and Reviews: A Commentary to Assist Us in Moving Our Field Forward by Analyzing Our Past", *The DATA BASE for Advances in Information Systems*, (38)3, pp. 29–50.
- Schulz, V., A. Hochstein, F. Uebernickel, and W. Brenner (2009) "Definition and Classification of IT-Shared-Service-Center", *Proceedings of the 15th Americas Conference on Information Systems*, San Francisco, CA, p. 265.
- Sebis (2005) *Enterprise Architecture Management Tool Survey 2005*, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- Shafer, S.M., H.J. Smith, and J.C. Linder (2005) "The Power of Business Models", *Business Horizons*, (48), pp. 199–207.
- Simon, D. (2009a) "The Key for Managed Change Is Actability—How to Master Application Landscape Transformation", <http://www.unternehmensarchitektur.de> (current Nov. 28, 2011).
- Simon, D. (2009b) "Application Landscape Transformation and the Role of Enterprise Architecture Frameworks", *Proceedings of Workshop "MDD, SOA and IT Management 2009"*, Oldenburg, Germany, pp. 1–15.
- Simon, D., K. Fischbach, and D. Schoder (2010) "Application Portfolio Management—An Integrated Framework and a Software Tool Evaluation Approach", *Communications of the Association for Information Systems*, (26) Article 3, pp. 35–56.
- Slot, R., G. Dedene, and R. Maes (2009) "Business Value of Solution Architecture", *Proceedings of the 1st NAF Academy Working Conference on Practice-Driven Research on Enterprise Transformation*, Amsterdam, Netherlands, pp. 84–108.
- Small, H. (1973) "Co-citation in the Scientific Literature: A New Measure of the Relationship Between Two Documents", *Journal of the American Society for Information Science*, (24)4, pp. 265–269.
- Small, H. and B.C. Griffith (1974) "The Structure of Scientific Literatures I: Identifying and Graphing Specialties", *Science Studies*, (4)1, pp. 17–40.
- Smith, K.L. (2011) *An Introduction to PEAf—Pragmatic Enterprise Architecture Framework*, Great Notley, England: Pragmatic EA.
- Sowa, J. and J. Zachman (1992) "Extending and Formalizing the Framework for Information Systems Architecture", *IBM Systems Journal*, (31)3, pp. 590–616.
- Spewak, S.H. and S.C. Hill (1993) *Enterprise Architecture Planning: Developing a Blueprint for Data, Applications and Technology*, Hoboken, NJ: Wiley.
- Stamas, P. (2009) "Process-centric Enterprise Architecture", *Journal of Enterprise Architecture*, (5)1, pp. 27–35.
- Strano, C. and Q. Rehmani (2007) "The Role of the Enterprise Architect", *Information Systems and e-Business Management*, (5), pp. 379–396.
- Teichert, T. and E. Shehu (2009) "Diskussion der Conjointanalyse in der Forschung" in Baier, D. and M. Brusch (eds.) *Conjointanalyse: Methoden—Anwendungen—Praxisbeispiele*, Berlin, Germany: Springer, pp. 19–41.
- Teichert, T. and E. Shehu (2010) "Investigating Research Streams of Conjoint Analysis: A Bibliometric Study", *BuR—Business Research*, (3)1, pp. 49–68.
- The Chief Information Officers Council (1999) "Federal Enterprise Architecture Framework Version 1.1", <http://www.cio.gov/documents/fedarch1.pdf> (current Nov. 28, 2011).

- The Open Group (2009) *TOGAF Version 9 Enterprise Edition*, Zaltbommel, Netherlands: Van Haren Publishing.
- Tiwana, A. and B. Konsynski (2010) "Complementarities Between Organizational IT Architecture and Governance Structure", *Information Systems Research*, (21)2, pp. 288–394.
- Uysal, Ö.Ö. (2010) "Business Ethics Research with an Accounting Focus: A Bibliometrics Analysis from 1988 to 2007", *Journal of Business Ethics*, (2010)93, pp. 137–160.
- Uzzi, B. and J. Spiro (2005) "Collaboration and Creativity: The Small World Problem", *American Journal of Sociology*, (111)2, pp. 447–504.
- Valorinta, M. (2011) "IT Alignment and the Boundaries of the IT Function", *Journal of Information Technology*, (26), pp. 46–59.
- van der Raadt, B., S. Schouten, and H. van Vliet (2008) "Stakeholder Perception of Enterprise Architecture", *Proceedings of the 2nd European conference on Software Architecture*, Paphos, Cyprus, pp. 19–34.
- Versteeg, G. and H. Bouwman (2006) "Business Architecture: A New Paradigm to Relate Business Strategy to ICT", *Information Systems Frontiers*, (8), pp. 91–102.
- vom Brocke, J., A. Simons, B. Niehaves, K. Riemer, R. Plattfaut, and A. Cleven (2009) "Reconstructing the Giant: On the Importance of Rigour in Documenting the Literature Search Process", *Proceedings of the 17th European Conference on Information Systems*, Verona, Italy, pp. 789–801.
- Wade, N. (1975) "Citation Analysis: A New Tool for Science Administrators", *Science*, (188), pp. 429–432.
- Wagter, R., M. van den Berg, J. Luijpers, and M. van Steenberghe (2005) *Dynamic Enterprise Architecture—How to Make It Work*, Hoboken, NJ: Wiley.
- Wasserman, S. and K. Faust (1994) *Social Network Analysis, Methods and Applications*, Cambridge, NY: Cambridge University Press.
- Webster, J. and R.T. Watson (2002) "Analyzing the Past to Prepare for the Future", *MIS Quarterly*, (26)2, pp. xiii–xxiii.
- Westney, L.C.H. (1998) "Historical Rankings of Science and Technology: A Citationist Perspective", *The Journal of the Association for History and Computing*, (1)1.
- White, H.D. and B.C. Griffith (1981) "Author Cocitation: A Literature Measure of Intellectual Structure", *Journal of the American Society for Information Science*, (32)3, pp. 163–171.
- White, H.D. (1990) "Perspectives on ... Author Cocitation Analysis", *Journal of the American Society for Information Science*, (41), pp. 429–432.
- White, H.D. and K.W. McCain (1998) "Visualizing a Discipline: An Author Co-citation Analysis of Information Science, 1972–1995", *Journal of the American Society for Information Science*, (49)4, pp. 327–355.
- Wieringa, R., H.M. Blanken, M.M. Fokkinga, and P.W.P.J. Grefen (2003) "Aligning Application Architecture to the Business Context", *Proceedings of the 15th International Conference on Advanced Information Systems Engineering*, Klagenfurt/Velden, Austria, pp. 209–225.
- Winter, K., S. Buckl, F. Matthes, and C.M. Schweda (2010) "Investigating the State-of-the-art in Enterprise Architecture Management Methods in Literature and Practice", *Proceedings of the 5th Mediterranean Conference on Information Systems*, Tel Aviv, Israel, p. 90.
- Winter, R. and R. Fischer (2006) "Essential Layers, Artifacts, and Dependencies of Enterprise Architecture", *Proceedings of the 10th IEEE International Enterprise Computing Conference*, Hong Kong, China, p. 30.
- Winter, R. and R. Fischer (2007) "Essential Layers, Artifacts, and Dependencies of Enterprise Architecture", *Journal of Enterprise Architecture*, (3)2, pp. 7–18.
- Winter, R., T. Bucher, R. Fischer and S. Kurpjuweit (2007) "Analysis and Application Scenarios of Enterprise Architecture: An Exploratory Study", *Journal of Enterprise Architecture*, (3)3, pp. 33–43.
- Wolff, H. (2011) "Die Zukunft des Enterprise Architecture Managements: 'Relax into Unsecurity'", *OBJEKTSpektrum*, EAM/April 2011, pp. 1–3.
- Zachman, J. (1987) "A Framework for Information Systems Architecture", *IBM Systems Journal*, (26)3, pp. 276–292.
- Zachman, J. (1997) "Enterprise Architecture: The Issue of the Century", *Database Programming and Design*, (10)3, pp. 44–53.

- Zellner, G. (2008) "Gestaltung hybrider Wertschöpfung mittels Architekturen—Analyse am Beispiel des Business Engineering", *Wirtschaftsinformatik*, (50)3, pp. 187–195.
- ZIFA (2001) "The Zachman Institute for Framework Advancement", <http://www.zifa.com/> (current Nov. 28, 2011).
- Zink, G. (2009) "How to Restart an Enterprise Architecture Program After Initial Failure", *Journal of Enterprise Architecture*, (5)2, pp. 31–41.

APPENDIX A: BIBLIOGRAPHY OF DOCUMENTS USED FOR BIBLIOMETRIC ANALYSIS

- Abdallah, S. and G.H. Galal-Edeen (2006) "Towards a Framework for Enterprise Architecture Frameworks Comparison and Selection", *Proceedings of the 4th International Conference on Informatics and Systems*.
- Abowd, G., L. Bass, P. Clements, R. Kazman, L. Northrop, and A. Zaremski (1997) *Recommended Best Industrial Practice for Software Architecture Evaluation*, Technical Report CMU/SEI-96-TR-025, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA.
- Addicks, J.S., H.-J. Appelrath, P. Gringel, M. Postina, U. Steffens, and C. Zillmann (2010) "A Component-oriented Tool-approach to Enterprise Architecture Management", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2010*, pp. 131–142.
- Addicks, J.S. and P. Gringel (2009) "Application Landscape Metrics: Overview, Classification, and Practical Usage" *Proceedings of the International Workshop on Enterprise Modelling and Information Systems Architectures 2009*, pp. 55–68.
- Addicks, J.S. and U. Steffens (2008) "Supporting Landscape Dependent Evaluation of Enterprise Applications", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2008*, pp. 1815–1825.
- Aerts, A.T.M., J.B.M. Goossenaerts, D.K. Hammer, and J.C. Wortmann (2004) "Architectures in Context: On the Evolution of Business, Application Software, and ICT Platform Architectures", *Information & Management*, (41)6, pp. 781–794.
- Ahsan, K., H. Shah, and P. Kingston (2009) "The Role of Enterprise Architecture in Healthcare-IT", *Proceedings of the 6th International Conference on Information Technology: New Generations*, pp. 1462–1467.
- Aier, S. (2004a) "EAI und Nachhaltigkeit von Architekturen—Ergebnisse einer empirischen Studie", *Proceedings of "DW2004—Data Warehousing und EAI"*, pp. 41–58.
- Aier, S. (2004b) "Sustainability of Enterprise Architecture and EAI", *Proceedings of the International Business Information Management Conference 2004*, pp. 182–189.
- Aier, S. (2006) "How Clustering Enterprise Architectures Helps to Design Service Oriented Architectures", *Proceedings of the IEEE International Conference on Services Computing 2006*, pp. 269–272.
- Aier, S., M. Ahrens, M. Stutz, and U. Bub (2007) "Deriving SOA Evaluation Metrics in an Enterprise Architecture Context", *Proceedings of the 2nd International SeMSoC Workshop—Business Oriented Aspects Concerning Semantics and Methodologies in Service-oriented Computing at the 5th International Conference on Service Oriented Computing*, pp. 224–233.
- Aier, S., N.J. Buchs, J. Saat, and G. Steiner (2008) "Szenariobasierte Entwicklung der Unternehmensarchitektur bei der Real-time Center AG", *Proceedings of "DW2008: Synergien durch Integration und Informationslogistik"*, pp. 363–377.
- Aier, S., S. Buckl, U. Franke, B. Gleichauf, P. Johnson, P. Närman, C.M. Schweda, and J. Ullberg (2009) "A Survival Analysis of Application Life Spans Based on Enterprise Architecture Models", *Proceedings of the 3rd International Workshop on Enterprise Modelling and Information Systems Architectures*, pp. 141–154.
- Aier, S. and T. Dogan (2004) "Nachhaltigkeit als Gestaltungsziel von Unternehmensarchitekturen" in Aier, S. and M. Schönherr (eds.) *Enterprise Application Integration—Serviceorientierung und nachhaltige Architekturen*, Berlin, Germany: Gito, pp. 75–122.
- Aier, S. and T. Dogan (2005) "Indikatoren zur Bewertung der Nachhaltigkeit von Unternehmensarchitekturen", *Proceedings of the 7th International Conference on Wirtschaftsinformatik*, pp. 607–626.
- Aier, S. and B. Gleichauf (2008) "Towards a Sophisticated Understanding of Service Design for Enterprise Architecture", *Proceedings of the 6th International Conference on Service Oriented Computing*, pp. 316–326.
- Aier, S. and B. Gleichauf (2010) "Applying Design Research Artifacts for Building Design Research Artifacts: A Process Model for Enterprise Architecture Planning" in Winter, R., J. Zhao, and S. Aier (eds.) *Global Perspectives on Design Science Research*, Berlin, Germany: Springer, pp. 333–348.

- Aier, S., B. Gleichauf, C. Riege, and J. Saat (2009) "Empirische Validierung von Integrationstypen am Beispiel unternehmensübergreifender Integration", *Proceedings of the 9th International Conference on Wirtschaftsinformatik*, pp. 99–108.
- Aier, S., B. Gleichauf, J. Saat, and R. Winter (2009) "Complexity Levels of Representing Dynamics in EA Planning", *Proceedings of the 5th International Workshops CIAO! and EOMAS, The 21st International Conference on Advanced Information Systems*, pp. 55–69.
- Aier, S., S. Kurpjuweit, C. Riege, and J. Saat (2008) "Stakeholderorientierte Dokumentation und Analyse der Unternehmensarchitektur", *Proceedings of "INFORMATIK 2008: Beherrschbare Systeme—dank Informatik"*, pp. 559–565.
- Aier, S., S. Kurpjuweit, J. Saat, and R. Winter (2009a) "Business Engineering Navigator: A Business-to-IT Approach to Enterprise Architecture Management" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 77–98.
- Aier, S., S. Kurpjuweit, J. Saat, and R. Winter (2009b) "Enterprise Architecture Design as an Engineering Discipline", *AIS Transactions on Enterprise Systems* (1)1, pp. 36–43.
- Aier, S., S. Kurpjuweit, O. Schmitz, J. Schulz, A. Thomas, and R. Winter (2008) "An Engineering Approach to Enterprise Architecture Design and Its Application at a Financial Service Provider", *Proceedings of the 2008 Conference on "Modellierung betrieblicher Informationssysteme"*, pp. 115–130.
- Aier, S., F. Maletta, C. Riege, K. Stucki, and A. Frank (2008) "Aufbau und Einsatz der Geschäftsarchitektur bei der AXA Winterthur Ein minimal invasiver Ansatz", *Proceedings of "DW2008: Synergien durch Integration und Informationslogistik"*, pp. 437–454.
- Aier, S., C. Riege, M. Schönherr, and U. Bub (2009) "Situative Methodenkonstruktion für die Projektbewertung aus Unternehmensarchitektur-perspektive", *Proceedings of the 9th International Conference on Wirtschaftsinformatik*, pp. 109–118.
- Aier, S., C. Riege, and R. Winter (2008a) "Classification of Enterprise Architecture Scenarios—An Exploratory Analysis", *Enterprise Modelling and Information Systems Architectures*, (3)1, pp. 14–23.
- Aier, S., C. Riege, and R. Winter (2008b) "Unternehmensarchitektur—Literaturüberblick und Stand der Praxis", *Wirtschaftsinformatik*, (50)4, pp. 292–304.
- Aier, S. and J. Schelp (2008) "EAI und SOA—Was bleibt nach dem Hype?", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2008*, pp. 1469–1480.
- Aier, S. and M. Schönherr (2003) "Flexibilisierung von Organisations-und IT-Architekturen durch EAI" in Aier, S. and M. Schönherr (eds.) *Enterprise Application Integration—Flexibilisierung komplexer Unternehmensarchitekturen*, Berlin, Germany: Gito, pp. 1–59.
- Aier, S. and M. Schönherr (2004) "Enterprise Application Integration als Enabler flexibler Unternehmensarchitekturen", *Proceedings of the German EAI Workshop 2004*, pp. 69–78.
- Aier, S. and M. Schönherr (2005a) "EAI als integrierendes Element einer nachhaltigen Unternehmensarchitektur" in Aier, S. and M. Schönherr (eds.) *Unternehmensarchitekturen und Systemintegration*, Berlin, Germany: Gito, pp. 4–56.
- Aier, S. and M. Schönherr (2005b) "Evaluating Integration Architectures—A Scenario-based Evaluation of Integration Technologies" in Draheim, D. and G. Weber (eds.) *Trends in Enterprise Application Architecture*, Berlin, Germany: Springer, pp. 2–14.
- Aier, S. and M. Schönherr (2005c) "Sustainable Enterprise Architecture with EAI—An Empirical Study", *Proceedings of the International Conference on Advances in Internet, Processing, Systems, and Interdisciplinary Research 2005*.
- Aier, S. and M. Schönherr (2006a) "Model Driven Service Domain Analysis", *Proceedings of the International Conference on Service-Oriented Computing 2006*, pp. 190–200.
- Aier, S. and M. Schönherr (2006b) "Status quo geschäftsprozessorientierter Architekturintegration", *Wirtschaftsinformatik*, (48)3, pp. 188–196.
- Aier, S. and M. Schönherr (2007) "Integrating an Enterprise Architecture Using Domain Clustering", *Proceedings of Trends in Enterprise Architecture Research 2007*, pp. 23–30.

- Aier, S. and R. Winter (2009) "Virtual Decoupling for IT/Business Alignment—Conceptual Foundations, Architecture Design and Implementation Example", *Business & Information Systems Engineering*, (1)2, pp. 150–163.
- Ajjan, H., R.L. Kumar, and C. Subramaniam (2008) "Investigating Determinants of Project Portfolio Management Adoption", *Proceedings of the 29th International Conference on Information Systems*, p. 85.
- Aitken, C. (2009) "Enterprise Architecture, Strategic Management, and Information Management" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 121–155.
- Albani, A. and J. Dietz (2006) "The Benefit of Enterprise Ontology in Identifying Business Components" in Avison, D., S. Elliot, J. Krogstie, and J. Pries-Heje (eds.) *The Past and Future of Information Systems: 1976–2006 and Beyond*, London, England: Springer, pp. 243–254.
- Albani, A., J. Dietz, and J. Zaha (2006) "Identifying Business Components on the Basis of an Enterprise Ontology" in Konstantas, D., J.-P. Bourrières, M. Léonard, and N. Boudjlida (eds.) *Interoperability of Enterprise Software and Applications*, London, England: Springer, pp. 335–347.
- Allen, B.R. and A.C. Boynton (1991) "Information Architecture: In Search of Efficient Flexibility", *MIS Quarterly*, (15)4, pp. 435–445.
- Allen, R.J. (1997) *A Formal Approach to Software Architecture*, Doctoral Dissertation, School of Computer Science, Carnegie Mellon University, Pittsburgh, PA.
- Almeida, J.P.A., G. Guizzardi, and P.S. Santos (2008) "A Semantic Foundation for Role-Related Concepts in Enterprise Modelling", *Proceedings of the 12th International IEEE Enterprise Computing Conference*, pp. 253–277.
- Amit, R. and P.J.H. Schoemaker (1993) "Strategic Assets and Organizational Rent", *Strategic Management Journal*, (14)1, pp. 33–46.
- Anastasopoulos, M. and D. Muthig (2007) "A Systematic Approach for the Development of Integrative Business Applications" in Lam, W. and V. Shankararaman (eds.) *Enterprise Architecture and Integration: Methods, Implementation and Technologies*, Hershey, PA: IGI Global, pp.139–163.
- Anaya, V. and A. Ortiz (2005) "How Enterprise Architectures Can Support Integration", *Proceedings of the 1st International Workshop on Interoperability of Heterogeneous Information Systems*, pp. 25–30.
- Anaya, V., G. Berio, M. Harzallah, P. Heymans, R. Matulevicius, A.L. Opdahl, H. Panetto, and M.J. Verdecho (2010) "The Unified Enterprise Modelling Language—Overview and Further Work", *Computers in Industry*, (61)2, pp. 99–111.
- Ansoff, H. (1965) *Corporate Strategy*, New York, NY: McGraw-Hill.
- Ansoff, H. (1979) *Strategic Management*, Hoboken, NJ: Wiley.
- Anthopoulos, L.G. (2009) "Applying Enterprise Architecture for Crisis Management: A Case of Hellenic Ministry of foreign affairs" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 263–280.
- Arbab, F., F. de Boer, M. Bonsangue, M. Lankhorst, E. Proper, and L. van der Torre (2007) "Integrating Architectural Models: Symbolic, Semantic and Subjective Models in Enterprise Architecture", *Enterprise Modelling and Information Systems Architectures*, (2)1, pp. 40–56.
- Archer, N. and F. Ghasemzadeh (2007) "Project Portfolio Selection and Management" in Morris, P.W.G. and J.K. Pinto (eds.) *The Wiley Guide to Project, Program & Portfolio Management*, Hoboken, NJ: Wiley, pp. 94–110.
- Armour, F., C. Emery, J. Houk, S.H. Kaisler, and J.S. Kirk (2007) "The Integrated Enterprise Life Cycle: Enterprise Architecture, Investment Management, and System Development" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture in Practice*, Hershey, PA: IGI Global, pp. 237–252.
- Artto, K.A. and P.H. Dietrich (2007) "Strategic Business Management Through Multiple Projects" in Morris, P.W.G. and J.K. Pinto (eds.) *The Wiley Guide to Project, Program & Portfolio Management*, Hoboken, NJ: Wiley, pp. 1–28.
- Asfaw, T., A. Bada, and F. Allario (2009) "Enablers and Challenges in Using Enterprise Architecture Concepts to Drive Transformation: Perspectives from Private Organizations and Federal Government Agencies", *Journal of Enterprise Architecture*, (5)3, pp. 18–28.

- Asundi, J., R. Kazman, and M. Klein (2001) *Using Economic Considerations to Choose Among Architecture Design Alternatives*, Technical Report CMU/SEI-2001-TR-035, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA.
- Auffret, J.-P. (2009) "Chief Information Officers, Enterprise Architecture and Coherency Management" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 383–400.
- Baacke, L., T. Mettler, and P. Rohner (2009) "Component-based Process Modelling in Health Care", *Proceedings of the 17th European Conference on Information Systems*, pp. 2390–2402.
- Babar, M.A. and I. Gorton (2004) "Comparison of Scenario-Based Software Architecture Evaluation Methods", *Proceedings of 11th Asia-Pacific Software Engineering Conference*, pp. 600–607.
- Babar, M.A., L. Zhu, and R. Jeffery (2004) "A Framework for Classifying and Comparing Software Architecture Evaluation Methods", *Proceedings of the Australian Software Engineering Conference 2004*, pp. 309–318.
- Bachmann, F., L. Bass, J. Carriere, P. Clements, D. Garlan, J. Ivers, R. Nord, and R. Little (2000) *Software Architecture Documentation in Practice: Documenting Architectural Layers*, Special Report CMU/SEI-2000-SR-004, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA.
- Bahill, A.T., R. Botta, and J. Daniels (2006) "The Zachman Framework Populated with Baseball Models", *Journal of Enterprise Architecture*, (2)4, pp. 50–68.
- Bahrami, A., D. Sadowski, and S. Bahrami (1998) "Enterprise Architecture for Business Process Simulation", *Proceedings of the 1998 Winter Simulation Conference*, pp. 1409–1413.
- Balabko, P. and A. Wegmann (2006) "Systemic Classification of Concern-based Design Methods in the Context of Enterprise Architecture", *Information Systems Frontiers*, (8)2, pp. 115–131.
- Balko, S., A.H.M. ter Hofstede, A.P. Barros, M. La Rosa, and M.J. Adams (2009) "Controlled Flexibility and Lifecycle Management of Business Processes Through Extensibility", *Proceedings of the International Workshop on Enterprise Modelling and Information Systems Architectures 2009*, pp. 97–110.
- Balsamo, S. and M. Simeoni (2001) "Deriving Performance Models from Software Architecture Specifications", *Proceedings of the European Simulation Multiconference 2001*, pp. 6–9.
- Barbacci, M.R., M.H. Klein, and C.B. Weinstock (1996) *Principles for Evaluating the Quality Attributes of a Software Architecture*, Technical Report CMU/SEI-96-TR-036, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA.
- Barbacci, M., S.J. Carriere, P.H. Feiler, R. Kazman, M.H. Klein, H.F. Lipson, T.A. Longstaff, and C.B. Weinstock (1997) *Steps in an Architecture Tradeoff Analysis Method: Quality Attribute Models and Analysis*, Technical Report CMU/SEI-97-TR-029, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA.
- Bardhan, I., S. Bagchi, and R. Sougstad (2004) "Prioritizing a Portfolio of Information Technology Investment Projects", *Journal of Management Information Systems*, (21)2, pp. 33–60.
- Bardhan, I., S. Bagchi, and R. Sougstad (2004) "A Real Options Approach for Prioritization of a Portfolio of Information Technology Projects: A Case Study of a Utility Company", *Proceedings of the 37th Hawaii International Conference on System Sciences*, p. 80215.
- Bardhan, I., R.J. Kauffman, and S. Naranpanawe (2006) "Optimizing an IT Project Portfolio with Time-wise Interdependencies", *Proceedings of the 39th Hawaii International Conference on System Sciences*, p. 168.
- Barjis, J. and I. Barjis (2007) "Business Process Modeling as a Blueprint for Enterprise Architecture" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 114–128.
- Barjis, J. (2009) "Collaborative, Participative and Interactive Enterprise Modeling", *Proceedings of the International Conference on Enterprise Information Systems 2009*, pp. 651–662.
- Barney, J.B. (1991) "Firm Resources and Sustained Competitive Advantage", *Journal of Management*, (17)1, pp. 99–120.
- Barney, J.B. (1996) "The Resource-based Theory of the Firm", *Organization Science*, (7)5, p. 469.
- Barney, J.B., M. Wright, and D.J. Ketchen (2001) "The Resource-based View of the Firm: Ten Years After 1991", *Journal of Management*, (27)6, pp. 625–641.
- Bartenschlager, J. and M. Goeken (2010) "IT Strategy Implementation Framework—Bridging Enterprise Architecture and IT Governance", *Proceedings of the 16th Americas Conference on Information Systems*, p. 400.

- Bass, L., P. Clements, and R. Kazman (2003) *Software Architecture in Practice*, Boston, MA: Pearson Education.
- Baumann, A., G. Engels, A. Hofmann, S. Sauer, and J. Willkomm (2009) "A Holistic Software Engineering Method for Service-Oriented Application Landscape Development", *Proceedings of the 1st NAF Academy Working Conference on Practice-Driven Research on Enterprise Transformation*, pp. 1–17.
- Baumöl, U. (2007) "Business-IT-Alignment durch Projektportfolio-Management und –Controlling", *HMD—Praxis der Wirtschaftsinformatik*, 254, pp. 71–81.
- Baumöl, U. and H. Ickler (2008) "Wertorientiertes IT-Controlling Projektselektion als Werkzeug der Projektportfolio-Steuerung", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2008*, pp. 975–987.
- Becker, J., B. Weiß, and A. Winkelmann (2010) "Utility vs. Efforts of Business Process Modeling: An Exploratory Study in the Financial Sector", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2010*, pp. 41–54.
- Benson, R.J., T.L. Bugnitz, and W.B. Walton (2004) *From Business Strategy to IT Action: Right Decisions for a Better Bottom Line*, Hoboken, NJ: Wiley.
- Berio, G. and F. Vernadat (1999a) "Enterprise Modelling with CIMOSA—Models and Methods", *Proceedings of the International Enterprise Modelling Conference 1999*.
- Berio, G. and F. Vernadat (1999b) "New Developments in Enterprise Modelling Using CIMOSA", *Computers in Industry*, (40)2–3, pp. 99–114.
- Berio, G. and F. Vernadat (2001) "Enterprise Modelling with CIMOSA: Functional and Organizational Aspects", *Production Planning & Control*, (2001), pp. 128–136.
- Bernard, S. (2005) *An Introduction to Enterprise Architecture*, Bloomington, IN: AuthorHouse.
- Bernard, S. (2009) "The Importance of Formal Documentation in Enterprise Architectures", *Journal of Enterprise Architecture*, (5)3, pp. 29–58.
- Bernard, S. and J. Grasso (2009a) "A Need for Formalization and Auditing in Enterprise Architecture Approaches and Programs", *Journal of Enterprise Architecture*, (5)2, pp. 18–30.
- Bernard, S. and J. Grasso (2009b) "Enterprise Architecture Formulization and Auditing" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 211–231.
- Bernus, P. (2003a) "Modelling Function and Information" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 417–434.
- Bernus, P. (2003b) "Organisational Design" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 575–594.
- Bernus, P. (2009) "The Future of Enterprise Engineering" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 431–449.
- Bernus, P. and L. Nemes (1996a) "A Framework to Define a Generic Enterprise Reference Architecture and Methodology", *Computer Integrated Manufacturing Systems*, (9)3, pp. 179–191.
- Bernus, P. and L. Nemes (1996b) *Modeling and Methodologies for Enterprise Integration*, London, England: Chapman & Hall.
- Bernus, P. and L. Nemes (2003) "Introduction" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 1–17.
- Betz, C.T. (2007) *Architecture and Patterns for IT Service Management, Resource Management, and Governance*, Amsterdam, Netherlands: Elsevier.
- Beveridge, T. and C. Perks (2002) *Guide to Enterprise IT Architecture*, New York, NY: Springer.
- Boar, B.H. (1998) *Constructing Blueprints for Enterprise IT Architectures*, Hoboken, NJ: Wiley.
- Boh, W. and D. Yellin (2006) "Using Enterprise Architecture Standards in Managing Information Technology", *Journal of Management Information Systems*, (23)3, pp. 163–207.
- Boh, W., D. Yellin, B. Dill, and J.D. Herbsleb (2003) "Effectively Managing Information Systems Architecture Standards: An Intra-organization Perspective", *Proceedings of the MIS Quartely Standards Workshop 2003*, pp. 171–187.

- Böhme, M., W. Swoboda, H.-M. Hornung, S. Buckl, and F. Matthes (2008) "Enterprise Architecture Management: Analyse und grafische Darstellung IuK-unterstützter klinischer Prozesse", *Proceedings of the 53th Jahrestagung der Deutschen Gesellschaft für Medizinische Informatik, Biometrie und Epidemiologie*.
- Bonham, S.S. (2004) *IT Project Portfolio Management*, Boston, MA: Artech House.
- Bosch, J., P.O. Bengtsson, and R. Smedinga (2002) "Assessing Optimal Software Architecture Maintainability", *Proceedings of the 5th European Conference on Software Maintainability and Reengineering*, pp. 168–175.
- Bosch, J. and P. Molin (1999) "Software Architecture Design: Evaluation and Transformation", *Proceedings of the IEEE Conference and Workshop on Engineering of Computer-Based Systems 1999*, pp. 4–10.
- Bot, S., C.-H. Lung, and M. Farrell (1996) "A Stakeholder-Centric Software Architecture Analysis Approach", *Proceedings of the 1st International Software Architecture Workshop*, pp. 152–154.
- Bratthall, L. and P. Runeson (1999) "A Taxonomy of Orthogonal Properties of Software Architectures", *Proceedings of the 2nd Nordic Software Architecture Workshop*.
- Braun, C. and R. Winter (2005) "A Comprehensive Enterprise Architecture Metamodel and Its Implementation Using a Metamodeling Platform", *Proceedings of 1st International Workshop on Enterprise Modelling and Information Systems Architectures*, pp. 64–79.
- Braun, C. and R. Winter (2007) "Integration of IT Service Management into Enterprise Architecture", *Proceedings of the 2007 ACM Symposium of Applied Computing*, pp. 1215–1219.
- Bricknall, R., G. Darrell, H. Nilsson, and K. Pessi (2006) "Enterprise Architecture: Critical Factors Affecting Modelling and Management", *Proceedings of the 14th European Conference on Information Systems*.
- Brits, J., G.H.K. Botha, and M.E. Herselman (2007) "Conceptual Framework for Modeling Business Capabilities", *Proceedings of the 2007 Informing Science and IT Education Joint Conference*.
- Brooks, T. (2009) "Service-oriented Enterprise Architecture (SOEA): A Conceptual Design Through Data Architecture", *Journal of Enterprise Architecture*, (5)4, pp. 16–26.
- Brückmann, M., S. Junginger, and D. Boudinova (2009) "Evaluating Enterprise Architecture Management Initiatives—How to Measure and Control the Degree of Standardization of an IT Landscape", *Proceedings of the 3rd International Workshop on Enterprise Modelling and Information Systems Architectures*, pp. 155–168.
- Bryson, R. and B. Stacey (2009) "Profile of Government of Canada's Internal Services" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 473–490.
- Buchanan, R.D. and R.M. Roley (2002) *Aligning Enterprise Architecture and IT Investments with Corporate Goals*, White Paper, Object Management Group, Needham, MA.
- Bucher, T., R. Fischer, S. Kurpuweit, and R. Winter (2006a) "Analysis and Application Scenarios of Enterprise Architecture: An Exploratory Study", *Proceedings of the 10th IEEE International Enterprise Computing Conference*, p. 28.
- Bucher, T., R. Fischer, S. Kurpuweit, and R. Winter (2006b) "Enterprise Architecture Analysis and Application—An Exploratory Study", *Proceedings of the Workshop on Trends in Enterprise Architecture Research 2006*.
- Buckl, S., T. Dierl, F. Matthes, R. Ramacher, and C.M. Schweda (2008) "Current and Future Tool Support for EA Management", *Proceedings of Workshop "MDD, SOA and IT Management 2008"*, pp. 9–23.
- Buckl, S., T. Dierl, F. Matthes, C. Schulz, and C.M. Schweda (2009) *Teaching Enterprise Architecture Management: A Practical Experience*, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- Buckl, S., T. Dierl, F. Matthes, and C.M. Schweda (2010a) "A Modeling Language for Describing Enterprise Architecture Management Methods", *Proceedings of the 2010 Conference on "Modellierung betrieblicher Informationssysteme"*.
- Buckl, S., T. Dierl, F. Matthes, and C.M. Schweda (2010b) "Tool-based Support for Organization-specific Enterprise Architecture Management", *Proceedings of the 22nd International Conference on Advanced Information Systems Engineering*, p. 66.
- Buckl, S., A.M. Ernst, H. Kopper, R. Marliani, F. Matthes, P. Petschownik, and C.M. Schweda (2009) "EA Management Patterns for Consolidations After Mergers", *Proceedings of the 1st Workshop on Patterns in Enterprise Architecture Management*, pp. 67–78.

- Buckl, S., A.M. Ernst, J. Lankes, and F. Matthes (2008) *Enterprise Architecture Management Pattern Catalog*, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- Buckl, S., A.M. Ernst, J. Lankes, F. Matthes, C.M. Schweda, and A. Wittenburg (2007) "Generating Visualizations of Enterprise Architectures Using Model Transformations", *Enterprise Modelling and Information Systems Architectures*, (2)2, pp. 3–13.
- Buckl, S., A.M. Ernst, J. Lankes, F. Matthes, and C.M. Schweda (2009) *State of the Art in Enterprise Architecture Management*, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- Buckl, S., A.M. Ernst, J. Lankes, K. Schneider, and C.M. Schweda (2007) "A Pattern based Approach for Constructing Enterprise Architecture Management Information Models", *Proceedings of the 8th International Conference on Wirtschaftsinformatik*, pp. 145–162.
- Buckl, S., A.M. Ernst, J. Lankes, C.M. Schweda, and A. Wittenburg (2007) "Generating Visualizations of Enterprise Architectures Using Model Transformations", *Proceedings of the 2nd International Workshop on Enterprise Modelling and Informations Systems Architectures*, pp. 33–46.
- Buckl, S., A.M. Ernst, F. Matthes, R. Ramacher, and C.M. Schweda (2009) "Using Enterprise Architecture Management Patterns to Complement TOGAF", *Proceedings of the 13th International IEEE Enterprise Computing Conference*, pp. 34–41.
- Buckl, S., A.M. Ernst, F. Matthes, C. Schulz, and C.M. Schweda (2009) "Constructing an Enterprise-specific Radar System for Assisted Project Surveillance", *Proceedings of Workshop "MDD, SOA and IT Management 2009"*, pp. 33–47.
- Buckl, S., A.M. Ernst, F. Matthes, and C.M. Schweda (2008) "An Information Model for Landscape Management—Discussing Temporality Aspects", *Proceedings of the 3^d Workshop on Trends in Enterprise Architecture Research*, pp. 363–374.
- Buckl, S., A.M. Ernst, F. Matthes, and C.M. Schweda (2009a) "An Information Model Capturing the Managed Evolution of Application Landscapes", *Proceedings of the 5th International Workshop on Cooperation & Interoperability—Architecture & Ontology*, pp. 85–99.
- Buckl, S., A.M. Ernst, F. Matthes, and C.M. Schweda (2009b) "An Information Model for Managed Application Landscape Evolution", *Journal of Enterprise Architecture*, (5)1, pp. 1–15.
- Buckl, S., A.M. Ernst, F. Matthes, and C.M. Schweda (2009c) "Constructing an Information Model for Application Landscape Management", *Proceedings of the 21st International Conference on Advanced Information Systems*, pp. 55–60.
- Buckl, S., A.M. Ernst, F. Matthes, and C.M. Schweda (2009d) "Enterprise Architecture Management Patterns for Enterprise Architecture Visioning", *Proceedings of the 14th European Conference on Pattern Languages of Programs*, pp. 1–14.
- Buckl, S., A.M. Ernst, F. Matthes, and C.M. Schweda (2009e) "How to Make Your Enterprise Architecture Management Endeavor Fail!", *Proceedings of the 16th Conference on Pattern Languages of Programs*.
- Buckl, S., A.M. Ernst, F. Matthes, and C.M. Schweda (2009f) "Visual Roadmaps for Managed Enterprise Architecture Evolution", *Proceedings of the 10th ACIS International Conference on Software Engineering, Artificial Intelligences, Networking and Parallel/Distributed Computing*, pp. 352–357.
- Buckl, S., A.M. Ernst, F. Matthes, and C.M. Schweda (2010) "Teaching Enterprise Architecture Management with Student Mini-Projects", *Proceedings of the 2nd European Workshop on Patterns for Enterprise Architecture Management*, pp. 309–320.
- Buckl, S., U. Franke, O. Holschke, F. Matthes, C.M. Schweda, T. Sommestad, and J. Ullberg (2009) "A Pattern-based Approach to Quantitative Enterprise Architecture Analysis", *Proceedings of the 15th Americas Conference on Information Systems*, p. 318.
- Buckl, S., S. Krell, and C.M. Schweda (2010) "A Formal Approach to Architectural Descriptions—Refining the ISO Standard 42010", *Proceedings of the 6th International Workshop CIAO! held at DESRIST 2010*, pp. 77–91.
- Buckl, S., F. Matthes, C. Neubert, and C.M. Schweda (2009) "A Wiki-based Approach to Enterprise Architecture Documentation and Analysis", *Proceedings of the 17th European Conference on Information Systems*, pp. 1476–1487.
- Buckl, S., F. Matthes, C. Neubert, and C.M. Schweda (2010) "Lightweight Approach for Enterprise Architecture Modeling and Documentation", *Proceedings of the 22nd International Conference on Advanced Information Systems Engineering*, pp.136–149.

- Buckl, S., F. Matthes, R. Ramacher, and C.M. Schweda (2009) "Towards a Language for Enterprise Architecture Documentation and Analysis—Extending the Meta Object Facility", *Proceedings of the 4th International Workshop on Vocabularies, Ontologies and Rules for the Enterprise*.
- Buckl, S., F. Matthes, W. Renz, C.M. Schweda, and J. Sudeikat (2008) "Towards Simulation-supported Enterprise Architecture Management", *Proceedings of the 2008 Conference on "Modellierung betrieblicher Informationssysteme"*, pp. 131–145.
- Buckl, S., F. Matthes, S. Roth, C. Schulz, and C.M. Schweda (2010) "A Method for Constructing Enterprise-wide Access Views on Business Objects", *Proceedings of "Informatik 2010: IT-Governance in verteilten Systemen"*, pp. 279–284.
- Buckl, S., F. Matthes, and C.M. Schweda (2009a) "Classifying Enterprise Architecture Analysis Approaches", *Proceedings of the 2nd IFIP WG5.8 Workshop on Enterprise Interoperability*, pp. 66–79.
- Buckl, S., F. Matthes, and C.M. Schweda (2009b) "Future Research Topics in Enterprise Architecture Management—A Knowledge Management Perspective", *Proceedings of the Workshop on Trends in Enterprise Architecture Research 2009*, pp. 1–11.
- Buckl, S., F. Matthes, and C.M. Schweda (2009c) "A Viable System Perspective on Enterprise Architecture Management", *Proceedings of the IEEE International Conference on Systems, Man and Cybernetics 2009*, pp. 1483–1488.
- Buckl, S., F. Matthes, and C.M. Schweda (2010a) "A Generative Approach for Creating Stakeholder-specific Enterprise Architecture Views", *Proceedings of the 22nd International Conference on Advanced Information Systems Engineering*, pp. 58–65.
- Buckl, S., F. Matthes, and C.M. Schweda (2010b) "A Meta-Language for EA Information Modeling—State-of-the-art and Requirements Elicitation", *Proceedings of the 15th International Conference on Exploring Modelling Methods in Systems Analysis and Design*, pp. 169–181.
- Buckl, S., F. Matthes, and C.M. Schweda (2010c) "A Technique for Annotating EA Information Models with Goals", *Proceedings of the 6th International Workshop on Enterprise Organizational Modeling and Simulation*, pp. 113–127.
- Buckl, S., F. Matthes, and C.M. Schweda (2010d) "Towards a Method Framework for Enterprise Architecture Management—A Literature Analysis from a Viable System Perspective", *Proceedings of the 5th International Workshop on Business/IT Alignment and Interoperability*, pp. 46–60.
- Buckl, S., F. Matthes, and C.M. Schweda (2010e) "Conceptual Models for Cross-cutting Aspects in Enterprise Architecture Modeling", *Proceedings of the 14th IEEE International Enterprise Computing Conference*, pp. 245–252.
- Buckl, S., F. Matthes, and C.M. Schweda (2010f) "From EA Management Patterns Towards a Prescriptive Theory for Designing Enterprise-specific EA Management Functions: Outline of a Research Stream", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2010*, pp. 67–78.
- Buckl, S., F. Matthes, and C.M. Schweda (2010g) "Interrelating Concerns in EA Documentation—Towards a Conceptual Framework of Relationships", *Proceedings of the 2nd European Workshop on Patterns for Enterprise Architecture Management*, pp. 243–252.
- Buckl, S., F. Matthes, C. Schulz, and C.M. Schweda (2010) "Exemplifying a Framework for Interrelating Enterprise Architecture Concerns", *Proceedings of the 4th International Workshop ONTOSE, The 22nd International Conference on Advanced Information Systems Engineering*, pp. 33–46.
- Buckl, S., C.M. Schweda, and F. Matthes (2010a) "A Design Theory Nexus for Situational Enterprise Architecture Management", *Proceedings of the 14th IEEE International Enterprise Computing Conference*, pp. 3–8.
- Buckl, S., C.M. Schweda, and F. Matthes (2010b) "A Situated Approach to Enterprise Architecture Management", *Proceedings of the 2010 IEEE International Conference on Systems, Man, and Cybernetics*, pp. 587–592.
- Buckow, H., H.J. Gross, G. Piller, K. Prott, J. Willkomm, and A. Zimmermann (2010) "Method for Service-Oriented EAM with Standard Platforms in Heterogeneous IT Landscapes", *Proceedings of the 2nd European Workshop on Patterns for Enterprise Architecture Management*, pp. 219–230.
- Burke, J.C. and M.J. Shaw (2007) "Implications of Complexity Theory on Real Option Analysis in IT Portfolio Management", *Proceedings of the 13th Americas Conference on Information Systems*, p. 245.
- Burke, J.C. and M.J. Shaw (2008) "IT Portfolio Management: A Case Study", *Proceedings of the 14th Americas Conference on Information Systems*, p. 183.

- Buschle, M., J. Ullberg, U. Franke, R. Lagerström, and T. Sommestad (2010) "A Tool for Enterprise Architecture Analysis Using the PRM Formalism", *Proceedings of the 22nd International Conference on Advanced Information Systems Engineering*, pp. 108–121.
- Caetano, A. and A. Rito Silva (2009) "A Role-Based Enterprise Architecture Framework", *Proceedings of the ACM Symposium on Applied Computing 2009*, pp. 253–258.
- Caldeira, M. and C. Pedron (2007) "Why CRM Doesn't Work—An Enterprise Architecture Approach", *Proceedings of the 4th International Conference on Enterprise Systems, Accounting and Logistics*, pp. 9–10.
- Camarinha-Matos, L.M. and H. Afsarmanesh (2003) "Designing the Information Technology Subsystem" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 617–681.
- Cane, S. and R. McCarthy (2007) "Measuring the Impact of Enterprise Architecture", *Issues in Information Systems*, (8)2, pp. 437–442.
- Cardwell, G. (2008) "The Influence of Enterprise Architecture and Process Hierarchies on Company Success", *Total Quality Management*, (19)1, pp. 47–55.
- Carlock, P. and J.A. Lane (2006) "System of Systems Enterprise Systems Engineering, the Enterprise Architecture Management Framework, and System of Systems Cost Estimation", *Proceedings of the 21st International Forum on COCOMO and System/Software Cost Modeling*.
- Caruso, D. (2007) "Application Portfolio Management—A Necessity for Future IT", *Manufacturing Business Technology*, (25)10, pp. 48–50.
- Carvalho, G. and P. Sousa (2008) "Business and Information Systems MisAlignment Model (BISMAM): An Holistic Model Leveraged on Misalignment and Medical Sciences Approaches", *Proceedings of the 3rd International Workshop on Business/IT Alignment and Interoperability*, pp. 104–119.
- Chae, H., Y. Choi, and K. Kim (2007) "Component-based Modeling of Enterprise Architectures for Collaborative Manufacturing", *The International Journal of Advanced Manufacturing Technology*, (34)5–6, pp. 605–616.
- Chen, D., B. Vallespir, and G. Doumeingts (1997) "GRAI Integrated Methodology and Its Mapping onto Generic Enterprise Reference Architecture and Methodology", *Computers in Industry*, (33)2–3, pp. 387–394.
- Chen, D., B. Vallespir, and G. Doumeingts (2003) "Preliminary Design: Translating Requirements for Design Specifications" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 545–574.
- Chen, H.-M., R. Kazman, and A. Garg (2005) "BITAM: An Engineering-principled Method for Managing Misalignments Between Business and IT Architectures", *Science of Computer Programming*, (57)1, pp. 5–26.
- Choi, Y., D. Kang, H. Chae, and K. Kim (2008) "An Enterprise Architecture Framework for Collaboration of Virtual Enterprise Chains", *The International Journal of Advanced Manufacturing Technology*, (35)11–12, pp. 1065–1078.
- Chorus, G., Y. Janse, C. Nellen, S. Hoppenbrouwers, and E. Proper (2007) "Formalizing Architecture Principles Using Object-Role Modelling", *Via Nova Architectura*, February 2007, <http://vianovaarchitectura.nl/page/formalizing-architecture-principles-using-object-role-modelling> (current Nov. 28, 2011).
- Chu, P.-Y.V., Y.-L. Hsu, and M. Fehling (1996) "A Decision Support System for Project Portfolio Selection", *Computers in Industry*, (32)2, pp. 141–149.
- Chung, L. and N. Subramanian (2001) "Process-Oriented Metrics for Software Architecture Adaptability", *Proceedings of the 5th IEEE International Symposium on Requirements Engineering*, p. 310.
- Chung, L., H.-K. Song, Y.-T. Song, and N. Subramanian (2009) "Understanding the Role of Enterprise Architecture Towards Better Institutionalization", *Proceedings of the 10th ACIS International Conference on Software Engineering, Artificial Intelligences, Networking and Parallel/Distributed Computing*, pp. 316–320.
- CIMOSA Association (1996) *CIMOSA—Open System Architecture for CIM*, Technical Baseline, CIMOSA Association, Böblingen, Germany.
- Cleland, D.I. (2007) "Strategic Management: The Project Linkages" in Morris, P.W.G. and J.K. Pinto (eds.) *The Wiley Guide to Project, Program & Portfolio Management*, Hoboken, NJ: Wiley, pp. 63–79.
- Clements, P., F. Bachmann, L. Bass, D. Garlan, J. Ivers, R. Little, P. Merson, R. Nord, and J. Stafford (2003) *Documenting Software Architectures: Views and Beyond*, Boston, MA: Addison-Wesley.

- Clements, P., R. Kazman, and M. Klein (2001) *Evaluating Software Architectures, Methods and Case Studies*, Reading, MA: Addison-Wesley.
- Clements, P., R. Kazman, and M. Klein (2002) *Handbook of Software Architecture Evaluation*, Reading, MA: Addison-Wesley.
- Collins, F.C. and P. De Meo (2009) "Realizing the Business Value of Enterprise Architecture Through Architecture Building Blocks" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 329–353.
- Cooke-Davies, T. (2007) "Project Success" in Morris, P.W.G. and J.K. Pinto (eds.) *The Wiley Guide to Project, Program & Portfolio Management*, Hoboken, NJ: Wiley, pp. 226–246.
- Corneliussen, M.S. (2008) "IT Architecting—Reconceptualizing Current Notions of Architecture in IS Reserach", *Proceedings of the 16th European Conference on Information Systems*, pp. 494–504.
- Corradini, F., A. Polzonetti, R. Pruno, and R. D'Angelo (2006) "Social Enterprise Architecture: Towards an Extendable and Scaleable System Architecture for KM", *Proceedings of the 17th International Conference on Database and Expert Systems Applications*, pp. 585–587.
- Correia, A. and F. Brito E Abreu (2009) "Integrating IT Service Management Within the Enterprise Architecture", *Proceedings of the 4th International Conference on Software Engineering Advances*, pp. 553–558.
- Dashofy, E.M., A. van der Hoek, and R.N. Taylor (2005) "A Comprehensive Approach for the Development of Modular Software Architecture Description Languages", *ACM Transactions on Software Engineering and Methodology*, (14)2, pp. 199–245.
- de Boer, F., M. Bonsangue, L.P.J. Groenewegen, A. Stam, S. Stevens, and L. van der Torre (2005) "Change Impact Analysis of Enterprise Architectures", *Proceedings of the Conference on Information Reuse and Integration 2005*, pp. 177–181.
- de Boer, F., M. Bonsangue, J. Jakob, A. Stam, and L. van der Torre (2005) "Enterprise Architecture Analysis with XML", *Proceedings of the 38th Annual Hawaii International Conference on System Sciences*, pp. 31–53.
- DeBoever, L.R., G.S. Paras, and T. Westbrook (2009) "A Pragmatic Approach to Enlisting the Support of CEOs for Enterprise Architecture" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 401–449.
- Deiters, C., P. Dohrmann, S. Herold, and A. Rausch (2009) "Rule-Based Architectural Compliance Checks for Enterprise Architecture Management", *Proceedings of the 13th IEEE International Enterprise Computing Conference*, pp. 183–192.
- Department of Defense U.S. (2009) "The DoDAF Architecture Framework Version 2.0", <http://cio-nii.defense.gov/sites/dodaf20/index.html> (current Nov. 28, 2011).
- Department of the Treasury U.S. (2000) "Treasury Enterprise Architecture Framework, Version 1", http://www.ea.or.kr/upload_files/TEAF1.0.pdf (current Nov. 28, 2011).
- Dern, G. (2006) *Management von IT-Architekturen: Informationssysteme im Fokus von Architekturplanung und -entwicklung*, Wiesbaden, Germany: Vieweg.
- de Vries, M. and A.C.J. van Rensburg (2008) "Enterprise Architecture—New Business Value Perspective", *South African Journal of Industrial Engineering*, (19)1, pp. 1–16.
- Dietz, J. (2006) *Enterprise Ontology—Theory and Methodology*, Berlin, Germany: Springer.
- Dietz, J. (2006) "Enterprise Ontology—Understanding the Essence of Organizational Operation" in Chen, C.-S., J. Felipe, I. Seruca, and J. Cordeiro (eds.) *Enterprise Information Systems VII*, Dordrecht, Netherlands: Springer, pp. 19–30.
- Dietz, J.L.G. and J.A.P. Hoogervorst (2008) "Enterprise Ontology in Enterprise Engineering", *Proceedings of the 2008 ACM Symposium on Applied Computing*, pp. 572–579.
- Dietzsch, A. (2003) "Positionierung eines Unternehmensarchitektur-Ansatzes—Erfahrungen der schweizerischen Mobiliar im Architekturmanagement", *Proceedings of the "Frühjarskonferenz des GI Arbeitskreises Enterprise Architecture 2003"*, pp. 50–62.
- Dietzsch, A. (2008) "Unternehmensarchitektur als Instrument der strategischen Unternehmensentwicklung—Erfahrungen bei der PostFinance", *HMD—Praxis der Wirtschaftsinformatik*, (262), pp. 49–58.

- Dietzsch, A. and T. Goetz (2005) "Nutzen-orientiertes Management einer Service-orientierten Unternehmensarchitektur", *Proceedings of the 7th International Conference on Wirtschaftsinformatik*, pp. 1519–1538.
- Dijkman, R.M., D.A.C. Quartel, and M.J. van Sinderen (2006) *Consistency in Multi-Viewpoint Architectural Design of Enterprise Information Systems*, Research Report, University of Twente, Enschede, Netherlands.
- Dobrica, L. and E. Niemelä (2000) *A Strategy for Analysing Product Line Software Architectures*, Technical Research Center of Finland, Oulu, Finland: VTT Publications.
- Dobrica, L. and E. Niemelä (2002) "A Survey on Software Architecture Analysis Methods", *IEEE Transactions on Software Engineering*, (28)7, pp. 638–653.
- Doucet, G., J. Gotze, P. Saha, and S. Bernard (2008) "Coherency Management: Using Enterprise Architecture for Alignment, Agility, and Assurance", *Journal of Enterprise Architecture*, (4)2, pp. 1–12.
- Doucet, G., J. Gotze, P. Saha, and S. Bernard (2009) "Commencing the Journey: Realizing Coherency Management" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 491–527.
- Doucet, G., J. Gotze, P. Saha, and S. Bernard (2009) "Introduction to Coherency Management: The Transformation of Enterprise Architecture" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 25–48.
- Dowell, S. (2007) "Enterprise Architecture Within the Service-oriented Enterprise" in Saha, P. (ed.) *Handbook Of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 382–399.
- Dreyfus, D. and B. Iyer (2005) *Architectural Control and Emergent Architecture: A Network Perspective*, Boston University, MA, Working Paper 2005.
- Dreyfus, D. and B. Iyer (2006) "Enterprise Architecture: A Social Network Perspective", *Proceedings of the 39th Annual Hawaii International Conference on System Sciences*, p. 178.
- Dubosson-Torbay, M., A. Osterwalder, and Y. Pigneur (2001) Business Model Design, Classification and Measurements, *Thunderbird International Business Review*, (44)1, pp. 5–23.
- Ducq, Y., D. Chen, and B. Vallespir (2004) "Interoperability in Enterprise Modelling: Requirements and Roadmap", *Advanced Engineering Informatics*, (18)4, pp. 193–203.
- Durst, M. (2006) "Kennzahlengestütztes Management von IT-Architekturen", *HMD—Praxis der Wirtschaftsinformatik*, (250), pp. 37–48.
- Eisenhardt, K.M. and J.A. Martin (2000) "Dynamic Capabilities: What Are They?", *Strategic Management Journal*, (21)10–11, pp. 1105–1121.
- Ekstedt, M. (2004) *Enterprise Architecture as a Means for IT Management*, EARP Working Paper 2004–02, Department of Industrial Information and Control Systems, Royal Institute of Technology, Stockholm, Sweden.
- Ekstedt, M., U. Franke, P. Johnson, R. Lagerström, T. Sommestad, J. Ullberg, and M. Buschle (2009) "A Tool for Enterprise Architecture Analysis of Maintainability", *Proceedings of the European Conference on Software Maintenance and Reengineering 2009*, pp. 327–328.
- Ekstedt, M., P. Johnson, A. Lindström, M. Gammelgard, E. Johansson, L. Plazaola, E. Silva, and J. Liliesköld (2004) "Consistent Enterprise Software System Architecture for the CIO—A Utility-cost Based Approach", *Proceedings of the 37th Hawaii International Conference on System Sciences*, p. 80225.
- Ekstedt, M. and T. Sommestad (2009) "Enterprise Architecture Models for Cyber Security Analysis", *Proceedings of the Power Systems Conference and Exposition 2009*, pp. 1–6.
- Ellis, W., R. Hilliard, P. Poon, D. Rayford, T. Saunders, B. Sherlund, and R. Wade (1996) "Toward a Recommended Practice for Architectural Description", *Proceedings of the 2nd IEEE International Conference on Engineering of Complex Computer Systems*, pp. 21–25.
- El Kourdi, M., H. Shah, and A. Atkins (2007) "A Proposed Framework for Knowledge Discovery in Enterprise Architecture", *Proceedings of the 2nd Workshop on Trends in Enterprise Architecture Research*, pp. 41–49.
- Emery, C., S.M. Faison, J. Houk, and J.S. Kirk (2007) "The Integrated Enterprise: Enterprise Architecture, Investment Process and System Development", *Proceedings of the 40th Annual Hawaii International Conference on System Sciences*, pp. 218–228.

- Emery, D. and R. Hilliard (2008) "Updating IEEE 1471: Architecture Frameworks and Other Topics", *Proceedings of the 7th Working IEEE IFIP Conference on Software Architecture*, pp. 303–306.
- Emery, D. and R. Hilliard (2009) "Every Architecture Description Needs a Framework: Expressing Architecture Frameworks Using ISO/IEC 42010", *Proceedings of the 2009 Joint Working IEEE IFIP Conference on Software Architecture*, pp. 31–40.
- Engels, G. and M. Assmann (2008) "Service-Oriented Enterprise Architectures: Evolution of Concepts and Methods", *Proceedings of the 12th International IEEE Enterprise Computing Conference*, pp. 34–43.
- Engels, G., A. Hess, B. Humm, O. Juwig, M. Lohmann, J.-P. Richter, M. Voß, and J. Willkomm (2008) *Quasar Enterprise*, Heidelberg, Germany: dpunkt.
- Engels, G. and Voß, M. (2008) "Quasar Enterprise—Anwendungslandschaften serviceorientiert gestalten", *Proceedings of the Conference on Software Engineering 2008*, pp. 24–27.
- Engelsman, W., M.E. Iacob, and H.M. Franken (2009) "Architecture-Driven Requirements Engineering", *Proceedings of the ACM Symposium on Applied Computing 2009*, pp. 285–286.
- Ernst, A.M., J. Lankes, C.M. Schweda, and A. Wittenburg (2006a) "Tool Support for Enterprise Architecture Management—Strengths and Weaknesses", *Proceedings of the 10th IEEE International Enterprise Computing Conference*, pp. 13–22.
- Ernst, A.M., J. Lankes, C.M. Schweda, and A. Wittenburg (2006b) *Using Model Transformation for Generating Visualizations from Repository Contents*, Technical Report TB 0601, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- Espinosa, J.A. and F. Armour (2008) "Geographically Distributed Enterprise Architecting: Towards a Theoretical Framework", *Proceedings of the 41st Hawaii International Conference on System Sciences*, pp. 400–408.
- Espinosa, J.A. and W.F. Boh (2009) "Coordination and Governance in Geographically Distributed Enterprise Architecting: An Empirical Research Design", *Proceedings of the 42nd Hawaii International Conference on System Sciences*, pp. 1–10.
- Esswein, W. and J. Weller (2008) "Unternehmensarchitekturen—Grundlagen, Verwendung und Frameworks", *HMD—Praxis der Wirtschaftsinformatik*, (262), pp. 6–18.
- Evernden, R. and E. Evernden (2003) "Third-Generation Information Architecture", *Communications of the ACM*, (46)3, pp. 95–98.
- Fabrieck, M., S. Brinkkemper, and J. van Dulleman (2007) "A Method for Application Portfolio Rationalization", *Proceedings of the 2nd International Conference on Digital Information Management*, pp. 466–472.
- Fatolahi, A. and F. Shams Aliee (2006) "An Investigation into Applying UML to the Zachman Framework", *Information Systems Frontiers*, (8)2, pp. 133–143.
- Fewster, R.M. and E. Mendes (2003) "Portfolio Management Method for Deadline Planning", *Proceedings of the 9th International Software Metrics Symposium*, pp. 325–336.
- Fischer, F., F. Matthes, and A. Wittenburg (2005) "Improving IT Management at the BMW Group by Integrating Existing IT Management Processes", *Proceedings of the 9th IEEE International Enterprise Computing Conference*, pp. 219–225.
- Fischer, R., S. Aier, and R. Winter (2007) "A Federated Approach to Enterprise Architecture Model Maintenance", *Proceedings of 2nd International Workshop on Enterprise Modelling and Information Systems Architectures*, pp. 9–22.
- Fischer, R. and R. Winter (2007) "Ein hierarchischer, architekturbasierter Ansatz zur Unterstützung des IT/Business Alignment", *Proceedings of the 8th International Conference on Wirtschaftsinformatik*, pp. 163–180.
- Fitterer, R. and F. Marx (2008) "Management Accounting Extension of the Core Business Meta Model—A Conceptual Model for Structured Analysis of Management Accounting Dependencies", *Proceedings of the 7th International Conference on Perspectives in Business Informatics Research*, pp. 337–350.
- Fitterer, R. and P. Rohner (2010) "Entwicklung eines Metamodells zur Modellierung der fachlichen Fähigkeiten der Softwarearchitektur in Krankenhäusern auf Grundlage von Stakeholder Concerns", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2010*, pp. 91–102.
- Foegen, M. (2003) "Architektur und Architekturmanagement—Modellierung von Architekturen und Architekturmanagement in der Softwareorganisation", *HMD—Praxis der Wirtschaftsinformatik*, 232, pp. 57–65.

- Foorthuis, R. and S. Brinkkemper (2007a) "A Framework for Local Project Architecture in the Context of Enterprise Architecture", *Journal of Enterprise Architecture*, (3)4, pp. 51–63.
- Foorthuis, R. and S. Brinkkemper (2007b) "A Framework for Project Architecture in the Context of Enterprise Architecture", *Proceedings of Trends in Enterprise Architecture Research Workshop 2007*, pp. 51–60.
- Foorthuis, R. and S. Brinkkemper (2008) "Best Practices for Business and Systems Analysis in Projects Conforming to Enterprise Architecture", *Enterprise Modelling and Information Systems Architectures*, (3)1, pp. 36–47.
- Foorthuis, R., S. Brinkkemper, and R. Bos (2008) *An Artifact Model for Projects Conforming to Enterprise Architecture*, The Hague, Netherlands: Statistics Netherlands.
- Foorthuis, R., S. Brinkkemper, and F. Hofman (2008) *A Process Model for Project Members Conforming to Enterprise Architecture*, Technical Report UU-CS-2008-023, Department of Information and Computing Sciences, Utrecht University, Utrecht, Netherlands.
- Foorthuis, R., F. Hofman, S. Brinkkemper, and R. Bos (2009) "Assessing Business and IT Projects on Compliance with Enterprise Architecture", *Proceedings of the 21st International Conference on Advanced Information Systems Engineering*.
- Fox, M.S. and M. Gruninger (1994) "Ontologies for Enterprise Integration", *Proceedings of the 2nd Conference on Cooperative Information Systems*, pp. 82–89.
- Fox, M.S., M. Barbuceanu, and M. Gruninger (1995) "An Organisation Ontology for Enterprise Modelling: Preliminary Concepts for Linking Structure and Behaviour", *Proceedings of the 4th Workshop on Enabling Technologies: Infrastructure for Collaborative Enterprises*, pp. 123–134.
- Fox, M.S. and M. Gruninger (1997) "On Ontologies and Enterprise Modelling", *Proceedings of the International Conference on Enterprise Integration Modelling Technology 1997*.
- Fox, M.S. and M. Gruninger (1998) "Enterprise Modeling", *AI Magazine*, (19)3, pp. 109–121.
- Frampton, K. and S.Y. Ho (2010) "Skills Analysis for Enterprise Architects: Implications for University Education and Curriculum Design", *Journal of Enterprise Architecture*, (6)4, pp. 44–54.
- Frank, U. (1994) "MEMO: A Tool Supported Methodology for Analyzing and (Re-)Designing Business Information Systems" in Ege, R., M. Singh, and B. Meyer (eds.) *Technology of Object-oriented Languages and Systems*, Englewood Cliffs, NJ: Prentice Hall, pp. 367–380.
- Frank, U. (1998) *The MEMO Meta-Metamodel*, Research Report No 9, Institut für Wirtschaftsinformatik, University Koblenz-Landau, Koblenz, Germany.
- Frank, U. (1998) *The Memo Object Modelling Language (MEMO-OML)*, Research Report No 10, Institut für Wirtschaftsinformatik, University Koblenz-Landau, Koblenz, Germany.
- Frank, U. (1998) *Applying the MEMO-OML: Guidelines and Examples*, Research Report No 11, Institut für Wirtschaftsinformatik, University Koblenz-Landau, Koblenz, Germany.
- Frank, U. (1999) "Eine Architektur zur Spezifikation von Sprachen und Werkzeugen für die Unternehmensmodellierung", *Proceedings of the Conference on "Modellierung betrieblicher Informationssysteme 1999"*, pp. 154–169.
- Frank, U. (1999) *MEMO: Visual Languages for Enterprise Modelling*, Research Report No 18, Institut für Wirtschaftsinformatik, University Koblenz-Landau, Koblenz, Germany.
- Frank, U. (2000) "Multi-perspective Enterprise Models as a Conceptual Foundation for Knowledge Management", *Proceedings of the 33rd Hawaii International Conference on System Sciences*, p. 3012.
- Frank, U. (2000) "Die Modellierung von Produkten für Handelsplattformen im Internet—Ein Ansatz auf der Basis von Metakonzepten" in Jasper, H., J. Küng, and G. Vossen (eds.) *Informationssysteme für E-Commerce: EMISA-2000*, Linz: Universitätsverlag Rudolf Trauner, pp. 169–185.
- Frank, U. (2002) "Multi-perspective Enterprise Modeling (MEMO)—Conceptual Framework and Modeling Languages", *Proceedings of the 35th Hawaii International Conference on System Sciences*, pp. 1258–1267.
- Frank, U. (2008) *The MEMO Meta Modelling Language (MML) and Language Architecture*, ICB Research Report No. 24, University Duisburg-Essen, Duisburg/Essen, Germany.
- Frank, U. and B. van Laak (2002) "A Method for the Multi-perspective Design of Versatile E-Business Systems", *Proceedings of the 8th Americas Conference on Information Systems*, pp. 621–627.

- Franke, U., W.R. Flores, and P. Johnson (2009) "Enterprise Architecture Dependency Analysis Using Fault Trees and Bayesian Networks", *Proceedings of the Spring Simulation Multiconference 2009*, pp. 209–216.
- Franke, U., D. Höök, J. König, R. Lagerström, P. Närman, J. Ullberg, P. Gustafsson, and M. Ekstedt (2009) "EAF2—A Framework for Categorizing Enterprise Architecture Frameworks", *Proceedings of Software Engineering, Artificial Intelligences, Networking and Parallel/Distributed Computing*, pp. 327–332.
- Franke, U. and P. Johnson (2009) "An Enterprise Architecture Framework for Application Consolidation in the Swedish Armed Forces", *Proceedings of the 13th IEEE International Enterprise Computing Conference*, pp. 264–273.
- Franke, U., P. Johnson, E. Ericsson, W.R. Flores, and K. Zhu (2009) "Enterprise Architecture Analysis Using Fault Trees and MODAF", *Proceedings of the 21st International Conference on Advanced Information Systems Engineering*, pp. 61–66.
- Franke, U., T. Sommestad, M. Ekstedt, and P. Johnson (2008) "Defense Graphs and Enterprise Architecture for Information Assurance Analysis", *Proceedings of the 26th Army Science Conference*.
- Franke, U., J. Ullberg, T. Sommestad, R. Lagerström, and P. Johnson (2009) "Decision Support Oriented Enterprise Architecture Metamodel Management Using Classification Trees", *Proceedings of the 13th IEEE International Enterprise Computing Conference*, pp. 328–335.
- Frese, E. (2000) *Grundlagen der Organisation: Konzept—Prinzipien—Strukturen*, Wiesbaden, Germany: Gabler.
- Gammelgård, M., M. Ekstedt, and P. Närman (2007) "Architecture Scenario Analysis—Estimating the Credibility of the Results", *Proceedings of the 17th International Symposium of the International Council on Systems Engineering*.
- Gammelgård, M., M. Simonsson, and A. Lindström (2007) "An IT Management Assessment Framework: Evaluating Enterprise Architecture Scenarios", *Information Systems & e-Business Management*, (5)4, pp. 415–435.
- Ganczarski, W. and R. Winter (2008) "On the Interplay of Organizational Architecture and Software Architecture", *Enterprise Modelling and Information Systems Architectures*, (3)1, pp. 24–35.
- Gareis, R. (2007) "Management of the Project-oriented Company" in Morris, P.W.G. and J.K. Pinto (eds.) *The Wiley Guide to Project, Program & Portfolio Management*, Hoboken, NJ: Wiley, pp. 250–269.
- Garg, A., R. Kazman, and H.-M. Chen (2006) "Interface Descriptions for Enterprise Architecture", *Science of Computer Programming*, (61)1, pp. 4–15.
- Garlan, D. and M. Shaw (1993) "An Introduction to Software Architecture" in Ambriola, V. and G. Tortora (eds.) *Advances in Software Engineering and Knowledge Engineering*, River Edge, NJ: World Scientific Publishing Company, pp. 1–39.
- Garlan, D. (2000) "Software Architecture: A Roadmap", *Proceedings of the Conference on The Future of Software Engineering 2000*, pp. 91–101.
- Gerber, S., U. Meyer, and C. Richert (2007) "EA Model as Central Part of the Transformation into a More Flexible and Powerful Organisation", *Proceedings of the International Workshop on Enterprise Modelling and Information Systems Architectures 2007*, pp. 23–32.
- Getter, J.R. (2007) "Enterprise Architecture and IT Governance: A Risk-based Approach", *Proceedings of the 40th Hawaii International Conference on System Sciences*, p. 220.
- Ghasemzadeh, F. and N. Archer (2000) "Project Portfolio Selection Through Decision Support", *Decision Support Systems*, (29)1, pp. 73–88.
- Ghidini, C., B. Kump, S. Lindstaedt, N. Mahbub, V. Pammer, M. Rospocher, and L. Serafini (2009) "MoKi: The Enterprise Modelling Wiki", *Proceedings of 6th European Semantic Web Conference*, pp. 831–835.
- Ghosh, S. (2007) "Promoting Netcentricity Through the Use of Enterprise Architecture" in Saha, P. (ed.) *Handbook Of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 253–270.
- Gieffers-Ankel, S. and G. Riempp (2010) "MCP-Portfolio—eine EAM-orientierte Methode zur fachlichen Konsolidierung von Geschäftsanwendungs-Portfolios", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2010*, pp. 79–90.
- Gieffers-Ankel, S., G. Riempp, and D. Tenfelde-Podehl (2008) "Master Construction Plan bei der Volkswagen AG", *HMD—Praxis der Wirtschaftsinformatik*, (262), pp. 59–69.

- Goeken, M., W. Johannsen, and J.C. Pfeiffer (2008) "Motivation einer IT-Governance-Geschäftsarchitektur zur Unterstützung des Business/IT-Alignments", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2008*.
- Goel, A., H. Schmidt, and D. Gilbert (2009) "Towards Formalizing Virtual Enterprise Architecture", *Proceedings of the 13th IEEE International Enterprise Computing Conference*, pp. 238–242.
- Goethals, F. (2005) *An Overview of Enterprise Architecture Framework Deliverables*, Katholieke Universiteit Leuven, Faculty of Economics and Applied Economics, Department of Applied Economics, Leuven, Belgium.
- Goethals, F., M. Snoeck, W. Lemahieu, J. Vandenbulcke (2006) "Management and Enterprise Architecture Click: The FAD(E)E Framework", *Information Systems Frontiers*, (8), pp. 67–79.
- Goethals, F., J. Vandenbulcke, W. Lemahieu, M. Snoeck, M. De Backer, and R. Haesen (2004) "Communication and Enterprise Architecture in Extended Enterprise Integration", *Proceedings of the 6th International Conference on Enterprise Information Systems*, pp. 332–337.
- Goethals, F., W. Lemahieu, M. Snoeck, and J.A. Vandenbulcke (2007) "The Data Building Blocks of the Enterprise Architect", *Future Generation Computer Systems*, (23)2, pp. 269–274.
- Goikoetxea, A. (2004) "A Mathematical Framework for Enterprise Architecture Representation and Design", *International Journal of Information Technology & Decision Making*, (3)1, pp. 5–32.
- Goossenaerts, J. and C. Pelletier (2001) "Enterprise Ontologies and Knowledge Management", *Proceedings of the 7th International Conference on Concurrent Enterprising*, pp. 281–289.
- Goranson, T. (2003) "Capability Improvement", in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin: Springer, pp. 281–290.
- Gordijn, J., H. Akkermans, and H. van Vliet, H. (2000) "Business Modelling Is Not Process Modelling", *Proceedings of ECOMO 2000: Conceptual Modeling for E-Business and the Web*, pp. 40–51.
- Gorton, I. and A. Liu (2004) "Architectures and Technologies for Enterprise Application Integration", *Proceedings of the 26th International Conference on Software Engineering*, pp. 726–727.
- Gottlieb, R. and B. Iyer (2004) "The Four-domain Architecture: An Approach to Support Enterprise Architecture Design", *IBM Systems Journal*, (43)3, pp. 587–597.
- Grant, R.M. (1991) "The Resource-Based Theory of Competitive Advantage: Implications for Strategy Formulation", *California Management Review*, (33)3, pp. 114–135.
- Greefhorst, D., H. Koning, and H. van Vliet (2006) "The Many Faces of Architectural Descriptions", *Information Systems Frontiers*, (8)2, pp. 103–113.
- Gregor, S., D. Hart, and N. Martin (2007) "Enterprise Architectures: Enablers of Business Strategy and IS/IT Alignment in Government", *Information Technology & People*, (20)2, pp. 96–120.
- Gronau, N. and M. Rohloff (2007) "Managing Change: Business/IT Alignment and Adaptability of Information Systems", *Proceedings of the 15th European Conference on Information Systems*, pp. 1741–1753.
- Groot, R., M. Smits, and H. Kuipers (2005) "A Method to Redesign the IS Portfolios in Large Organizations", *Proceedings of the 38th Hawaii International Conference on System Sciences*, p. 223.
- Grundy, J. and J. Hosking (2000) "High-level Static and Dynamic Visualisation of Software Architectures", *Proceedings of the 2000 IEEE Symposium on Visual Languages*, pp. 5–12.
- Gruninger, M. (2003) "Enterprise Modelling" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 515–543.
- Guijarro, L. (2007) "Interoperability Frameworks and Enterprise Architectures in Egovernment Initiatives in Europe and the United States", *Government Information Quarterly*, (24)1, pp. 89–101.
- Gümüşkaya, H. (2005) "Core Issues Affecting Software Architecture in Enterprise Projects", *Proceedings of World Academy of Science, Engineering and Technology 2005*, pp. 32–37.
- Guney, C., R.N. Celik, and S.G. Erturk (2006) "An Open Enterprise Architecture Framework Design for the Cultural Heritage Domain", *Proceedings of 26th Annual ESRI International User Conference*.
- Günzel, H. and M. Rohloff (2003) "Architektur im Großen: Gegenstand und Handlungsfelder", *Proceedings of "GI Jahrestagung 2003"*, pp. 422–425.
- Hafner, M., J. Schelp, and R. Winter (2004) "Architekturmanagement als Basis effizienter und effektiver Produktion von IT-Services", *HMD—Praxis der Wirtschaftsinformatik*, 237, pp. 54–66.

- Hafner, M. and R. Winter (2005) "Vorgehensmodell fuer das Management der unternehmensweiten Applikationsarchitektur", *Proceedings of the 7th International Conference on Wirtschaftsinformatik*, pp. 627–646.
- Hafner, M. and R. Winter (2008) "Processes for Enterprise Application Architecture Management", *Proceedings of the 41st Annual Hawaii International Conference on System Sciences*, p. 396.
- Haft, M., B. Humm, and J. Siedersleben (2005) "The Architect's Dilemma—Will Reference Architectures Help?", *Proceedings of the 1st International Conference on the Quality of Software Architecture*, pp. 106–122.
- Hämäläinen, N. and K. Liimatainen (2007) "A Framework to Support Business-IT-Alignment in Enterprise Architecture Decision Making", *Proceedings of the EBRF 2007- Research Forum to Understand Business in Knowledge Society*.
- Hamilton, J.A. and G.A. Catania (2003) "A Practical Application of Enterprise Architecture for Interoperability", *Proceedings of the International Conference on Information Systems Engineering, SCS Summer Simulation Multiconference 2003*, pp. 183–188.
- Han, J., P. Chen, and A. El-Aakka (1999) "Representation and Management of Systems Architecture at the Enterprise Level", *Proceedings of the 2nd Australasian Workshop on Software Architectures*, pp. 9–23.
- Hanschke, I. (2010) *Strategic IT Management: A Toolkit for Enterprise Architecture Management*, Berlin: Springer.
- Harmsen, F., E. Proper, and N. Kok (2009) "Informed Governance of Enterprise Transformations", *Proceedings of the 1st NAF Academy Working Conference on Practice-driven Research on Enterprise Transformation*, pp. 155–180.
- Harris, P.T. (2008) "Enterprise Architecture and Its Role in Solving Business Issues: Case Study of the NSW Department of Lands", *Proceedings of the 8th International Conference on Computer and Information Technology Workshops*, pp. 607–615.
- Hartwich, C. (2003) "An Enterprise Application Architecture for Reconfigurable Distributed Process Topologies", *Proceedings of the 23rd International Conference on Distributed Computing Systems Workshops*, pp. 146–152.
- Hashimoto, D., A. Tanaka, and M. Yokoyama (2007) "Case Study on RM-ODP and Enterprise Architecture", *Proceedings of the 11th International IEEE Enterprise Computing Conference*, pp. 216–223.
- Heberling, M., C. Maier, and T. Tensi (2002) "Visual Modelling and Managing the Software Architecture Landscape in a Large Enterprise by an Extension of the UML", *Proceedings of the 2nd Workshop on Domain Specific Visual Languages*.
- Hedman, J. and T. Kalling (2002) "The Business Model: A Means to Comprehend the Management and Business Context of Information and Communication Technology", *Proceedings of the 10th European Conference on Information Systems*, pp. 148–162.
- Hedman, J. and T. Kalling (2003) "The Business Model Concept: Theoretical Underpinnings and Empirical Illustrations", *European Journal of Information Systems*, (12), pp. 49–59.
- Heinrich, B., M. Henneberger, S. Leist, and G. Zellner (2009) "The Process Map as an Instrument to Standardize Processes: Design and Application at a Financial Service Provider", *Information Systems and e-Business Management*, (7)1, pp. 81–102.
- Heise, D., S. Strecker, U. Frank, and J. Jung (2008) "Erweiterung einer Unternehmensmodellierungsmethode zur Unterstützung des IT-Controllings", *Proceedings of Multikonferenz Wirtschaftsinformatik 2008*, pp. 1017–1028.
- Helfat, C.E. and M.A. Perera (2002) "The Dynamic Resource-based View: Capability Lifecycles", *Strategic Management Journal*, (24)10, pp. 997–1010.
- Herz, S., O. Koch, J. Schellhase, and U. Winand (2008) "Strategiebasierte Bewertung von Anwendungslandschaften", *HMD—Praxis der Wirtschaftsinformatik*, (262), pp. 70–77.
- Hess, A., B. Humm, M. Voss, and G. Engels (2007) "Structuring Software Cities—A Multidimensional Approach", *Proceedings of the 11th IEEE International Enterprise Computing Conference*, pp. 122–129.
- Hirvonen, A. (2004) "Application Portfolio Models in Practice—Tools for ICT Planning, Management and Business Value Evaluation", *Proceedings of the 11th European Conference on Information Technology Evaluation*, pp. 183–192.

- Hirvonen, A., T. Oyj, and M. Pulkkinen (2003) "Evaluation of Enterprise IT Architecture Solutions—How Can an ICT Consultant Tell What Is Best for You?", *Proceedings of the 10th European Conference on Information Technology Evaluation*, pp. 327–338.
- Hirvonen, A. and M. Pulkkinen (2005) "User Participation in Consulting Projects: Client and Provider Role Variations", *Proceedings of the 13th European Conference on Information Systems*, pp. 140–153.
- Hirvonen, A., M. Pulkkinen, and K. Valtonen (2007) "Selection Criteria for Enterprise Architecture Methods", *Proceedings of the European Conference on Information Management and Evaluation*, pp. 227–236.
- Hjort-Madsen, K. (2006) "Enterprise Architecture Implementation and Management: A Case Study on Interoperability", *Proceedings of the 39th Hawaii International Conference on System Sciences*, p. 71.
- Hjort-Madsen, K. (2007) "Institutional Patterns of Enterprise Architecture Adoption in Government", *Transforming Government: People, Process and Policy*, (1)4, pp. 333–349.
- Hjort-Madsen, K. and J. Pries-Heje (2009) "Enterprise Architecture in Government: Fad or Future?", *Proceedings of the 42nd Hawaii International Conference on System Sciences*, pp. 1–10.
- Hofer, S. (2009) "Anwendungslandschaften und ihre Verwendung durch exemplarische Geschäftsprozessmodellierung verstehen", *Proceedings of the 1st Workshop of the "GI-Arbeitskreis Langlebige Softwaresysteme"*, pp. 27–38.
- Hoffmann, M. (2007) "Analysis of the Current State of Enterprise Architecture Evaluation Methods and Practices", *Proceedings of the European Conference on Information Management and Evaluation 2007*, pp. 237–246.
- Holschke, O., P. Närman, W.R. Flores, E. Eriksson, and M. Schönherr (2008) "Using Enterprise Architecture Models and Bayesian Belief Networks for Failure Impact Analysis", *Proceedings of the 3rd Workshop on Trends in Enterprise Architecture Research*, pp. 339–350.
- Hoogervorst, J.A.P. (2004) "Enterprise Architecture: Enabling Integration, Agility and Change", *International Journal of Cooperative Information Systems*, (13)3, pp. 213–233.
- Höök, D., L. Nordström, and P. Johnson (2009) "An Enterprise Architecture Based Method for Quantified Analysis of ICT System Impact on Maintenance Management", *Proceedings of the ICOMS Asset Management Conference 2009*.
- Horkoff, J. and E. Yu (2009) "Evaluating Goal Achievement in Enterprise Modeling—An Interactive Procedure and Experiences", *Proceedings of 2nd IFIP WG 8.1 Working Conference on the Practice of Enterprise Modeling*, pp. 145–160.
- Hungerford, P. (2007) "The Syngenta Architecture Story" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture in Practice*, Hershey, PA: IGI Global, pp. 331–350.
- Hungerford, P. (2009) "The Evolving Role of Enterprise Architecture Within Syngenta" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington: AuthorHouse, pp. 307–328.
- Hwang, S.-K., K.-J. Lee, and Y.-T. Byun (2009) "A Method for Dynamic NCW Service Selection Based on EA Ontology", *Proceedings of the 10th ACIS International Conference on Software Engineering, Artificial Intelligences, Networking and Parallel/Distributed Computing*, pp. 300–305.
- Iacob, M.E. and H. Jonkers (2006) "Quantitative Analysis of Enterprise Architectures", *Proceedings of the 1st International Conference on Interoperability of Enterprise Software and Applications*, pp. 239–252.
- IFAC-IFIP (1999) "GERAM: Generalized Enterprise Reference Architecture and Methodology, Version 1.6.3", <http://www.ict.griffith.edu.au/~bernus/taskforce/geram/versions/geram1-6-3/v1.6.3.html> (current Nov. 28, 2011).
- In, H., R. Kazman, and D. Olson (2001) "From Requirements Negotiation to Software Architectural Decisions", *Proceedings of the 2nd International Workshop from Software Requirements to Architectures*.
- Ionita, M., D. Hammer, and H. Obbink (2002) "Scenario-Based Software Architecture Evaluation Methods: An Overview", *Proceedings of the Workshop on Methods and Techniques for Software Architecture Review and Assessment at the International Conference on Software Engineering 2002*.
- Iyamu, T. (2009) "The Factors Affecting Institutionalisation of Enterprise Architecture in the Organisation", *Proceedings of the IEEE Conference on Commerce and Enterprise Computing 2009*, pp. 221–225.
- Iyengar, V., D. Flaxer, A. Nigam, and J. Vergo (2006) "Evaluation of IT Portfolio Options by Linking to Business Services", *Proceedings of the 2nd International Workshop DEECS*, pp. 66–80.

- Iyer, B., D. Dreyfus, and P. Gyllstrom (2007) "A Network-based View of Enterprise Architecture" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 306–319.
- Jaafari, A. (2007) "Modeling of Large Projects" in Morris, P.W.G. and J.K. Pinto (eds.) *The Wiley Guide to Project, Program & Portfolio Management*, Hoboken, NJ: Wiley, pp. 144–176.
- Jain, R., A. Chandrasekaran, and G. Elias (2009) "System Architecture Concerns: A Stakeholders' Perspective", *Journal of Enterprise Architecture*, (5)2, pp. 42–67.
- Jamieson, A. and P.W.G. Morris (2007) "Moving from Corporate Strategy to Project Strategy" in Morris, P.W.G. and J.K. Pinto (eds.) *The Wiley Guide to Project, Program & Portfolio Management*, Hoboken, NJ: Wiley, pp. 34–61.
- Janssen, M. (2009) "Framing Enterprise Architecture: A Meta-framework for Analyzing Architectural Efforts in Organizations" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 99–119.
- Janssen, M. and A. Cresswell (2005a) "The Development of a Reference Architecture for Local Government", *Proceedings of the 38th Hawaii International Conference on System Sciences*, p. 223.
- Janssen, M. and A. Cresswell (2005b) "Enterprise Architecture Integration in E-government", *Proceedings of the 38th Hawaii International Conference on System Sciences*, p. 118.
- Janssen, M. and K. Hjort-Madsen (2007) "Analyzing Enterprise Architecture in National Governments: The Cases of Denmark and the Netherlands", *Proceedings of the 40th Hawaii International Conference on System Sciences*, pp. 218.
- Janssen, M. and G. Kuk (2006) "A Complex Adaptive System Perspective of Enterprise Architecture in Electronic Government", *Proceedings of the 39th Hawaii International Conference on System Sciences*, p. 71.
- Javanbakht, M., M. Pourkamali, and M. Feizi (2009) "A New Method for Enterprise Architecture Assessment and Decision-making About Improvement or Redesign", *Proceedings of the 4th International Multi-Conference on Computing in the Global Information Technology*, pp. 69–76.
- Johannesson, P., B. Andersson, M. Bergholtz, and H. Weigand (2008) "Enterprise Modelling for Value Based Service Analysis", *Proceedings of 1st IFIP WG 8.1 Working Conference on the Practice of Enterprise Modeling*, pp. 153–167.
- Johnson, P. and M. Ekstedt (2007) *Enterprise Architecture: Models and Analyses for Information Systems Decision Making*, Pozkal, Poland: Studentlitteratur.
- Johnson, P., L. Nordström, and R. Lagerström (2006) "Formalizing Analysis of Enterprise Architecture", *Proceedings of the 2nd International Conference on Interoperability for Enterprise Software and Applications*, pp. 35–44.
- Johnson, P., M. Ekstedt, E. Silva, and L. Plazaola (2004) "Using Enterprise Architecture for CIO Decision-Making: On the Importance of Theory", *Proceedings of the 2nd Annual Conference on Systems Engineering Research*.
- Johnson, P., E. Johannson, T. Sommestad, and J. Ullberg (2007) "A Tool for Enterprise Architecture Analysis", *Proceedings of the 11th IEEE International Enterprise Computing Conference*, pp. 142–156.
- Johnson, P., R. Lagerström, P. Närman, and M. Simonsson (2006) "Extended Influence Diagrams for Enterprise Architecture Analysis", *Proceedings of the 10th IEEE International Annual Enterprise Computing Conference*, pp. 3–12.
- Johnson, P., R. Lagerström, P. Närman, and M. Simonsson (2007a) "Enterprise Architecture Analysis with Extended Influence Diagrams", *Information Systems Frontiers*, (9)2–3, pp. 163–180.
- Johnson, P., R. Lagerström, P. Närman, and M. Simonsson (2007b) "Extended Influence Diagrams for System Quality Analysis", *Journal of Software*, (2)3, pp. 30–42.
- Johnson, P., R. Lagerström, P. Närman, and M. Simonsson (2007c) "System Quality Analysis with Extended Influence Diagrams", *Proceedings of the IEEE 11th European Conference on Software Maintenance and Reengineering*.
- Jonkers, H., M. Lankhorst, H. ter Doest, F. Arbab, H. Bosma, and R. Wieringa (2006) "Enterprise Architecture: Management Tool and Blueprint for the Organisation", *Information Systems Frontiers*, (8)2, pp. 63–66.
- Jonkers, H., M. Lankhorst, R. van Buuren, S. Hoppenbrouwers, M. Bonsangue, and L. van der Torre (2004) "Concepts for Modelling Enterprise Architectures", *International Journal of Cooperative Information Systems*, (13)3, pp. 257–287.

- Jonkers, H., R. van Buuren, F. Arbab, F. de Boer, M. Bonsangue, H. Bosma, H. ter Doest, L. Groenewegen, J.G. Scholten, S. Hoppenbrouwers, M.-E. Iacob, W. Janssen, M. Lankhorst, D. van Leeuwen, E. Proper, A. Stam, L. van der Torre, and G. Veldhuijzen van Zanten (2003) Towards a Language for Coherent Enterprise Architecture Descriptions, *Proceedings of the 7th IEEE International Conference on Enterprise Computing*, pp. 28–37.
- Joseph, D. (2009) "Trends in Enterprise Architecture: Virtualization, Visualization, Service-Orientation, and Personal Architectures", *Journal of Enterprise Architecture*, (5)3, pp. 9–17.
- Jung, J. (2006) "Supply Chains in the Context of Enterprise Modelling", *Proceedings of the Conference on "Modellierung 2006"*, p. 193–202.
- Jung, C.-K. (2009) "Actionable Enterprise Architecture", *Proceedings of the 10th ACIS International Conference on Software Engineering, Artificial Intelligences, Networking and Parallel/Distributed Computing*, pp. 294–299.
- Junginger, S., M. Orywal, M. Brückmann, and T. Engel (2008) "Anwendungsportfoliomanagement mit ADOit im ZIVIT", *HMD—Praxis der Wirtschaftsinformatik*, (262), pp. 29–38.
- Kaisler, S., F. Armour, and M. Valivullah (2005) "Enterprise Architecting: Critical Problems", *Proceedings of the 38th Annual Hawaii International Conference on System Sciences*, p. 224.
- Källgren, A., J. Ullberg, and P. Johnson (2009) "A Method for Constructing a Company Specific Enterprise Architecture Model Framework", *Proceedings of the 10th ACIS International Conference on Software Engineering, Artificial Intelligences, Networking and Parallel/Distributed Computing*, pp. 346–351.
- Kalpic, B., K. Pandza, and P. Bernus (2003) "Strategy as a Creation of Corporate Future" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 213–254.
- Kamogawa, T. and H. Okada (2005) "A Framework for Enterprise Architecture Effectiveness", *Proceedings of the International Conference on Services Systems and Services Management 2005*, pp. 740–745.
- Kamogawa, T. and H. Okada (2008) "Enterprise Architecture and Information Systems—In Japanese Banking Industry", *Proceedings of the 8th International Symposium on Applications and the Internet 2008*, pp. 433–436.
- Kamogawa, T. and H. Okada (2009) "Enterprise Architecture Create Business Value", *Proceedings of the 9th International Symposium on Applications and the Internet*, pp. 209–212.
- Kaplan, R.S. and D.P. Norton (2004) *Strategy Maps: Converting Intangible Assets into Tangible Outcomes*, Boston, MA: Harvard School Business Press.
- Kappelman, L., T. McGinnis, A. Pettite, B., and A. Sidorova (2008) "Enterprise Architecture: Charting the Territory for Academic Research", *Proceedings of the 14th Americas Conference on Information Systems*, p. 162.
- Karlsen, A. (2008) "A Research Model for Enterprise Modeling in ICT-Enabled Process Change", *Proceedings of 1st IFIP WG 8.1 Working Conference on the Practice of Enterprise Modeling*, pp. 217–230.
- Kazman, R., G. Abowd, L. Bass, and P. Clements (1996) "Scenario-Based Analysis of Software Architecture", *IEEE Software*, (13)6, pp. 47–55.
- Kazman, R., J. Asundi, and M. Klein (2001) "Quantifying the Costs and Benefits of Architectural Decisions", *Proceedings of the 23rd International Conference on Software Engineering*, pp. 297–306.
- Kazman, R., J. Asundi, and M. Klein (2002) *Making Architecture Design Decisions: An Economic Approach*, Technical Report CMU/SEI-2002-TR-035, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA.
- Kazman, R. and L. Bass (1994) *Toward Deriving Software Architectures from Quality Attributes*, Technical Report CMU/SEI-94-TR-10, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA.
- Kazman, R., L. Bass, G. Abowd, and M. Webb (1994) "SAAM: A Method for Analyzing the Properties of Software Architectures", *Proceedings of the 16th International Conference on Software Engineering*, pp. 81–90.
- Kazman, R., L. Bass, and M. Klein (2006) "The Essential Components of Software Architecture Design and Analysis", *The Journal of Systems and Software* 79(8), pp. 1207–1216.
- Kazman, R., M. Klein, and P. Clements (2000) *ATAM: A Method for Architecture Evaluation*, Technical Report CMU/SEI-2000-TR-004, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA.
- Kearney, T. (2009) "Marketing Communications of Coherency Management" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 451–471.

- Keller, W. (2001) "A Few Patterns for Managing Large Application Portfolios", *Proceedings of the 6th European Conference on Pattern Languages of Programs*, pp. 437–454.
- Keller, W. (2004) "Managing Application Portfolios in Merger Situations", *Proceedings of "34. Jahrestagung der Gesellschaft für Informatik 2004"*, pp. 91–95.
- Keller, W. (2007) *IT-Unternehmensarchitektur: Von der Geschäftsstrategie zur optimalen IT-Unterstützung*, Heidelberg, Germany: dpunkt.
- Keller, W. (2009a) "TOGAF 9—Quick Start Guides for Enterprise Architects", <http://www.objectarchitects.biz/TOGAF9/TOGAF9QuickstartGuideV10c.pdf> (current Nov. 28, 2011).
- Keller, W. (2009b) *Using Capabilities in Enterprise Architecture Management*, objectsarchitects, Lochham, Germany.
- Kemp, N. (2009) "Reference Models for Government" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington: AuthorHouse, pp. 355–379.
- Kenneally, J. and Y. Lichtenstein (2002) "The Optional Value of IS Projects—A Study of an IS Portfolio at a Multinational Manufacturer", *Proceedings of the 2002 European Conference on Information Systems*, pp. 240–251.
- Kersten, B. and C. Verhoef (2003) "IT Portfolio Management: A Banker's Perspective on IT", *Cutter IT Journal*, (16)4, pp. 27–33.
- Khoury, G.R. and S.J. Simoff (2004) "Enterprise Architecture Modelling Using Elastic Metaphors", *Proceedings of the 1st Asian-Pacific Conference on Conceptual Modelling*, pp. 65–69.
- Khoury, G.R., S.J. Simoff, and J. Debenham (2005) "Modelling Enterprise Architectures: An Approach Based on Linking Metaphors and Ontologies", *Proceedings of the Conferences in Research and Practice in Information Technology 2005*, pp. 41–46.
- Kilpeläinen, T. (2006) "From Genre-based Ontologies to Business Information Architecture Descriptions", *Proceedings of the 17th Australasian Conference on Information Systems*.
- Kilpeläinen, T. (2007) "Business Information Driven Approach for EA Development in Practice", *Proceedings of the 18th Australasian Conference on Information Systems*, pp. 447–457.
- Kilpeläinen, T. and M. Nurminen (2007) "Applying Genre-based Ontologies to Enterprise Architecture", *Proceedings of the 18th Australasian Conference on Information Systems*, pp. 468–477.
- Kim, S., D.-K. Kim, L. Lu, and S.-Y. Park (2008) "A Tactic-Based Approach to Embodying Non-functional Requirements into Software Architectures", *Proceedings of the 12th International IEEE Enterprise Computing Conference*, pp. 139–148.
- Kim, T.-Y., S. Lee, J.-S. Lee, K. Kim, and C.-H. Kim (2007) "Enterprise Architecture Framework for Agile and Interoperable Virtual Enterprises" in Saha, P. (ed.) *Handbook Of Enterprise Systems Architecture in Practice*, Hershey, PA: IGI Global, pp. 62–84.
- King, W.R. (1995) "Creating a Strategic Capabilities Architecture", *Information Systems Management*, (12)1, pp. 67–69.
- Kirchner, L. (2003) "Eine Sprache für die Modellierung von IT-Landschaften: Anforderungen, Potenziale, zentrale Konzepte", *Proceedings of the 2003 Conference on "Modellierung betrieblicher Informationssysteme"*, pp. 69–86.
- Kirokova, M., L. Businska, and A. Finke (2009) "Enterprise Models as Data", *Proceedings of 2nd IFIP WG 8.1 Working Conference on the Practice of Enterprise Modeling*, pp. 237–244.
- Kirikova, M. and A. Stasko (2007) "Enterprise Architecture and Foresight Based Business Process Adequacy Analysis", *Proceedings of Workshops and Doctoral Consortium of the International Conference on Advanced Information Systems Engineering 2007*, pp. 229–233.
- Klement, P. (2004) *Integrated Enterprise Architecture*, Unterschleißheim, Germany: Microsoft Press.
- Klesse, M., F. Wortmann, and J. Schelp (2005) "Erfolgsfaktoren der Applikationsintegration", *Wirtschaftsinformatik*, (47)4, pp. 259–267.

- Klievink, B., W. Derks, and M. Janssen (2009) "Enterprise Architecture and Governance Challenges for Orchestrating Public-Private Cooperation" in Saha, P. (ed.) *Advances in Government Enterprise Architecture*, New York, NY: Information Science Reference.
- Kloos, O., V. Nissen, and M. Petsch, M. (2009) "From Process to Simulation—A Transformation Model Approach", *Proceedings of the International Workshop on Enterprise Modelling and Information Systems Architectures 2009*, pp. 83–96.
- Kluge, C., A. Dietzsch, and M. Rosemann (2006) "How to Realise Corporate Value from Enterprise Architecture", *Proceedings of the 14th European Conference on Information Systems*, pp. 1572–1581.
- Koffi, A. (2010) "A Model for Characterizing the Influence of the Zachman Framework's Enterprise Architecture Perspectives", *Journal of Enterprise Architecture*, (6)2, pp. 30–47.
- Koning, H., R. Bos, and S. Brinkkemper (2006) *A Lightweight Method for the Modeling of Enterprise Architectures: Introduction and Empirical Validation*, Technical Report UU-CS-2006-003, Department of Information and Computing Sciences, Utrecht University, Utrecht, Netherlands.
- Kopp, O., H. Eberle, T. Unger, and F. Leymann (2007) "From Process Models to Business Landscapes", *Proceedings of "EPK 2007—Geschäftsprozessmanagement mit Ereignisgesteuerten Prozessketten"*, pp. 7–21.
- Kosanke, K. (1992) "CIMOSA: A European Development for Enterprise Integration. Part 1: An Overview" in Petrie, C. (ed.) *Enterprise Integration Modeling*, Cambridge, MA: The MIT Press, pp. 179–188.
- Kosanke, K. (1995) "CIMOSA Overview and Status", *Computers in Industry*, (27)2, pp. 101–109.
- Kosanke, K., F. Vernadat, and M. Zelm (1999) "CIMOSA: Enterprise Engineering and Integration", *Computers in Industry*, (40)2–3, pp. 83–97.
- Kotani, M. (2004) "Enterprise Applications Portfolio Management Utilizing COTS", *Journal of Issues in Informing Science and Information Technology*, (1), pp. 741–745.
- Krogmann, K., C.M. Schweda, S. Buckl, M. Kuperberg, A. Martens, and F. Matthes, (2009) "Improved Feedback for Architectural Performance Prediction Using Software Cartography Visualizations", *Proceedings of the 5th International Conference on the Quality of Software Architecture*, pp. 52–69.
- Kruchten, P. (1995) "Architectural Blueprints—The "4+1" View Model of Software Architecture", *IEEE Software*, (12)6, pp. 42–50.
- Kum, D.K. and S.D. Kim (2006) "A Method to Generate C# Code from MDA/PSM for Enterprise Architecture", *Proceedings of the 5th IEEE/ACIS International Conference on Computer and Information Science*, pp. 2–7.
- Kurpjuweit, S. and S. Aier (2009) "Ein allgemeiner Ansatz zur Ableitung von Abhängigkeitsanalysen auf Unternehmensarchitekturmodellen", *Proceedings of the 9th International Conference on Wirtschaftsinformatik*, pp. 129–138.
- Kurpjuweit, S. and R. Winter (2007) "Viewpoint-based Meta Model Engineering", *Proceedings of the 2nd International Workshop on Enterprise Modelling and Information Systems Architectures*, pp. 143–161.
- Kurpjuweit, S. and R. Winter (2009) "Concern-oriented Business Architecture Engineering", *Proceedings of the 24th Annual ACM Symposium on Applied Computing*, pp. 265–272.
- Kutvonen, L. (2007) "Using the ODP Reference Model for Enterprise Architecture", *Proceedings of the 11th International IEEE Enterprise Computing Conference*, pp. 231–238.
- Kwan, S.K. and J. West (2004) "Heterogeneity of IT Importance: Implications for Enterprise IT Portfolio Management", *Proceedings of the 64th Annual Academy of Management Conference*.
- Lagerström, R. (2007) "Analyzing System Maintainability Using Enterprise Architecture Models", *Proceedings of Trends in Enterprise Architecture Research Workshop 2007*, pp. 31–40.
- Lagerström, R., U. Franke, P. Johnson, and J. Ullberg (2009) "A Method for Creating Enterprise Architecture Metamodels—Applied to Systems Modifiability Analysis", *International Journal of Computer Science and Applications* (6)5, pp. 89–120.
- Lagerström, R. and P. Johnson (2008) "Using Architectural Models to Predict the Maintainability of Enterprise Systems", *Proceedings of the 12th European Conference on Software Maintenance and Reengineering*, pp. 248–252.

- Lagerström, R., P. Johnson, and D. Höök (2009) "An Enterprise Architecture Management Pattern for Software Change Project Cost Analysis", *Proceedings of the 1st Workshop on Patterns for Enterprise Architecture Management*, pp. 43–54.
- Lagerström, R., P. Johnson, and D. Höök (2010) "Architecture Analysis of Enterprise Systems Modifiability—Models, Analysis, and Validation", *The Journal of Systems & Software*, (83)8, pp. 1387–1403.
- Lagerström, R., J. Saat, U. Franke, S. Aier, and M. Ekstedt (2009) "Enterprise Meta Modeling Methods—Combining a Stakeholder-oriented and a Causality-based Approach", *Proceedings of the International Workshops BMMDS and EMMSAD 2009, The 21st International Conference on Advanced Information Systems*, pp. 381–393.
- Lahrmann, G. and F. Stroh (2009) "Towards a Classification of Information Logistics Scenarios—An Exploratory Analysis", *Proceedings of the 42nd Hawaii International Conference on System Sciences*, pp. 1–10.
- Langenberg, K. and A. Wegmann (2004) "Enterprise Architecture: What Aspects Is Current Research Targeting?", EPFL Technical Report IC/2004/77, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland.
- Lankes, J., F. Matthes, and T. Ploom (2008) "Evaluating Failure Propagation in the Application Landscape of a Large Bank", *Proceedings of the 11th International Symposium on Component-based Software Engineering*.
- Lankes, J., F. Matthes, and A. Wittenburg (2005a) "Architekturbeschreibung von Anwendungslandschaften: Softwarekartographie und IEEE Std 1471-2000", *Proceedings of "Fachtagung des GI-Fachbereichs Softwaretechnik"*, pp. 43–54.
- Lankes, J., F. Matthes, and A. Wittenburg (2005b) "Softwarekartographie als Beitrag zum Architekturmanagement" in Aier, S. and M. Schönherr (eds) *Unternehmensarchitekturen und Systemintegration*, Band 3, Berlin, Germany: Gito, pp. 305–333.
- Lankes, J., F. Matthes, and A. Wittenburg (2005c) "Softwarekartographie: Systematische Darstellung von Anwendungslandschaften", *Proceedings of the 7th International Conference on Wirtschaftsinformatik*, pp. 1443–1462.
- Lankes, J. and C.M. Schweda (2007) *Constructing Application Landscape Metrics: Why & How*, Technical Report TB 0701, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- Lankes, J. and C.M. Schweda (2008) "Using Metrics to Evaluate Failure Propagation in Application Landscapes", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2008*, pp. 1827–1838.
- Lankhorst, M. (2004) "Enterprise Architecture Modelling—The Issue of Integration", *Advanced Engineering Informatics*, (18)4, pp. 205–216.
- Lankhorst, M. et al. (2005) *Enterprise Architecture at Work—Modelling, Communication, and Analysis*, Berlin, Germany: Springer.
- Lankhorst, M. and P.H.W.M. Oude Luttighuis (2009) "Enterprise Architecture Patterns for Multichannel Management", *Proceedings of the 1st Workshop on Patterns in Enterprise Architecture Management*, pp. 31–42.
- Lankhorst, M., E. Proper, and H. Jonkers, H. (2009) "The Architecture of the ArchiMate Language", *Proceedings of the International Workshops BMMDS and EMMSAD 2009, The 21st International Conference on Advanced Information Systems*, pp. 367–380.
- Lankhorst, M., D. Quartel, and M. Steen (2010) "Architecture-Based IT Valuation—Supporting Portfolio Management and Investment Decisions", *Via Nova Architectura*, March 2010, <http://vianovaarchitectura.nl/page/architecture-based-it-valuation> (current Nov. 28, 2011).
- Lankhorst, M. and H. van Drunen (2007) "Enterprise Architecture Development and Modelling—Combining TOGAF and ArchiMate", *Via Nova Architectura*, March 2007, <http://vianovaarchitectura.nl/page/enterprise-architecture-development-and-modelling> (current Nov. 28, 2011).
- Lassing, N., D. Rijsenbrij, and H. van Vliet (1999) "The Goal of Software Architecture Analysis: Confidence Building or Risk Assessment", *Proceedings of the 1st Benelux Conference on State-of-the-Art of ICT Architecture*.
- Lau, A., T. Fischer, M. Weiß, S. Buckl, A.M. Ernst, F. Matthes, and C.M. Schweda (2009) "EA Management Patterns for Smart Networks", *Proceedings of the 1st Workshop on Patterns in Enterprise Architecture Management 2009*, pp. 79–90.
- Laudato, N.C. and D.J. DeSantis (1996) "Managing the Implementation of an Enterprise-wide Information Architecture", *Proceedings of the 1996 CAUSE Annual Conference*.

- Lawrence, C. (2007) "Architecture-driven Business Transformation" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 207–221.
- Le, L.-S. and A. Wegmann (2005) "Definition of an Object-oriented Modeling Language for Enterprise Architecture", *Proceedings of the 38th Hawaii International Conference on System Sciences*, p. 222.
- Lee, J. and D.H. Lee (2009) "Quantitative Tradeoff Analysis of Software Architecture Using the Architecture Analysis and Design Language", *Proceedings of the 10th ACIS International Conference on Software Engineering, Artificial Intelligences, Networking and Parallel/Distributed Computing*, pp. 561–566.
- Leist, S. and W. Lichtenegger (2010) "Integration von automatisch generierten und manuell konstruierten Prozessmodellen als Grundlage für den Aufbau einer Prozessarchitektur", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2010*, pp. 103–118.
- Leist, S. and G. Zellner (2006) "Evaluation of Current Architecture Frameworks", *Proceedings of the 2006 ACM Symposium on Applied Computing*, pp. 1546–1553.
- Leist, S. and G. Zellner (2008) "Situational Architecture Engineering (SAE)—Improving Strategic Change Through Architecture Methods", *Proceedings of the International Conference on Information Systems 2008*, p. 2.
- Lenz, R. (2003) "Integration und Evolution ablaufunterstützender Informationssysteme im Krankenhaus", *Proceedings of "GI Arbeitskreis EA Frühjahrskonferenz 2003"*, pp. 34–41.
- Levi, M. (2003) "The Business Process Revolution" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 725–737.
- Levine, H.A. (2005) *Project Portfolio Management: A Practical Guide to Selecting Projects, Managing Portfolios, and Maximizing Benefits*, San Francisco, CA: Jossey-Bass.
- Lichtenegger, R., M. Rohloff, and B. Rosauer (2003) "Beschreibung von Unternehmensarchitekturen: Sichten und Abhängigkeiten am Beispiel der IT-Infrastrukturarchitektur", *Proceedings of the Workshop "Enterprise Architecture—Architecture in the Large" 2003*, pp. 426–434.
- Liimatainen, K. (2007) "Evaluating Benefits of Government Enterprise Architecture", *Proceedings of the 39th Hawaii International Conference on System Sciences*.
- Liimatainen, K., J. Heikkilä, and V. Seppänen (2008) "A Framework for Evaluating Compliance of Public Service Development Programs with Government Enterprise Architecture", *Proceedings of the 2nd European Conference on Information Management and Evaluation*, pp. 269–276.
- Lillehagen, F. and D. Karlsen (2006) "Enterprise Architectures—Survey of Practices and Initiatives", *Proceedings of the 1st International Conference on Interoperability of Enterprise Software and Applications*.
- Lim, N., T.-G. Lee, and S.-G. Park (2009) "A Comparative Analysis of Enterprise Architecture Frameworks Based on EA Quality Attributes", *Proceedings of the 10th ACIS International Conference on Software Engineering, Artificial Intelligences, Networking and Parallel/Distributed Computing*, pp. 283–288.
- Lim, S.H., N. Juster, and A. de Pennington (1997) "Enterprise Modelling and Integration: A Taxonomy of Seven Key Aspects", *Computers in Industry* (34)3, pp. 339–359.
- Lindheim, C., T. Totland, and K.M. Lien, 1996) "Enterprise Modeling a New Task for Process Systems Engineers?", *Computers & Chemical Engineering*, (20)2, pp. 1527–1532.
- Lindström, A. (2006a) "An Approach for Developing Enterprise-Specific ICT Management Methods—From Architectural Principles to Measures", *Proceedings of 15th International Conference on Management of Technology*.
- Lindström, A. (2006b) "On the Syntax and Semantics of Architectural Principles", *Proceedings of the 39th Hawaii International Conference on System Sciences*, pp. 178–188.
- Lindström, A. and R. Berntsson (2006) "Developing an Enterprise Specific Application Portfolio Assessment Method: From Architectural Principles to Measures", *Proceedings of PICMET 2006*, pp. 1604–1612
- Lindström, A., T. Cegrell, and M. Grandell (2006) "The Top IT Concerns for Chief Information Officers in European Electric Power Industries", *Proceedings of the Cigré Symposium 2006*.
- Lindström, A., M. Gammelgård, M. Simonsson, and N. Jonsson (2005) "A Method to Assess the Enterprise-wide IT Resources for Performance and Investment Justifications", *Proceedings of the 3rd Conference on Systems Engineering Research*.

- Lindström, A., P. Johnson, E. Johansson, M. Ekstedt, and M. Simonsson (2006) "A Survey on CIO Concerns—Do Enterprise Architecture Frameworks Support Them?", *Information System Frontiers*, (8)2, pp. 81–90.
- Linthicum, D.S. (1999) *Enterprise Application Integration*, Reading, MA: Addison Wesley.
- Liu, H., X. Wang, and Q. Quan (2009) "Research on the Enterprise' Model of Information Lifecycle Management Based on Enterprise Architecture", *Proceedings of the 9th International Conference on Hybrid Intelligent Systems*, pp. 165–169.
- London, T. and S.L. Hart (2004) "Reinventing Strategies for Emerging Markets: Beyond the Transnational Model", *Journal of International Business Studies*, (35)5, pp. 350–370.
- Long, A.M. (2008) "Enterprise Architecture: Origins, Tools, and Insights", *Air Force Journal of Logistics*, (32)4, pp. 53–64.
- Longépé, C. (2003) *The Enterprise Architecture IT Project: The Urbanisation Paradigm*, Oxford, England: Butterworth-Heinemann.
- Lucke, C., S. Krell, and U. Lechner (2010) "Critical Issues in Enterprise Architecting—A Literature Review", *Proceedings of the 16th Americas Conference on Information Systems*, p. 305.
- Lucke, C., M. May, N. Kratzke, and U. Lechner (2009) "How Do System and Enterprise Architectures Influence Knowledge Management in Software Projects?—An Exploratory Study of Six Software Projects", *Proceedings of the International Workshop on Enterprise Modeling and Information Systems Architectures 2009*, pp. 69–82.
- Lung, C.-H. and K. Kalaichelvan (2000) "An Approach to Quantitative Software Architecture Sensitivity Analysis", *International Journal of Software Engineering and Knowledge Engineering*, (10)1, pp. 97–114.
- Lux, J., J. Wiedenhöfer, and F. Ahlemann (2008) "Modellorientierte Einführung von Enterprise Architecture Management", *HMD—Praxis der Wirtschaftsinformatik*, (262), pp. 19–28.
- Ma, D.C., B.M. Carter, S.W. Sadiq, and M.E. Orlowska (2007) "Enterprise Integration Architecture for Harmonized Messaging" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 434–454.
- Mackay, H. (2003) "Leadership: Better Relationships Through Better Communication" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 255–279.
- Magalhaes, R., M. Zacarias, and J. Tribolet (2007) "Making Sense of Enterprise Architectures as Tools of Organizational Self-awareness (OSA)", *Proceedings of the 2nd Workshop on Trends in Enterprise Architecture Research*, pp. 61–70.
- Mahapatra, R. and S. Perumal (2007) "Enterprise Architecture as an Enabler for E-Governance: An Indian Perspective" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture in Practice*, Hershey, PA: IGI Global, pp. 272–289.
- Maizlish, B. and R. Handler (2005) *IT Portfolio Management Step-by-Step*, Hoboken, NJ: Wiley.
- Makadok, R. (2001) Toward a Synthesis of the Resource-based and Dynamic-capability Views of Rent Creation, *Strategic Management Journal*, (2001)22, pp. 387–401.
- Mårtensson, A. (2006) "A Resource Allocation Matrix Approach to IT Management", *Information Technology and Management*, (7)1, pp. 21–34.
- Martin, A. (2006) "Successful IT Application Architecture Design: An Empirical Study", *Information Systems and e-Business Management*, (4), pp. 107–135.
- Martin, A., D. Dmitriev, and J. Akeroyd (2010) "A Resurgence of Interest in Information Architecture", *International Journal of Information Management*, (30)1, pp. 6–12.
- Martin, N. and S. Gregor (2002) "Enterprise Architectures and Information Systems Alignment: Policy, Research and Future Implications", *Proceedings of the 8th Americas Conference on Information Systems*, pp. 1057–1068.
- Martin, R.A., E.L. Robertson, and J.A. Springer (2004) "Architectural Principles for Enterprise Frameworks: Guidance for Interoperability" in Bernus, P. and M. Fox (eds.) *Knowledge Sharing in the Integrated Enterprise: Interoperability Strategies for the Enterprise Architect*, Boston, MA: Springer, pp. 79–91.
- Marx Gomez, J. and T. Biskup (2009) "Bridging the Gap Between EA Goals and Technology Requirements with Conceptual Programming" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency*

Management—Architecting the Enterprise for Alignment, Agility and Assurance, Bloomington, IN: AuthorHouse, pp. 281–305.

Maryan, J.P. (2009) “From Portfolio Management to Portfolio Optimization—Application Portfolio Management in the SOA Era”, *Proceedings of 2009 Congress on Services*, pp. 477–481.

Masak, D. (2005) *Moderne Enterprise Architekturen*, Berlin, Germany: Springer.

Matthee, M.C., P.K.J. Tobin, and P. van Der Merwe (2007) “The Status Quo of Enterprise Architecture Implementation in South African Financial Services Companies”, *South African Journal of Business Management*, (38)1, pp. 11–24.

Matthes, F. and A. Wittenburg (2004a) *Softwarekarten zur Visualisierung von Anwendungslandschaften und ihren Aspekten—Eine Bestandsaufnahme*, Technical Report, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.

Matthes, F. and A. Wittenburg (2004b) “Softwarekartographie: Visualisierung von Anwendungslandschaften und ihrer Schnittstellen”, *Proceedings of “Informatik 2004—Informatik verbindet”*, pp. 71–75.

Matthes, F., S. Buckl, J. Leitel, and C.M. Schweda (2008) *Enterprise Architecture Management Tool Survey 2008*, TU Munich, Chair for Informatics (19) (sebis), Munich, Germany.

McCarthy, R.V. (2006) “Toward a Unified Enterprise Architecture Framework: An Analytical Evaluation”, *Issues in Information Systems*, (7)2, pp. 14–17.

McFarlan, F.W. (1981) “Portfolio Approach to Information Systems”, *Harvard Business Review*, (59)5, pp. 142–150.

McGovern, J., S.W. Ambler, M.E. Stevens, J. Linn, V. Sharan, and E. Jo (2003) *A Practical Guide to Enterprise Architecture*, Upper Saddle River, NJ: Prentice Hall.

McKeen, J.D. and H.D. Smith (2002a) “New Developments in Practice II: Enterprise Application Integration”, *Communications of the Association for Information Systems*, (8), pp. 451–466.

McKeen, J.D. and H.A. Smith (2002b) “New Developments in Practice IV: Managing the Technology Portfolio”, *Communications of the Association for Information Systems*, (9), pp. 77–89.

McKeen, J.D. and H.A. Smith (2008) “Developments in Practice XXIX: The Emerging Role of the Enterprise Business Architect”, *Communications of the Association for Information Systems*, (22) Article 14, pp. 261–274.

Medvidovic, M. and R.N. Taylor (2000) “A Classification and Comparison Framework for Software Architecture Description Languages”, *IEEE Transactions on Software Engineering*, (26)1, pp. 70–93.

Ministry of Defence UK (2008) “The MOD Architecture Framework Version 1.2”, <http://www.mod.uk/DefenceInternet/AboutDefence/WhatWeDo/InformationManagement/MODAF/> (current Nov. 28, 2011).

Minoli, D. (2008) *Enterprise Architecture A to Z: Frameworks, Business Process Modeling, SOA, and Infrastructure Technology*, Boca Raton, FL: CRC Press.

Mintzberg, H. (1979a) *The Structure of Organizations*, Upper Saddle River, NJ: Prentice-Hall.

Mintzberg, H. (1979b) *The Structuring of Organizations: A Synthesis of the Research*, Upper Saddle River, NJ: Prentice Hall.

Mintzberg, H. (1983) *Structures in Five: Designing Effective Organizations*, Upper Saddle River, NJ: Prentice Hall.

Mintzberg, H., B. Ahlstrand, and J. Lampel (1998) *Strategy Safari—A Guided Tour Through the Wilds of Strategic Management*, New York, NY: Free Press.

Mo, J. (2003) “Farley Remote Operations Support System” in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 738–755.

Mo, J.P.T. and L. Nemes (2009) “Issues in Using Enterprise Architecture for Mergers and Acquisitions” in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 235–262.

Mocker, M. (2009) “What Is Complex About 273 Applications? Untangling Application Architecture Complexity in a Case of European Investment Banking”, *Proceedings of the 42nd Hawaii International Conference on System Sciences*, pp. 1–14.

Moghaddam, M.R.S., A. Sharifi, and E. Merati (2008) “Using Axiomatic Design in the Process of Enterprise Architecting”, *Proceedings of the 3rd International Conference on Convergence and Hybrid Information Technology*, pp. 279–284.

- Molina, A. (2003) "Developing the Enterprise Concept—The Business Plan" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 333–371.
- Molina, A. and R. Carrasco (2003) "The Use of GERAM to Support SMEs Development in Mexico" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 756–778.
- Moller, C., S.S. Chaudhry, and B. Jorgensen (2008) "Complex Service Design: A Virtual Enterprise Architecture for Logistics Service", *Information Systems Frontiers*, (10), pp. 503–518.
- Molter, M. (2005) "Die prozessorientierte Applikationslandschaft" in Scheer, A.-W., W. Jost, and K. Wagner (eds.) *Von Prozessmodellen zu lauffähigen Anwendungen*, Berlin, Germany: Springer, pp. 151–172.
- Moore, M., R. Kazman, M. Klein, and J. Asundi (2003) "Quantifying the Value of Architecture Design Decisions: Lessons from the Field", *Proceedings of the 25th International Conference on Software Engineering*, pp. 557–562.
- Morganwalp, J. and A.P. Sage (2003) "A System of Systems Focused Enterprise Architecture Framework and an Associated Architecture Development Process", *Information, Knowledge, Systems Management*, (3)2–4, pp. 87–105.
- Morganwalp, J. and A.P. Sage (2004) "Enterprise Architecture Measures of Effectiveness", *International Journal of Technology, Policy and Management*, (4)1, pp. 81–94.
- Moser, C. and F. Bayer (2005) "IT Architecture Management: A Framework for IT-Services", *Proceedings of the 1st International Workshop on Enterprise Modelling and Information Systems Architectures*, pp. 137–151.
- Moser, C., S. Junginger, M. Brückmann, and K.-M. Schöne (2009) "Some Process Patterns for Enterprise Architecture Management", *Proceedings of the 1st Workshop on Patterns in Enterprise Architecture Management*, pp. 19–30.
- Moser, C., C. Richert, D. Fürstenau, and S. Junginger (2010) "A Method for Integrating EAM and BPM", *Proceedings of the 2nd European Workshop on Patterns for Enterprise Architecture Management*, pp. 231–242.
- Moser, C., M. Winklhofer, and C. Kuplich (2008) "Business Objectives Compliance Architecture Framework: Mechanisms for Controlling Architecture Artefacts", *Proceedings of the Conference on "Modellierung 2008"*, pp. 73–88.
- Mowbray, T., G. Chanachote, B. Fenchel, and M. Odell (2009) "The Service Oriented Architecture Method for Federated Enterprise Architectures", *Journal of Enterprise Architecture*, (5)4, pp. 27–34.
- Muhammad Abul Kalam, A., M.A.A. Khan, and M. Alam (2008) "Government Enterprise Architectures: Present Status of Bangladesh and Scope of Development", *Proceedings of the 2nd International Conference on Theory and Practice of Electronic Governance*, pp. 459–460.
- Müller, F.R. (2007) "Anwendungsarchitektur-Beurteilung unter Berücksichtigung zu erwartender Flexibilität", *Proceedings of the 8th International Conference on Wirtschaftsinformatik*, pp. 89–106.
- Mykityshyn, M.G. and W.B. Rouse (2007) "Supporting Strategic Enterprise Processes: An Analysis of Various Architectural Frameworks", *Information Knowledge Systems Management*, (6)1–2, pp. 145–175.
- Nakakawa, A. (2008) "Collaboration Engineering Approach to Enterprise Architecture Design Evaluation and Selection", *Proceedings of the 2008 Conference on "Modellierung betrieblicher Informationssysteme"*, pp. 115–130.
- Nakakawa, A., P. van Bommel, and E. Proper (2009) "Quality Enhancement in Creating Enterprise Architecture: Relevance of Academic Models in Practice", *Proceedings of the 1st NAF Academy Working Conference on Practice-Driven Research on Enterprise Transformation*, pp. 109–133.
- Namba, Y. and J. Iijima (2004) "City Planning Approach for Enterprise Information System", *Proceedings of the 8th Pacific-Asia Conference on Information Systems*, pp. 169–180.
- Namiri, K. and N. Stojanovic (2008) "Towards a Formal Framework for Business Process Compliance", *Proceedings of Multikonferenz Wirtschaftsinformatik 2008*, pp. 1185–1196.
- Närman, P., P. Johnson, M. Ekstedt, M. Chenine, and J. König (2009) "Enterprise Architecture Analysis for Data Accuracy Assessments", *Proceedings of the 13th IEEE International Enterprise Computing Conference*, pp. 24–33.

- Närman, P., P. Johnson, R. Lagerström, U. Franke, and M. Ekstedt (2008) "Data Collection Prioritization for System Quality Analysis", *Proceedings of the 2nd International Workshop System Quality and Maintainability*.
- Närman, P., P. Johnson, R. Lagerström, U. Franke, and M. Ekstedt (2009) "Data Collection Prioritization for System Quality Analysis", *Electronic Notes in Theoretical Computer Science*, (233), pp. 29–42.
- Närman, P., P. Johnson, and L. Nordström (2007) "Enterprise Architecture: A Framework Supporting System Quality Analysis", *Proceedings of the 11th International IEEE Enterprise Computing Conference*, pp. 130–141.
- Närman, P., M. Schönherr, P. Johnson, M. Ekstedt, and M. Chenine (2008) "Using Enterprise Architecture Models for System Quality Analysis", *Proceedings of the 12th International IEEE Enterprise Computing Conference*, pp. 14–23.
- Nevins, J.L., R.I. Winner, and D.L. Reed (2003) "Ford Motor Company's Investment Efficiency Initiative: A Case Study" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 683–724.
- Nguyen, T. (2001) "E-Business Integration: E-Services Framework in Enterprise Architectures", *Proceedings of the 7th Americas Conference on Information Systems*.
- Niemann, K.D. (2005) "IT Governance and Enterprise Architecture-Impact of IT Cost Reduction on Innovation Power", *The Journal of Enterprise Architecture*, (1), pp. 31–40.
- Niemann, K.D. (2006) *From Enterprise Architecture to IT Governance—Elements of Effective IT Management*, Wiesbaden, Germany: Vieweg.
- Niemann, K.D. (2008) "Enterprise Architecture Management and Its Role in IT Governance and IT Investment Planning" in Saha, P. (ed.) *Advances in Government Enterprise Architecture*, New York, NY: Information Science Reference, pp. 208–228.
- Niemi, E. (2006a) "Architectural Work Status: Challenges and Developmental Potential—A Case Study of Three Finnish Business Enterprises", *Proceedings of the 6th WSEAS International Conference on Applied Computer Science*, pp. 434–439.
- Niemi, E. (2006b) "Enterprise Architecture Benefits: Perceptions from Literature and Practice", *Proceedings of the 7th IBIMA Conference Internet & Information Systems in the Digital Age*.
- Niemi, E. (2007) "Enterprise Architecture Stakeholders—A Holistic View", *Proceedings of the 13th Americas Conference on Information Systems*, p. 41.
- Niemi, E. and S. Pekkola (2009) "Adapting the DeLone and McLean Model for the Enterprise Architecture Benefit Realization Process", *Proceedings of the 42nd Hawaii International Conference on System Sciences*, pp. 1–10.
- Niemi, E. and T. Ylimäki (2007) "Defining Enterprise Architecture Risks in Business Environment", *Proceedings of ERBF 2007*, pp. 25–27.
- Nikolaidou, M. and N. Alexopoulou (2008) "Enterprise Information System Engineering: A Model-Based Approach Based on the Zachman Framework", *Proceedings of the 41st Hawaii International Conference on System Sciences*, p. 399.
- Nikolaidou, M., A. Tsadimas, N. Alexopoulou, and D. Anagnostopoulos (2009) "Employing Zachman Enterprise Architecture Framework to Systematically Perform Model-Based System Engineering Activities", *Proceedings of the 42nd Hawaii International Conference on System Sciences*, pp. 1–10.
- Noran, O. (2003a) "An Analysis of the Zachman Framework for Enterprise Architecture from the GERAM Perspective", *Annual Reviews in Control*, (27)2, pp. 163–183.
- Noran, O. (2003b) "A Mapping of Individual Architecture Frameworks onto GERAM" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 65–210.
- Noran, O. (2009) "Engineering the Sustainable Business: An Enterprise Architecture Approach" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 179–210.
- Nord, L., M.R. Barbacci, P. Clements, R. Kazman, M. Klein, L. O'Brien, and J.E. Tomayko (2003) *Integrating the Architecture Tradeoff Analysis Method (ATAM) with the Cost Benefit Analysis Method (CBAM)*, Technical Note CMU/SEI-2003-TN-038, Software Engineering Institute, Carnegie Mellon University, Pittsburgh, PA.
- Nurcan, S. and R. Schmidt (2009) "Service Oriented Enterprise-architecture for Enterprise Engineering", *Proceedings of the 13th IEEE International Enterprise Computing Conference*, pp. 247–253.

- Nurminen, M. (2007) *Genres and Ontologies in Enterprise Architecture—A Short Introduction to GOBIAF*, Information Technology Research Institute, University of Jyväskylä, Jyväskylä, Finland.
- Offermann, P., C. Schröpfer, and M. Schönherr (2007) "Entwurf eines Enterprise Architecture Frameworks für serviceorientierte Architekturen", *Proceedings of the 8th International Conference on Wirtschaftsinformatik*, pp. 549–566.
- Oh, L.-B., B.L.-T. Ng, and H.-H. Teo (2007) "IT Portfolio Management: A Framework for Making Strategic IT Investment Decisions", *Proceedings of the 15th European Conference on Information Systems*, pp. 1265–1275.
- Olegario, C. and P. Bernus (2003) "Modelling the Management System" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 435–500.
- O'Neill, T., M. Denford, J. Leaney, and K. Dunsire (2007) "Managing Enterprise Architecture Change" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 192–205.
- Op't Land, M., K. Middeljans, and V. Buller (2008) "Enterprise Ontology Based Application Portfolio Rationalization at Rijkswaterstaat", *Via Nova Architectura*, May 2008, <http://vianovaarchitectura.nl/page/enterprise-ontology-based-application-portfolio-rationalization-a> (current Nov. 28, 2011).
- Op't Land, M. and E. Proper (2007) "Impact of Principles on Enterprise Engineering", *Proceedings of the 15th European Conference on Information Systems*, pp. 1965–1976.
- Op't Land, M., E. Proper, M. Waage, J. Cloo, and C. Steghuis (2009) *Enterprise Architecture—Creating Value by Informed Governance*, Berlin, Germany: Springer.
- Ortega, D., E. Uzcategui, and M.M. Guevara (2009) "Enterprise Architecture and Web Services", *Proceedings of the 4th International Conference on Internet and Web Applications and Services*, pp. 24–29.
- Ostadzadeh, S.S., F. Shams Aliee, and S.A. Ostadzadeh (2007a) "A Method for Consistent Modeling of Zachman Framework Cells" in Elleithy, K. (ed.) *Advances and Innovations in Systems, Computing Sciences and Software Engineering*, Dordrecht, Netherlands: Springer, pp. 375–380.
- Ostadzadeh, S.S., F. Shams Aliee, and S.A. Ostadzadeh (2007b) "Employing MDA in Enterprise Architecture", *Proceedings of the 12th International CSI Computer Conference*, pp. 1646–1653.
- Ostadzadeh, S.S., F. Shams Aliee, and S.A. Ostadzadeh (2008) "An MDA-Based Generic Framework to Address Various Aspects of Enterprise Architecture" in Sobh, T. (ed.) *Advances in Computer and Information Sciences and Engineering*, Dordrecht, Netherlands: Springer, pp. 455–460.
- Österle, H. and D. Blessing (2000) "Business Engineering Model" in Österle, H. and R. Winter (eds.) *Business Engineering—Auf dem Weg zum Unternehmen des Informationszeitalters*, Berlin, Germany: Springer, pp. 61–81.
- Österle, H. and R. Winter (2003) "Business Engineering" in Österle, H. and R. Winter (eds.) *Business Engineering—Auf dem Weg zum Unternehmen des Informationszeitalters*, Berlin, Germany: Springer, pp. 3–19.
- Österle, H. and D. Blessing (2005) "Ansätze des Business Engineering", *HMD—Praxis der Wirtschaftsinformatik*, 241, pp. 7–17.
- Österle, H., R. Winter, F. Höning, S. Kurpjuweit, and P. Osl (2007) "Business Engineering: Core-Business-Metamodell", *WISU—Das Wirtschaftsstudium 2/07*, pp. 191–194.
- Osterwalder, A., S.B. Lagha, and Y. Pigneur (2002) "An Ontology for Developing e-Business Models", *Proceedings of the International Conference on Decision Making and Decision Support in the Internet Age 2002*, pp. 3–7.
- Osterwalder, A., C. Parent, and Y. Pigneur (2004) "Setting Up an Ontology of Business Models", *Proceedings of the 16th International Conference on Advanced Information Systems Engineering*, pp. 319–324.
- Osterwalder, A. and Y. Pigneur (2002a) "An e-Business Model Ontology for Modeling e-Business", *Proceedings of the 15th Bled Electronic Commerce Conference*, pp. 75–91.
- Osterwalder, A. and Y. Pigneur (2002b) "Business Models and Their Elements", *Proceedings of the International Workshop on Business Models 2002*.
- Osterwalder, A. and Y. Pigneur (2003a) "An Ontology for e-Business Models" in Currie, W. (ed.) *Value Creation from e-Business Models*, Oxford, England: Butterworth-Heinemann, pp. 65–97.

- Osterwalder, A. and Y. Pigneur (2003b) "Towards Business and Information Systems Fit Through a Business Model Ontology", *Proceedings of the Strategic Management Society Conference 2003*.
- Osterwalder, A., Y. Pigneur, and C.L. Tucci (2005) "Clarifying Business Models: Origins, Present, and Future of the Concept", *Communications of the Association for Information Systems*, (16) Article1, pp. 1–25.
- Panetto, H., G. Berio, K. Benali, N. Boudjlida, and M. Petit (2004) "A Unified Enterprise Modelling Language for Enhanced Interoperability of Enterprise Models", *Proceedings of the 11th IFAC INCOM2004 Symposium*, pp. 605–616.
- Parker, T. (2009) "The Strategic Dimension of Enterprise Architecture" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 157–178.
- Patankar, A.J. and S. Adiga (1995) "Enterprise Integration Modelling: A Review of Theory and Practice", *Computer Integrated Manufacturing Systems*, (8)1, pp. 21–34.
- Pavlak, A. (2006) "Enterprise Architecture: Lessons from Classical Architecture", *Journal of Enterprise Architecture* (2)2, pp. 1–7.
- Pereira, C.M. and P. Sousa (2003) "Getting into the Misalignment Between Business and Information Systems", *Proceedings of the 10th European Conference On Information Technology Evaluation*.
- Pereira, C.M. and P. Sousa (2004) "A Method to Define an Enterprise Architecture Using the Zachman Framework", *Proceedings of the 2004 ACM Symposium on Applied Computing*, pp. 1366–1371.
- Pereira, C.M. and P. Sousa (2005) "Enterprise Architecture: Business and IT Alignment", *Proceedings of the 2005 ACM Symposium on Applied Computing*, pp. 1344–1345.
- 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.
- Peristeras, V. and K. Tarabanis (2004) "Governance Enterprise Architecture (GEA): Domain Models for e-Governance", *Proceedings of the 6th International Conference on Electronic Commerce*, pp. 471–479.
- Perry, D.E. and A.L. Wolf (1992) "Foundations for the Study of Software Architecture", *Software Engineering Notes*, (17)4, pp. 40–52.
- Petrie, C.J. (1992) *Enterprise Integration Modelling—Proceedings of the 1st International Conference*, Cambridge, MA: MIT Press.
- Pheng, T. and G.W. Boon (2007) "Enterprise Architecture in the Singapore Government" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 129–143.
- Phillips, B. (2007) "A Theoretical Framework for Information Systems Portfolio Management", *Proceedings of the 13th Americas Conference on Information Systems*, p. 434.
- Plazaola, L., J. Flores, E. Silva, N. Vargas, and M. Ekstedt (2007) "An Approach to Associate Strategic Business-IT Alignment Assessment to Enterprise Architecture", *Proceedings of the 5th Conference on Systems Engineering Research*.
- Plazaola, L., J. Flores, N. Vargas, and M. Ekstedt (2008) "Strategic Business and IT Alignment Assessment: A Case Study Applying an Enterprise Architecture-based Metamodel", *Proceedings of the 41st Annual Hawaii International Conference on System Sciences*, p. 398.
- Plazaola, L., E. Silva Molina, N. Vargas, J. Flores, and M. Ekstedt (2006) "A Metamodel for Strategic Business and IT Alignment Assessment", *Proceedings of the 4th Conference on Systems Engineering Research*.
- Ponis, S.T., I.P. Tatsiopoulos, G. Vagenas, and E. Koronis (2007) "A Process-based Knowledge Management Framework Supported by ARIS Enterprise Modelling Architecture", *International Journal of Applied Systemic Studies*, (1)2, pp. 168–187.
- Porter, M.E. (1980) *Competitive Strategy: Techniques for Analysing Industries and Competitors*, New York, NY: Free Press.
- Porter, M.E. (1985) *Competitive Advantage: Creating and Sustaining Superior Performance*, New York, NY: Collier Macmillan.
- Postina, M., J. Gonzales, and I. Sechyn (2009) "On the Architecture Development of Utility Enterprises with Special Respect to the Gap Analysis of Application Landscapes", *Proceedings of Workshop "MDD, SOA and IT Management 2009"*, pp. 17–31.

- Prahalad, C.K. and G. Hamel (1990) "The Core Competence of the Corporation", *Harvard Business Review*, (68)3, pp. 79–91.
- Proper, E. (2003) "Architecture-driven Information System Development—Toward a Framework for Understanding", *Proceedings of the 7th World Multiconference on Systemics, Cybernetics and Informatics*, pp. 144–149.
- Proper, E., H. Bosma, S. Hoppenbrouwers, and R. Janssen (2000) "An Alignment Perspective on Architecture-driven Information Systems Engineering", *Proceedings of the 2nd National Architecture Congress*.
- Proper, E., A.A. Verrijn-Stuart, and S. Hoppenbrouwers (2005) "On Utility-based Selection of Architecture-Modelling Concepts", *Proceedings of the 2nd Asia-Pacific Conference on Conceptual Modelling*, pp. 25–34.
- Pulkkinen, M. (2006) "Systemic Management of Architectural Decisions in Enterprise Architecture Planning. Four Dimensions and Three Abstraction Levels", *Proceedings of the 39th Hawaii International Conference on System Sciences*, p. 179.
- Pulkkinen, M. and A. Hirvonen (2005) "EA Planning, Development and Management Process for Agile Enterprise Development", *Proceedings of the 38th Hawaii International Conference on System Sciences*, p. 223.
- Pulkkinen, M., A. Naumenko, and K. Luostarinen (2007) "Managing Information Security in a Business Network of Machinery Maintenance Services Business—Enterprise Architecture as a Coordination Tool", *Journal of Systems and Software*, (80)10, pp. 1607–1620.
- Pütz, C., D. Wagner, O.K. Ferstl, and E.J. Sinz (2010) "Konzeption eines generischen Geschäftsprozessmodells für Medizinische Versorgungszentren", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2010*, pp. 143–154.
- Pyarelal, S. (2006) "Standards and Enterprise Architecture Framework for E-governance: Select Aspects" in Bhattacharya, J. (ed.) *Technology in Government*, GIFT Publishing, pp. 1–9.
- Quartel, D., W. Engelsman, H. Jonkers, and M. van Sinderen (2009) "A Goal-oriented Requirements Modelling Language for Enterprise Architecture", *Proceedings of the 13th IEEE International Enterprise Computing Conference*, pp. 3–13.
- Raderius, J., P. Närman, and M. Ekstedt (2009) "Assessing System Availability Using an Enterprise Architecture Analysis Approach", *Proceedings of the 6th International Conference on Service Oriented Computing*, pp. 351–362.
- Raghunathan, R. (2010) "Ontology Driven Enterprise Architecture Framework", *Journal of Enterprise Architecture*, (6)2, pp. 24–29.
- Rajegopal, S., P. McGuin, and J. Waller (2007) *Project Portfolio Management: Leading the Corporate Vision*, Basingstoke, England: Palgrave Macmillan.
- Ramanathan, J., R. Ramnath, and A. Desai (2009) "Adaptive IT Architecture as a Catalyst for Network Capability in Government", Saha, P. (ed.) *Advances in Government Enterprise Architecture*, New York, NY: Information Science Reference, pp. 149–172.
- Rasmussen, B. (2007) *Business Models and the Theory of the Firm*, Working Paper No 32, Centre for Strategic Economic Studies, Victoria University of Technology, Melbourne, Australia.
- Razak, R.A. and Z.M. Dahalin (2008) "An Exploratory Study of Enterprise Architecture Practices in Malaysia", *Communications of the IBIMA*, (18)3, pp. 133–137.
- Razak, R.A., Z.M. Dahalin, R.D. Damiri, S.S. Kamaruddin, and S. Abdullah (2007) "Enterprise Information Architecture (EIA): Assessment of Current Practices in Malaysian Organizations", *Proceedings of the 40th Hawaii International Conference on System Sciences*, p. 219.
- Razavi, M., F. Shams Aliee, and A.E. Sarabadani (2009) "A Fuzzy AHP Based Approach Towards Enterprise Architecture Evaluation", *Proceedings of the 3rd European Conference on Information Management and Evaluation*, pp. 408–421.
- Rechtin, E. and M.W. Maier (1996) *The Art of Systems Architecting*, Boca Raton, FL: CRC Press.
- Ren, M. and K.J. Lyytinen (2008) "Building Enterprise Architecture Agility and Sustenance with SOA", *Communications of the Association for Information Systems*, (22) Article 4, p. 75–86.
- Rhodes, D.H., A.M. Ross, and D.J. Nightingale (2009) "Architecting the System of Systems Enterprise: Enabling Constructs and Methods from the Field of Engineering Systems", *Proceedings of the 3rd Annual IEEE Systems Conference*, pp. 190–195.

- Richardson, G.L., B.M. Jackson, and G.W. Dickson (1990) "A Principles-based Enterprise Architecture: Lessons from Texaco and Star Enterprise", *MIS Quarterly*, (14)4, pp. 385–403.
- Rico, D.F. (2006) "A Framework for Measuring ROI of Enterprise Architecture", *Journal of Organizational and End User Computing*, (18)2, pp. 1-12.
- Rico, D.F. (2008) "Optimizing the ROI of Enterprise Architecture Using Real Options" in Clarke, S. (ed.) *End User Computing Challenges and Technologies: Emerging Tools and Applications*, Hershey, PA: IGI Global, pp. 48–56.
- Riedl, R. and A. Kühn (2008) *Unternehmensarchitekturen für den Staat*, Bern University of Applied Sciences, Bern, Switzerland.
- Riege, C. and S. Aier (2008) "A Contingency Approach to Enterprise Architecture Method Engineering", *Proceedings of the International Conference on Service-oriented Computing Workshops*, pp. 388–399.
- Riege, C. and S. Aier (2009) "A Contingency Approach to Enterprise Architecture Method Engineering", *Journal of Enterprise Architecture*, (5)1, pp. 36–48.
- Riege, C., M. Stutz, and R. Winter (2008) "Geschäftsanalyse im Kontext der Unternehmensarchitektur", *HMD—Praxis der Wirtschaftsinformatik*, (262), pp. 39–48.
- Riemp, G. and S. Gieffers-Ankel (2007) "Application Portfolio Management: A Decision-oriented View of Enterprise Architecture", *Information Systems & e-Business Management*, (5)4, pp. 359–378.
- Rispens, M. and F. Vogelegang (2007) "Application Portfolio Management, The Basics: How Much Software Do I Have?", *Proceedings of the 4th Software Measurement European Forum*.
- Robinson, P. and F. Gout (2007) "Extreme Architecture Framework: A Minimalist Framework for Modern Times" in Saha, P. (ed.) *Handbook Of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 18–38.
- Rohloff, M. (2003) "Bausteine einer Unternehmensarchitektur: Die Integration von Geschäfts- und IT-Architektur", *Proceedings of "GI-Arbeitskreis EA, Frühjahrskonferenz 2003"*, pp. 2–9.
- Rohloff, M. (2005) "Enterprise Architecture—Framework and Methodology for the Design of Architectures in the Large", *Proceedings of the 13th European Conference on Information Systems*, pp. 1659–1672.
- Rohloff, M. (2007) "An Approach to Enterprise Wide Information Management", *Proceedings of the 18th Australasian Conference on Information Systems*, pp. 458–467.
- Rohloff, M. (2008a) "Ein Ansatz zur Beschreibung und zum Management von Unternehmensarchitekturen", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2008*, pp. 639–650.
- Rohloff, M. (2008b) "Erfahrungen in der Umsetzung von Unternehmensarchitekturen", *HMD—Praxis der Wirtschaftsinformatik*, (262), pp. 89–96.
- Rohloff, M. (2008c) "Framework and Reference for Architecture Design", *Proceedings of the 14th Americas Conference on Information Systems*, p. 118.
- Romero, J.R. and A. Vallecillo (2007) "Requirements for ODP Enterprise Architecture Tools", *Proceedings of the 11th International IEEE Enterprise Computing Conference*, pp. 224–230.
- Rosemann, M. (2003) "Application Reference Models and Building Blocks for Management and Control" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin: Springer, pp. 595–616.
- Roshandel, R. (2004) "Calculating Architectural Reliability via Modeling and Analysis", *Proceedings of the 26th International Conference on Software Engineering*, pp. 69–71.
- Ross, J.W. (2003) "Creating a Strategic IT Architecture Competency: Learning in Stages", *MIS Quarterly Executive*, (2)1, pp. 31–43.
- Ross, J.W. and C.M. Beath (2006) "Sustainable IT Outsourcing Success: Let Enterprise Architecture Be Your Guide", *MIS Quarterly Executive*, (5)4, pp. 181–192.
- Ross, J.W., P. Weill, and D.C. Robertson (2006) *Enterprise Architecture as Strategy—Creating a Foundation for Business Execution*, Boston, MA: Harvard Business School Press.
- Rostad, C.C. (2000) "Enterprise Modeling for Enterprise Integration: A Case of Manufacturing" in Rolstad, A. and B. Andersen (eds.) *Enterprise Modeling: Improving Global Industrial Competitiveness*, Norwell, MA: Kluwer Academic Publishers, pp. 119–136.

- Roy, B. and T.C.N. Graham (2008) *Methods for Evaluating Software Architecture: A Survey*, Technical Report No 2008-545, School of Computing, Queen's University at Kingston, Ontario, Canada.
- Ruh, W., F. Maginnis, and W.J. Brown (2000) *Enterprise Application Integration—A Wiley Tech Brief*, Hoboken, NJ: Wiley.
- Saat, J. (2010) "Zeitbezogene Abhängigkeitsanalysen der Unternehmensarchitektur", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2010*, pp. 119–130.
- Saat, J., S. Aier, and B. Gleichauf (2009) "Assessing the Complexity of Dynamics in Enterprise Architecture Planning—Lessons from Chaos Theory", *Proceedings of the 15th Americas Conference on Information Systems*, p. 808.
- Saha, P. (2004) *Analyzing The Open Group Architecture Framework from the GERAM Perspective*, The Open Group White Paper, Singapore.
- Saha, P. (2006) "A Real Options Perspective to Enterprise Architecture as an Investment Activity", *Journal of Enterprise Architecture*, (2)3, pp. 32–52.
- Saha, P. (2007) "A Synergistic Assessment of the Federal Enterprise Architecture Framework Against GERAM (ISO15704:2000)" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture in Practice*, Hershey, PA: IGI Global, pp. 1–17.
- Saha, P. (2008) "A Methodology for Government Transformation with Enterprise Architecture" in Saha, P. (ed.) *Advances in Government Enterprise Architecture*, New York, NY: Information Science Reference, pp. 1–29.
- Saha, P. (2009) "The Four Design Models of Enterprise Architecture" in Doucet, G., J. Gotze, P. Saha, and S. Bernard (eds.) *Coherency Management—Architecting the Enterprise for Alignment, Agility and Assurance*, Bloomington, IN: AuthorHouse, pp. 51–76.
- Salger, F., M. Bennicke, G. Engels, and C. Lewerentz (2008) "Comprehensive Architecture Evaluation and Management in Large Software-Systems", *Proceedings of Quality of Software Architectures 2008*, pp. 205–219.
- Salinesi, C. (2007) "Enterprise Architecture from Practice Issues to Research Innovation", *Proceedings of the 1st International Conference on Research Challenges in Information Science*, pp. 107–120.
- Schallert, M. and M. Rosemann (2003) "Issues in the Design of Enterprise Architectures—Insights from a Case Study", *Proceedings of the Conference on Enterprise Architecture and Enterprise Application Integration 2003*, pp. 42–49.
- Schekkerman, J. (2004a) *How to Survive in the Jungle of Enterprise Architecture Frameworks—Creating or Choosing an Enterprise Architecture Framework*, Victoria, Canada: Trafford.
- Schekkerman, J. (2004b) "Trends in Enterprise Architecture: How Are Organizations Progressing?", Institute for Enterprise Architecture Developments, Amersfoort, Netherlands.
- Schekkerman, J. (2005) *The Economic Benefits of Enterprise Architecture*, Victoria, Canada: Trafford Publishing.
- Schelp, J. and S. Aier (2009) "SOA and EA—Sustainable Contributions for Increasing Corporate Agility", *Proceedings of the 42nd Hawaii International Conference on System Sciences*, pp. 1–8.
- Schelp, J. and A. Schwinn (2005) "Extending the Business Engineering Framework for Application Integration Purposes", *Proceedings of the 2005 ACM symposium on Applied computing*, pp. 1333–1337.
- Schelp, J. and M. Stutz (2007) "A Balanced Scorecard Approach to Measure the Value of Enterprise Architecture", *Proceedings of the 2nd Workshop on Trends in Enterprise Architecture Research*, pp. 5–11.
- Schelp, J. and R. Winter (2009) "Language Communities in Enterprise Architecture Research", *Proceedings of 4th Conference on Design Science Research in Information Systems and Technologies*, pp. 1–10.
- Schmidt, C. (2009) *Management komplexer IT-Architekturen*, Wiesbaden, Germany: Gabler.
- Schmidt, C., P. Buxmann, and Z. Sokolovsky (2007) "IT-Architekturmanagement in Banken", *Proceedings of the 8th International Conference on Wirtschaftsinformatik*, pp. 723–740.
- Schönherr, M. (2004) "Enterprise Architecture Frameworks" in Aier, S. and M. Schönherr (eds.) *Enterprise Application Integration—Serviceorientierung und nachhaltige Architekturen*, Berlin, Germany: Gito, pp. 3–46.
- Schönherr, M. (2008) "Towards a Common Terminology in the Discipline of Enterprise Architecture", *Proceedings of the International Conference on Service-Oriented Computing Workshops*, pp. 400–414.

- Schwarze, L. (2006) "Ausrichtung des IT-Projektportfolios an der Unternehmensstrategie", *HMD—Praxis der Wirtschaftsinformatik*, (250), pp. 49–58.
- Schweers, F. (2009) "The Role of Enterprise Architecture in Knowledge Conversion", *Via Nova Architectura*, June 2009, <http://vianovaarchitectura.nl/page/the-role-of-enterprise-architecture-in-knowledge-conversion> (current Nov. 28, 2011).
- Schwinn, A. (2003) "Logische Datenintegrationstypen", *Proceedings of "GI Arbeitskreis EA Frühjahrskonferenz 2003"*, pp. 10–19.
- Schwinn, A. and R. Winter (2005a) "Entwicklung von Zielen und Messgrößen zur Steuerung der Applikationsintegration", *Proceedings of the 8th International Conference on Wirtschaftsinformatik*, pp. 587–606.
- Schwinn, A. and R. Winter (2005b) "Success Factors and Performance Indicators for Enterprise Application Integration", *Proceedings of the 11th Americas Conference on Information Systems*, pp. 2179–2189.
- Schwinn, A. and R. Winter (2007) "Success Factors and Performance Indicators for Enterprise Application Integration" in Lam, W. and V. Shankararaman (eds.) *Enterprise Architecture and Integration*, Hershey, PA: IGI Global: pp. 23–39.
- Sebis (2005) *Enterprise Architecture Management Tool Survey 2005*, TU Munich, Chair for Informatics 19 (sebis), Munich, Germany.
- Seppänen, V., J. Heikkilä, and K. Liimatainen (2009) "Key Issues in EA-implementation: Case Study of Two Finnish Government Agencies", *Proceedings of the IEEE Conference on Commerce and Enterprise Computing 2009*, pp. 114–120.
- Sessions, R. (2007) *A Comparison of the Top Four Enterprise-Architecture Methodologies*, Microsoft Corporation, <http://msdn.microsoft.com/en-us/library/bb466232.aspx> (current Nov. 28, 2011).
- Shafer, S.M., H.J. Smith, J.C. Linder (2005) "The Power of Business Models", *Business Horizons*, (2005)48, pp. 199–207.
- Shan, T.C., W. Bank, and W.W. Hua (2006) "Solution Architecting Mechanism", *Proceedings of the 10th IEEE International Enterprise Computing Conference*, pp. 23–34.
- Shane, B., M. Fry, and R. Toro (1987) "The Design of an Investment Portfolio Selection Decision Support System Using Two Expert Systems and a Consulting System", *Journal of Management Information Systems*, (3)4, pp. 79–92.
- Shaw, M., R. DeLine, D.V. Klein, T.L. Ross, D.M. Young, and G. Zelesnik (1995) "Abstractions for Software Architecture and Tools to Support Them", *IEEE Transactions on Software Engineering*, (21)4, pp. 314–335.
- Shaw, N.G. and S.B. Yadav (2001) "DEACON: An Integrated Approach to the Analysis and Design of Enterprise Architecture-based Computer Networks", *Communications of the Association for Information Systems*, (7) Article 11, pp. 1–26.
- Shenhar, A.J. and D. Dvir (2007) "How Projects Differ, and What to Do About It" in Morris, P.W.G. and J.K. Pinto (eds.) *The Wiley Guide to Project, Program & Portfolio Management*, Hoboken, NJ: Wiley, pp. 177–198.
- Silingas, D. and R. Butleris (2009) "Towards Customizing UML Tools for Enterprise Architecture Modeling", *Proceedings of the IADIS International Conference 2009*, pp. 267–274.
- Sjöholm, M., R. Uddström, R. Wester, and M. Vikingsson (2009) "Principles as a Complement to Models in Defining the Target Enterprise Architecture", *Proceedings of the 3rd European Conference on Information Management and Evaluation*, pp. 422–429.
- Simon, D. (2009) "Application Landscape Transformation and the Role of Enterprise Architecture Frameworks", *Proceedings of Workshop "MDD, SOA and IT Management 2009"*, pp. 1–15.
- Simon, D., K. Fischbach, and D. Schoder (2010) "Application Portfolio Management—An Integrated Framework and a Software Tool Evaluation Approach", *Communications of the Association for Information Systems*, (26) Article 3, pp. 35–56.
- Simonin, J., Y. Le Traon, and J.-M. Jezequel (2007) "An Enterprise Architecture Alignment Measure for Telecom Service Development", *Proceedings of the 11th IEEE International Enterprise Computing Conference*, pp. 476–483.

- Simonin, J., F. Alizon, J.-P. Deschrevel, Y. Le Traon, J.-M. Jézéquel, and B. Nicolas (2008) "EA4UP: An Enterprise Architecture-assisted Telecom Service Development Method", *Proceedings of the 12th International IEEE Enterprise Computing Conference*, pp. 279–285.
- Simonsson, M., A. Lindström, P. Johnson, L. Nordström, J. Grundbäck, and O. Wijnblad (2005) "Scenario-based Evaluation of Enterprise Architecture", *Proceedings of the International Conference on Enterprise Information Systems 2005*, pp. 130–137.
- Sliva, R. (2007) "Enterprise Architecture by a Small Unit in a Federated Organization" in Saha, P. (ed.) *Handbook Of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 320–330.
- Slot, R., G. Dedene, and R. Maes (2009) "Business Value of Solution Architecture", *Proceedings of the 1st NAF Academy Working Conference on Practice-driven Research on Enterprise Transformation*, pp. 84–108.
- Smolander, K., M. Rossi, and S. Purao (2008) "Software Architectures: Blueprint, Literature, Language or Decision?", *European Journal of Information Systems*, (17)6, pp. 575–588.
- Sommestad, T., M. Ekstedt, and P. Johnson (2008) "Combining Defense Graphs and Enterprise Architecture Models for Security Analysis", *Proceedings of the 12th International IEEE Enterprise Computing Conference*, pp. 349–355.
- Sommestad, T., M. Ekstedt, and P. Johnson (2009) "Cyber Security Risks Assessment with Bayesian Defense Graphs and Architectural Models", *Proceedings of the 42nd Hawaii International Conference on System Sciences*, pp. 1530–1605.
- Sousa, P., A. Caetano, A. Vasconcelos, C. Pereira, and J. Tribolet (2006) "Enterprise Architecture Modeling with the Unified Modeling Language" in Rittgen, P. (ed.) *Enterprise Modeling and Computing with UML*, Hershey, PA: IGI Global, pp. 69–97.
- Sousa, P., J. Lima, A. Sampaio, and C. Pereira (2009) "An Approach for Creating and Managing Enterprise Blueprints: A Case for IT Blueprints", *Proceedings of the 5th International Workshops CIAO! and EOMAS held at the 21st International Conference on Advanced Information Systems*, pp. 70–84.
- Sowa, J. and J. Zachman (1992) "Extending and Formalizing the Framework for Information Systems Architecture", *IBM Systems Journal*, (31)3, pp. 590–616.
- Spadoni, M. and A. Abdmouleh (2007) "Information Systems Architecture for Business Process Modeling" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture*, Hershey, PA: IGI Global, pp. 366–380.
- Spewak, S.H. and S.C. Hill (1993) *Enterprise Architecture Planning: Developing a Blueprint for Data, Applications and Technology*, Hoboken, NJ: Wiley.
- Sprenger, J. and J. Jung (2008) *Enterprise Modelling in the Context of Manufacturing—Outline of an Approach Supporting Production Planning*, ICB Research Report No 23, University Duisburg-Essen, Duisburg/Essen, Germany.
- Stam, A. and E. Proper (2000) "Improving Architectures by Simulation and Animation", *Proceedings of the 2nd National Architecture Congress*.
- Stamas, P. (2009) "Process-Centric Enterprise Architecture", *Journal of Enterprise Architecture*, (5)1, pp. 27–35.
- Starke, G. (2002) *Effektive Software Architekturen: Ein praktischer Leitfaden*, Munich, Germany: Hanser.
- Starke, G. and P. Hruschka (2007) "Eine Strukturvorlage zur effektiven Dokumentation von Software- und IT Architekturen", *Proceedings of the 8th International Conference on Wirtschaftsinformatik*, pp. 77–88.
- Steen, M.W.A., D.H. Akehurst, H. ter Doest, and M. Lankhorst (2004) "Supporting Viewpoint-oriented Enterprise Architecture", *Proceedings of the 8th IEEE International Enterprise Computing Conference*, pp. 201–211.
- Steghuis, C. and E. Proper (2008) "Competencies and Responsibilities of Enterprise Architects", *Proceedings of the 4th International Workshops CIAO! and EOMAS, The 20th International Conference on Advanced Information Systems*, pp. 93–107.
- Stelzer, D. and W. Bratfisch (2007) "Earned-Value-Analyse—Controlling-Instrument für IT-Projekte und IT-Projektportfolios", *HMD—Praxis der Wirtschaftsinformatik*, 254, pp. 61–70.
- Stelzer, D. (2009) "Enterprise Architecture Principles: Literature Review and Research Directions", *Proceedings of the Workshop on Trends in Enterprise Architecture Research 2009*, pp. 21–36.
- Stelzer, D. (2010) "Prinzipien für Unternehmensarchitekturen—Grundlagen und Systematisierung", *Proceedings of the Multikonferenz Wirtschaftsinformatik 2010*, pp. 55–66.

- Stewart, G. (2006) "Reflections on Teaching Enterprise Architecture to Graduate Students", *Proceedings of the 12th Americas Conference on Information Systems*, p. 296.
- Stirna, J., A. Persson, and L. Aggestam (2006) "Building Knowledge Repositories with Enterprise Modelling and Patterns—From Theory to Practice", *Proceedings of 14th European Conference on Information Systems*, pp. 937–948.
- Stirna, J., A. Persson, and K. Sandkuhl (2007) "Participative Enterprise Modeling: Experiences and Recommendations", *Proceedings of the 19th International Conference on Advanced Information Systems Engineering*, pp. 546–560.
- Stoddard, B. (2010) "Enterprise Architecture Evaluation Methods", *Journal of Enterprise Architecture*, (6)2, pp. 48–58.
- Strano, C. and Q. Rehmani (2007) "The Role of the Enterprise Architect", *Information Systems and e-Business Management*, (5), pp. 379–396.
- Struck, V., S. Buckl, F. Matthes, and C.M. Schweda (2010) "Enterprise Architecture Management from a Knowledge Management Perspective—Results from an Empirical Study", *Proceedings of the 5th Mediterranean Conference on Information Systems*, p. 84.
- Stutz, M. (2007) "Enterprise Architecture as a Source for Sustainable Competitive Advantage", *Proceedings of the 15th European Conference on Information Systems*.
- Sundberg, H.P. and P. Wallin (2007) "Recordkeeping and Information Architecture—A Study of the Swedish Financial Sector", *International Journal of Public Information Systems*, (2007)1, pp. 31–45.
- Susarapu, S.R. and E. White Baker (2007) "Analyzing Enterprise Architecture Integration at the DHS Using the Zachman Framework", *Proceedings of the Southern Association for Information Systems Conference 2007*, pp. 172–177.
- Tang, A., J. Han, and P. Chen (2004) "A Comparative Analysis of Architecture Frameworks", *Proceedings of the 11th AsiaPacific Software Engineering Conference*, pp. 640–647.
- Tang, A. and J. Han (2005) "Architecture Rationalization: A Methodology for Architecture Verifiability, Traceability and Completeness", *Proceedings of the 12th IEEE International Conference and Workshops on the Engineering of Computer-Based Systems*, pp. 135–144.
- Tang, A., Y. Jin, and J. Han (2007) "A Rationale-based Architecture Model for Design Traceability and Reasoning", *Journal of Systems and Software*, (80)6, pp. 918–934.
- Tanigawa, U. (2004) "Decision Processes in Enterprise Architecture: Descriptive Study", *Proceedings of the 10th Americas Conference on Information Systems*, p. 24.
- Tarabanis, K., V. Peristeras, and G. Frigidis (2001) "Building an Enterprise Architecture for Public Administration: A High-level Data Model for Strategic Planning", *Proceedings of the 9th European Conference on Information Systems Bled*, pp. 987–998.
- Tarcisius, G., R. Al-Ekram, and Y. Ping (2002) *Enterprise Architecture—An Overview*, Project Report for CS 798: Software Architecture, Waterloo, Canada.
- Tatsiopoulos, I.P. and N. Panayiotou (2000) "The Integration of Activity Based Costing and Enterprise Modeling for Reengineering Purposes", *International Journal of Production Economics*, (66)1, pp. 33–44.
- Taylor, K. and D. Palmer (2003) "Applying Enterprise Architectures and Technology to the Embedded Devices Domain", *Proceedings of the Workshop on Wearable, Invisible, Context-Aware, Ambient, Pervasive and Ubiquitous Computing 2003*, pp. 185–190.
- Teece, D.J., G. Pisano, and A. Shuen (1997) "Dynamic Capabilities and Strategic Management", *Strategic Management Journal*, (18)7, pp. 509–533.
- Teng, J.T.C. and W.J. Kettinger (1995) "Business Process Redesign and Information Architecture: Exploring the Relationships", *DATA BASE Advances*, (26)1, pp. 30–42.
- The Chief Information Officers Council (1999) "Federal Enterprise Architecture Framework Version 1.1", <http://www.cio.gov/documents/fedarch1.pdf> (current Nov. 28, 2011).
- The Open Group (2009a) *ArchiMate 1.0 Specification*, Zaltbommel, Netherlands: Van Haren Publishing.
- The Open Group (2009b) *TOGAF Version 9 Enterprise Edition*, Zaltbommel, Netherlands: Van Haren Publishing.

- Thiry, M. (2007a) "Program Management: A Strategic Decision Management Process" in Morris, P.W.G. and J.K. Pinto (eds.) *The Wiley Guide to Project, Program & Portfolio Management*, Hoboken, NJ: Wiley, p. 113–143.
- Thiry, M. (2007b) "Value Management" in Morris, P.W.G. and J.K. Pinto (eds.) *The Wiley Guide to Project, Program & Portfolio Management*, Hoboken, NJ: Wiley, pp. 199–225.
- Thornton, S. (2007) "Understanding and Communicating with Enterprise Architecture Users" in Saha, P. (ed.) *Handbook Of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 145–159.
- Tiemeyer, E. (2008) "IT-Projektportfoliomanagement—Konzepte und praktische Lösungen", *HMD—Praxis der Wirtschaftsinformatik*, (260), pp. 43–52.
- Tolle, M. and J. Vesterager (2003) "Developing the Business Model—A Methodology for Virtual Enterprises" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 291–308.
- Traverson, B. (2008) "A Comparison Study of Viewpoint Approaches in Service Enterprise Architecture", *Proceedings of the 12th IEEE International Enterprise Computing Conference*, pp. 9–11.
- Ullberg, J., U. Franke, M. Buschle, and P. Johnson (2010) "A Tool for Interoperability Analysis of Enterprise Architecture Models Using Pi-OCL", *Proceedings of the International Conference on Interoperability for Enterprise Software and Applications 2010*, p. 81–90.
- Ullberg, J., R. Lagerström, and P. Johnson (2008) "A Framework for Service Interoperability Analysis Using Enterprise Architecture Models", *Proceedings of the IEEE International Conference on Services Computing 2008*, pp. 99–107.
- Uppington, G. and P. Bernus (2003) "Analysing the Present Situation and Refining Strategy" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin, Germany: Springer, pp. 309–332.
- Urbach, N. and J. Lux (2010) "Understanding the Performance Impact of Enterprise Architecture Management", *Proceedings of the 16th Americas Conference on Information Systems*, p. 403.
- Urbaczewski, L. and S. Mrdalj (2006) "A Comparison of Enterprise Architecture Frameworks", *Issues in Information Systems*, (7)2, pp. 18–23.
- Uzzle, L. (2009) "Using Metamodels to Improve Enterprise Architecture", *Journal of Enterprise Architecture*, (5)1, pp. 49–61.
- Vahid, M. and A.K. Moghaddam (2006) "A Proposed Framework for Enterprise Architecture (EA) Assessment" in Bhattacharya, J. (ed.) *Technology in Government*, New Delhi, India: GIFT Publishing, pp. 10–21.
- Valtonen, K., V. Seppänen, and M. Leppänen (2009) "Government Enterprise Architecture Grid Adaptation in Finland", *Proceedings of the 42nd Hawaii International Conference on System Sciences*, pp. 1–10.
- van Bommel, P., S. Hoppenbrouwers, E. Proper, and Th.P. van der Weide (2006) "Giving Meaning to Enterprise Architectures—Architecture Principles with ORM and ORC", *Proceedings of "On the Move to Meaningful Internet Systems" Workshops 2006*, pp. 1138–1147.
- van Bommel, P., P.G. Buitenhuis, S. Hoppenbrouwers, and E. Proper (2007) "Architecture Principles—A Regulative Perspective on Enterprise Architecture", *Proceedings of the 2nd International Workshop on Enterprise Modelling and Information Systems Architectures*, pp. 47–60.
- van den Berg, M. and M. van Steenberg (2006) *Building an Enterprise Architecture Practice: Tools, Tips, Best Practices, Ready-to-use Insights*, Berlin, Germany: Springer.
- van der Aalst, W.M.P., A.H.M. ter Hofstede, and M. Weske (2003) "Business Process Management: A Survey", *Proceedings of the 1st International Conference on Business Process Management*, pp. 1–12.
- van der Aalst, W.M.P. (2005) "Business Alignment: Using Process Mining as a Tool for Delta Analysis and Conformance Testing", *Requirements Engineering*, (10)3, pp. 198–211.
- van der Aalst, W.M.P. (2007) "Trends in Business Process Analysis: From Verification to Process Mining", *Proceedings of the International Conference on Enterprise Information Systems 2007*, pp. 5–9.
- van der Raadt, B., S. Schouten, and H. van Vliet (2008) "Stakeholder Perception of Enterprise Architecture", *Proceedings of the 2nd European Conference on Software Architecture*, pp. 19–34.

- van der Raadt, B., R. Slot, and H. van Vliet (2007) "Experience Report: Assessing a Global Financial Services Company on Its Enterprise Architecture Effectiveness Using NAOMI", *Proceedings of the 40th Hawaii International Conference on System Sciences*, p. 218.
- van der Raadt, B. and H. van Vliet (2008) "Designing the Enterprise Architecture Function", *Proceedings of Quality of Software Architectures 2008*, pp. 103–118.
- van der Raadt, B. and H. van Vliet (2009) "Assessing the Efficiency of the Enterprise Architecture Function", *Proceedings of the 1st NAF Academy Working Conference on Practice-Driven Research on Enterprise Transformation*, pp. 63–83.
- van der Raadt, B., J. Soetendal, M. Perdeck, and H. Van Vliet (2004) "Polyphony in Architecture", *Proceedings of the 26th International Conference on Software Engineering*, pp. 533–542.
- van der Torre, L., M. Lankhorst, H. ter Doest, J.T.P. Campschroer, and F. Arbab (2006) "Landscape Maps for Enterprise Architectures", *Proceedings of the Conference on Advanced Information Systems Engineering 2006*, pp. 351–366.
- van Eck, P., H.M. Blanken, and R. Wieringa (2004) "Project GRAAL: Towards Operational Architecture Alignment", *International Journal of Cooperative Information Systems*, (13)3, pp. 235–255.
- van Gils, B. and D. Vojevodina (2006) *The Effects of Exceptions on Enterprise Architecture*, Radboud University Nijmegen, Nijmegen, Netherlands.
- van Gils, B. (2009) "Strategy and Architecture—reconciling Worldviews", *Proceedings of the 1st NAF Academy Working Conference on Practice-Driven Research on Enterprise Transformation*, pp. 181–196.
- van Roosmalen, M. and S. Hoppenbrouwers (2008) "Supporting Corporate Governance with Enterprise Architecture and Business Rule Management: A Synthesis of Stability and Agility", *Proceedings of the International Workshop on Regulations Modelling and Deployment 2008*, pp. 13–24.
- van Steenberg, M. and S. Brinkkemper (2008) "Modeling the Contribution of Enterprise Architecture Practice to the Achievement of Business Goals", *Proceedings of the 17th International Conference on Information Systems Development*, pp. 609–618.
- van Steenberg, M. and S. Brinkkemper (2009) "The Architectural Dilemma: Division of Work versus Knowledge Integration", *Proceedings of the 3rd International Workshop on Business/IT Alignment and Interoperability*, pp. 46–60.
- van Steenberg, M., M. van Den Berg, and S. Brinkkemper (2007a) "A Balanced Approach to Developing the Enterprise Architecture Practice", *Proceedings of the International Conference on Enterprise Information Systems*, pp. 240–253.
- van Steenberg, M., M. van Den Berg, and S. Brinkkemper (2007b) "An Instrument for the Development of the Enterprise Architecture Practice", *Proceedings of the International Conference on Enterprise Information Systems*, pp. 14–22.
- Vargas, N., L. Plazaola, and M. Ekstedt (2008) "A Consolidated Strategic Business and IT Alignment Representation: A Framework Aggregated from Literature", *Proceedings of the 41st Hawaii International Conference on System Sciences*, p. 397.
- Vasconcelos, A., A. Caetano, J. Neves, P. Sinogas, R. Mendes, and J. Tribolet (2001) "A Framework for Modeling Strategy, Business Processes and Information Systems", *Proceedings of the 5th International Enterprise Computing Conference*, p. 69.
- Vasconcelos, A., M. da Silva, A. Fernandes, and J. Tribolet (2004) "An Information System Architectural Framework for Enterprise Application Integration", *Proceedings of the 37th Hawaii International Conference on System Sciences*, pp. 225–233.
- Vasconcelos, A., P. Sousa, and J. Tribolet (2003a) "Information Systems Architectures", *Proceedings of Business Excellence 2003 at the International Conference on Performance Measures, Benchmarking and Best Practices in New Economy*.
- Vasconcelos, A., P. Sousa, and J. Tribolet (2003b) "Information System Architectures: Representation, Planning and Evaluation", *Journal of Systemics, Cybernetics and Informatics*, (1)6, pp. 78–84.
- Vasconcelos, A., P. Sousa, and J. Tribolet (2005) "Information System Architecture Evaluation: From Software to Enterprise Level Approaches", *Proceedings of the 12th European Conference on Information Technology Evaluation*, pp. 473–488.

- Vasconcelos, A., P. Sousa, and J. Tribolet (2007) "Information System Architecture Metrics: An Enterprise Engineering Evaluation Approach", *The Electronic Journal Information Systems Evaluation*, (10)1, pp. 91–122.
- Vasconcelos, A., P. Sousa, and J. Tribolet (2008) "Enterprise Architecture Analysis—An Information System Evaluation Approach", *Enterprise Modelling and Information Systems Architectures*, (3)2, pp. 31–53.
- Veasey, P.W. (2001) "Use of Enterprise Architectures in Managing Strategic Change", *Business Process Management Journal*, (7)5, pp. 420–436.
- Velitchkov, I. (2008) "Integration of IT Strategy and Enterprise Architecture Models", *Proceedings of the International Conference on Computer Systems and Technologies 2008*, p. 69.
- Veltman-van Reekum, E., M. van Steenbergen, M. van den Berg, R. Bos, and S. Brinkkemper (2006) "An Instrument for Measuring the Quality of Enterprise Architecture Products", *Via Nova Architectura*, November 2006, <http://vianovaarchitectura.nl/page/an-instrument-for-measuring-the-quality-of-enterprise-architectur> (current Nov. 28, 2011).
- Verhoef, C. (2002) Quantitative IT Portfolio Management, *Science of Computer Programming*, (45), pp. 1–96.
- Verhoef, C. (2003) "Managing Multi-billion Dollar IT Budgets Using Source Code Analysis", *Proceedings of the 3rd IEEE International Workshop on Source Code Analysis and Manipulation*, pp. 77–78.
- Verhoef, C. (2005) Quantifying the Value of IT-investments, *Science of Computer Programming*, (56), pp. 315–342.
- Vernadat, F. (1996) *Enterprise Modeling and Integration: Principles and Applications*, London, England: Chapman & Hall.
- Vernadat, F. (1998) "The CIMOSA Languages" in Bernus, P., K. Mertins, and G. Schmidt (eds.) *Handbook on Architectures for Information Systems*, Berlin, Germany: Springer, pp. 251–272.
- Vernadat, F. (2001) "UEML: Towards a Unified Enterprise Modelling Language", *International Journal of Production Research*, (40)17, pp. 4309–4321.
- Vernadat, F. (2002) "Enterprise Modeling and Integration (EMI): Current Status and Research Perspectives", *Annual Reviews in Control*, (26)1, pp. 15–25.
- Vernadat, F. (2007) "Interoperable Enterprise Systems: Principles, Concepts, and Methods", *Annual Reviews in Control*, (31)1, pp. 137–145.
- Versteeg, G. and H. Bouwman (2004) "Business Architecture: A New Paradigm to Relate e-Business Strategy to ICT", *Proceedings of the 12th European Conference on Information Systems*, pp. 1948–1960.
- Versteeg, G. and H. Bouwman (2006) "Business Architecture: A New Paradigm to Relate Business Strategy to ICT", *Information Systems Frontiers*, (8)2, pp. 91–102.
- Viaene, S., S. Fagan, and S. Almeida (2007) "Belgacom: IT Project Selection 2005", *Communications of the Association for Information Systems*, (19) Article 4, pp. 47–60.
- Voelpel, S.C., M. Leibold, and E.B. Tekie (2003) *The Wheel of Business Model Reinvention: How to Reshape your Business Model and Organizational Fitness to Leapfrog Competitors*, IIR Working Paper 03-10, Institute of Innovation Research, Hitotsubashi University, Hitotsubashi, Japan.
- vom Brocke, J., C. Sonneberg, B. Thurnher, and B. Müller (2008) "Wertorientierte Gestaltung von Unternehmensarchitekturen", *HMD—Praxis der Wirtschaftsinformatik*, 262, pp. 78–88.
- Wade, M. and J. Hulland (2004) "Review: The Resource-Based View and Information Systems Research: Review, Extension, and Suggestions for Future Research", *MIS Quarterly*, (28)1, pp. 107–142.
- Wagter, R., M. van den Berg, J. Luijpers, and M. van Steenbergen (2005) *Dynamic Enterprise Architecture—How to Make It Work*, Hoboken, NJ: Wiley.
- Wang, X. and Y. Zhao (2009) "An Enterprise Architecture Development Method in Chinese Manufacturing Industry", *Proceedings of the 9th International Conference on Hybrid Intelligent Systems*, pp. 226–230.
- Ward, J.M. (1988) "Information Systems and Technology Application Portfolio Management: An Assessment of Matrix-Based Analyses", *Journal of Information Technology*, (3)3, pp. 205–215.
- Ward, J.M. (1990) "A Portfolio Approach to Evaluating Information Systems Investments and Setting Priorities", *Journal of Information Technology*, (5), pp. 222–231.
- Ward, J.M. (1993) *Investment in IT—The Portfolio Approach*, London, England: Chartered Institute of Management Accountants.

- Watson, R.W. (2000) "An Enterprise Information Architecture: A Case Study for Decentralized Organizations", *Proceedings of the 33rd Hawaii International Conference on System Sciences*, p. 7059.
- Wegmann, A. (2003) "On the Systemic Enterprise Architecture Methodology (SEAM)", *Proceedings of the International Conference on Enterprise Information Systems 2003*, pp. 483–490.
- Wegmann, A., P. Balabko, L.-S. Lê, G. Regev, and I. Rychkova (2005) "A Method and Tool for Business-IT Alignment in Enterprise Architecture", *Short Paper Proceedings of the Conference on Advanced Information Systems Engineering 2005*, pp. 113–118.
- Wegmann, A., A. Kotsalainen, L. Matthey, G. Regev, and A. Giannattasio (2008) "Augmenting the Zachman Enterprise Architecture Framework with a Systemic Conceptualization", *Proceedings of the 12th International IEEE Enterprise Computing Conference*, pp. 3–13.
- Wegmann, A., G. Regev, J.D. de la Cruz, L.S. Lê, and I. Rychkova (2007) "Teaching Enterprise Architecture and Service-oriented Architecture in Practice", *Proceedings of Trends in Enterprise Architecture Research 2007*, pp. 13–22.
- Wegmann, A., G. Regev, I. Rychkova, L.S. Lê, J.D. de la Cruz, and P. Julia (2007) "Business and IT Alignment with SEAM for Enterprise Architecture", *Proceedings of the 11th IEEE International Enterprise Computing Conference*, pp. 111–121.
- Weill, P. and M. Vitale (1999) "Assessing the Health of an Information Systems Applications Portfolio: An Example from Process Manufacturing", *MIS Quarterly*, (23)4, pp. 601–624.
- Wheeler, Z.B. (2007) "A Fundamental SOA Approach to Rebuilding Enterprise Architecture for a Local Government after a Disaster" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 400–418.
- Whittle, R. and C.B. Myrick (2004) *Enterprise Business Architecture—The Formal Link between Strategy and Results*, Boca Raton, FL: CRC Press.
- Wieringa, R., H.M. Blanken, M.M. Fokkinga, and P.J.P.W. Grefen (2003) "Aligning Application Architecture to the Business Context", *Proceedings of the 15th International Conference on Advanced Information Systems Engineering*, pp. 209–225.
- Wilkinson, M. (2006) "Designing an 'Adaptive' Enterprise Architecture", *BT Technology Journal*, (24)4, pp. 81–92.
- Wilton, D.R. (2008) "The Relationship Between IS Strategic Planning and Enterprise Architectural Practice: Case Studies in New Zealand Enterprises", *Proceedings of the Pacific Asia Conference on Information Systems 2008*, pp. 100–107.
- Winch, G.M. (2007) "Managing Project Stakeholders" in Morris, P.W.G. and J.K. Pinto (eds.) *The Wiley Guide to Project, Program & Portfolio Management*, Hoboken, NJ: Wiley, p. 271–290.
- Winter, A., B. Brigl, and T. Wendt (2003) "3LGM²: Methode und Werkzeug zur Modellierung von Unternehmensarchitekturen im Krankenhaus", *Proceedings of "GI-Arbeitskreis EA, Frühjahrskonferenz 2003"*, pp. 20–33.
- Winter, R. (2002) "Business Strategy Modelling in the Information Age", *Proceedings of the 3rd International Web Conference*.
- Winter, R. (2003) "Modelle, Techniken und Werkzeuge im Business Engineering" in Österle, H. and R. Winter (eds.) *Business Engineering—Auf dem Weg zum Unternehmen des Informationszeitalters*, Berlin, Germany: Springer, pp. 87–118.
- Winter, R. (2003) "An Architecture Model for Supporting Application Integration Decisions", *Proceedings of the 11th European Conference on Information Systems*, pp. 2188–2200.
- Winter, R. (2006) "Ein Modell zur Visualisierung der Anwendungslandschaft als Grundlage der Informationssystem-Architekturplanung" in Schelp, J. and R. Winter (eds.) *Integrationsmanagement*, Berlin, Germany: Springer, pp. 1–29.
- Winter, R., T. Bucher, R. Fischer and S. Kurpjuweit (2007) "Analysis and Application Scenarios of Enterprise Architecture: An Exploratory Study", *Journal of Enterprise Architecture*, (3)3, pp. 33–43.
- Winter, R. and R. Fischer (2006) "Essential Layers, Artifacts, and Dependencies of Enterprise Architecture", *Proceedings of the 10th IEEE International Enterprise Computing Conference*, p. 30.
- Winter, R. and R. Fischer (2007) "Essential Layers, Artifacts, and Dependencies of Enterprise Architecture", *Journal of Enterprise Architecture*, (3)2, pp. 7–18.

- Winter, R. and J. Schelp (2008) "Enterprise Architecture Governance: The Need for a Business-to-IT Approach", *Proceedings of the ACM Symposium on Applied Computing 2008*, pp. 548–552.
- Winter, R., J. vom Brocke, P. Fettke, P. Loos, S. Junginger, C. Moser, W. Keller, F. Matthes, A.M. Ernst (2009) "Patterns in Business and Information Systems Engineering", *Business & Information Systems Engineering*, (1)6, pp. 468–474.
- Wognum, N. and F. Ip-Shing (2007) "Maturity of IT-Business Alignment: An Assessment Tool" in Saha, P. (ed.) *Handbook of Enterprise Systems Architecture In Practice*, Hershey, PA: IGI Global, pp. 221–236.
- Wolfenden, P.J. and D.E. Welch (2000) "Business Architecture: A Holistic Approach to Defining the Organization Necessary to Deliver a Strategy", *Knowledge and Process Management*, (7)2, pp. 97–106.
- Ylimäki, T. and V. Halttunen (2006) "Method engineering in Practice: A Case of Applying the Zachman Framework in the Context of Small Enterprise Architecture Oriented Projects", *Information Knowledge Systems Management*, (5)3, pp. 189–209.
- Ylimäki, T., E. Niemi, and N. Hämäläinen (2007) "Enterprise Architecture Compliance: the Viewpoint of Evaluation", *Proceedings of the European Conference on Information Management and Evaluation 2007*, pp. 409–417.
- Yu, E., M. Strohmaier, and X. Deng (2006) "Exploring Intentional Modeling and Analysis for Enterprise Architecture", *Proceedings of the 10th IEEE International Enterprise Computing Conference*, p. 32.
- Yu, S., J. Wang, and N. Guo (2008) "The Application of Project Portfolio Management in the Government Investment Projects", *Proceedings of the 2008 International Seminar on Business and Information Management*, pp. 513–516.
- Zacarias, M., A. Caetano, R. Magalhaes, H.S. Pinto, and J. Tribolet (2007) "Adding a Human Perspective to Enterprise Architectures", *Proceedings of the 18th International Workshop on Database and Expert Systems Applications*, pp. 840–844.
- Zachman, J. (1987) "A Framework for Information Systems Architecture", *IBM Systems Journal*, (26)3, pp. 276–292.
- Zachman, J. (1997) "Enterprise Architecture: The Issue of the Century", *Database Programming and Design*, (10)3, pp. 44–53.
- Zarvic, N. and R. Wieringa (2006) "An Integrated Enterprise Architecture Framework for Business-IT Alignment", *Proceedings of the 18th International Conference on Advanced Information Systems Engineering*, pp. 262–270.
- Zellner, G. (2008) "Gestaltung hybrider Wertschöpfung mittels Architekturen—Analyse am Beispiel des Business Engineering", *Wirtschaftsinformatik*, (50)3, pp. 187–195.
- Zelm, M. (2003) "Resource Requirements of Enterprise Management" in Bernus, P., L. Nemes, and G.J. Schmidt (eds.) *Handbook on Enterprise Architecture*, Berlin: Springer, pp. 501–514.
- Zheng, G. (2007) "A Visual Exploration Approach to Project Portfolio Management", *Proceedings of the 13th Americas Conference on Information Systems*, p. 382.
- ZIFA (2001) "The Zachman Institute for Framework Advancement", <http://www.zifa.com/> (current Nov. 28, 2011).
- Zimmermann, S. (2008) "IT-Portfoliomanagement—Ein Konzept zur Bewertung und Gestaltung von IT", *Informatik Spektrum*, (31)5, pp. 460–468.
- Zink, G. (2009) "How to Restart an Enterprise Architecture Program After Initial Failure", *Journal of Enterprise Architecture*, (5)2, pp. 31–41.
- Zott, C. and R. Amit (2009) *Designing Your Future Business Model: An Activity System Perspective*, Working Paper 781, IESE Business School—University of Navarra, Barcelona, Spain.
- zu Knyphausen-Aufseß, D. and Y. Meinhardt (2002) "Revisiting Strategy: Ein Ansatz zur Systematisierung von Geschäftsmodellen" in Bieger, T., N. Bickhoff, R. Casper, and K. Reding (eds.) *Zukünftige Geschäftsmodelle: Konzept und Anwendung in der Netzökonomie*, Berlin, Germany: Springer.
- Zwegers, A.J.R., S.-G. Fang, and H.-J. Pels (1997) "Evaluation of Architecture Design with CIMOSA", *Computers in Industry*, (34), pp. 187–200.

ABOUT THE AUTHORS

Daniel Simon is a Ph.D. student with the Department of Information Systems and Information Management at the University of Cologne, Germany. He is also an Enterprise Architect with a large insurance enterprise, following several years of work as a Consultant specializing in enterprise architecture management and IT portfolio management. He is TOGAF 9-certified and has gained practical experience in several industries and within different company departments in Germany and the United Kingdom. His recent work on application portfolio management has been published in *Communications of the Association for Information Systems*.

Kai Fischbach is a Full Professor and Chair in Information Systems and Social Networks at the University of Bamberg. His research focuses on integrated information systems, enterprise systems, social and economic networks, and the design of efficient information exchanges. His articles have appeared in *Journal of the Association for Information Systems*, *Communications of the Association for Information Systems*, *Electronic Markets*, *Communications of the ACM*, *Business and Information Systems Engineering*, and other journals.

Detlef Schoder is a Full Professor and Chairman of the Department of Information Systems and Information Management, as well as Director at the Institute for Broadcasting Economics at the University of Cologne, Germany. His work appeared in *Journal of Marketing*, *Journal of Product Innovation Management*, *Journal of the Association for Information Systems*, *Communications of the Association for Information Systems*, *Electronic Markets*, *Communications of the ACM*, as well as in transfer-oriented outlets including *Wall Street Journal*, *MIT Sloan Management Review* and *Harvard Business Review*. Detlef Schoder was appointed reviewer to the German Parliament's lower house for e-commerce issues and consulted the European Commission. He is recipient of numerous academic and industry-related awards and holds patents for IT-enabled individualized media innovations.

Copyright © 2013 by the Association for Information Systems. Permission to make digital or hard copies of all or part of this work for personal or classroom use is granted without fee provided that copies are not made or distributed for profit or commercial advantage and that copies bear this notice and full citation on the first page. Copyright for components of this work owned by others than the Association for Information Systems must be honored. Abstracting with credit is permitted. To copy otherwise, to republish, to post on servers, or to redistribute to lists requires prior specific permission and/or fee. Request permission to publish from: AIS Administrative Office, P.O. Box 2712 Atlanta, GA, 30301-2712, Attn: Reprints; or via e-mail from ais@aisnet.org.

Communications of the Association for Information Systems

ISSN: 1529-3181

EDITOR-IN-CHIEF

Matti Rossi
Aalto University

AIS PUBLICATIONS COMMITTEE

Kalle Lyytinen Vice President Publications Case Western Reserve University	Matti Rossi Editor, CAIS Aalto University	Shirley Gregor Editor, JAIS The Australian National University
Robert Zmud AIS Region 1 Representative University of Oklahoma	Phillip Ein-Dor AIS Region 2 Representative Tel-Aviv University	Bernard Tan AIS Region 3 Representative National University of Singapore

CAIS ADVISORY BOARD

Gordon Davis University of Minnesota	Ken Kraemer University of California at Irvine	M. Lynne Markus Bentley University	Richard Mason Southern Methodist University
Jay Nunamaker University of Arizona	Henk Sol University of Groningen	Ralph Sprague University of Hawaii	Hugh J. Watson University of Georgia

CAIS SENIOR EDITORS

Steve Alter University of San Francisco	Michel Avital Copenhagen Business School
--	---

CAIS EDITORIAL BOARD

Monica Adya Marquette University	Dinesh Batra Florida International University	Tina Blegind Jensen Copenhagen Business School	Indranil Bose Indian Institute of Management Calcutta
Tilo Böhmann University of Hamburg	Thomas Case Georgia Southern University	Harvey Enns University of Dayton	Andrew Gemino Simon Fraser University
Matt Germonprez University of Nebraska at Omaha	Mary Granger George Washington University	Åke Gronlund University of Umea	Douglas Havelka Miami University
Jonny Holmström Umeå University	K.D. Joshi Washington State University	Michel Kalika University of Paris Dauphine	Karlheinz Kautz Copenhagen Business School
Julie Kendall Rutgers University	Nelson King American University of Beirut	Hope Koch Baylor University	Nancy Lankton Marshall University
Claudia Loebbecke University of Cologne	Paul Benjamin Lowry City University of Hong Kong	Don McCubbrey University of Denver	Fred Niederman St. Louis University
Shan Ling Pan National University of Singapore	Katia Passerini New Jersey Institute of Technology	Jan Recker Queensland University of Technology	Jackie Rees Purdue University
Jeremy Rose Aarhus University	Saonee Sarker Washington State University	Raj Sharman State University of New York at Buffalo	Mikko Siponen University of Oulu
Thompson Teo National University of Singapore	Heikki Topi Bentley University	Frank Ulbrich Newcastle Business School	Chelley Vician University of St. Thomas
Padmal Vitharana Syracuse University	Rolf Wigand University of Arkansas, Little Rock	Fons Wijnhoven University of Twente	Vance Wilson Worcester Polytechnic Institute
Yajiong Xue East Carolina University			

DEPARTMENTS

Information Systems and Healthcare Editor: Vance Wilson	Information Technology and Systems Editors: Dinesh Batra and Andrew Gemino	Papers in French Editor: Michel Kalika
--	---	---

ADMINISTRATIVE PERSONNEL

James P. Tinsley AIS Executive Director	Meri Kuikka CAIS Managing Editor Aalto University	Sheri Hronek CAIS Publications Editor Hronek Associates, Inc.	Copyediting by S4Carlisle Publishing Services
--	---	---	--