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Enterprise Architecture: What Did We Study?

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Enterprise architecture (EA) is a description of an enterprise from an integrated business and IT perspective intended to improve business and IT alignment, and is used in the majority of large companies. However, despite that EA was established as an independent discipline long ago, a commonly accepted "big picture" in EA research is still missing. As a result, the scope of the EA discipline is vague, the extent of diversity in EA publications is poorly understood and the progression of the EA research stream over time is unclear. In this paper I conduct a comprehensive EA literature review covering 1075 publications aiming to structure, clarify and consolidate the whole EA research stream. I analyze the distribution of the EA research stream by time, source, research methodology and attitude, code all the issues discussed in EA publications into 42 narrow EA-related topics and 11 broader themes, establish the conceptual relationship between them and present a picture of the EA discipline "on a page". Moreover, I classify all EA-related topics into four categories according to their lifecycles helping future EA researchers to better understand the evolution of the EA discipline and make the maximum contribution to it.

Keywords: Enterprise architecture (EA); literature review; research methodologies; topics; themes; lifecycles.

1. Introduction

The role of IT for modern companies is critical. Companies spend significant amounts of money investing in IT. However, in order to realize the full potential value of IT investments, the IT strategy of a company should be aligned with its business strategy.[1–3] Enterprise architecture (EA) is a description of an enterprise from an integrated business and IT perspective intended to bridge the communication gap between business and IT stakeholders. Currently, EA is practiced by the majority of large companies[4,5] and helps these organizations to reduce costs and risks,[6] improve IT efficiency and flexibility,[7] shorten development time and increase management satisfaction.[8]

The origins of the modern EA discipline are discussable. Its earliest roots can be traced back to the Business Systems Planning (BSP) methodology introduced by IBM in the 1960s.[9,10] However, some authors[11–15] argue that EA started its life as an independent discipline since the publication of the PRISM architecture framework,[16] while others[17–21] argue that EA emerged after the publication of the Zachman Framework.[22] On the other hand, non-U.S. roots of EA can be traced back to the European CIMOSA framework,[23,24] German ARIS modeling approach,[12,25] French GRAI method,[26] Canadian TOVE framework[27] and largely Australian GERAM framework.[28]

Since then EA research has evolved into an intense, diverse and complex research stream forming an independent subfield of IS research of high potential relevance to real-world practice. Simon *et al.*[29] identified 608 publications belonging to the EA research stream. However, the prior reviews of the EA discipline show that EA research is predominantly prescriptive in nature and low on empirical validity,[30] lacking basic research,[31] highly influenced by industry publications,[21,31] insufficiently represented in the leading academic IS journals[21,32] and separated on several language communities.[33] Therefore, the available knowledge on EA is scattered, good introductory books are absent[32] and a commonly accepted "big picture" in EA research is missing.[29,32]

The previous EA literature reviews have analyzed many important aspects of the EA discipline including its distribution in time,[29,31,32] research groups and communities,[31–33] citations and authorship patterns,[29,32] publication types and geographical distribution,[32] reference disciplines,[31] theory types and empirical validity.[30] However, some critical aspects of the EA discipline still received little or no attention in the previous EA literature reviews. Specifically, the usage of different research methodologies, the diversity of narrow EA-related subtopics, the overall progression of the EA discipline over time beyond publication numbers and some other important aspects of the EA discipline have not been analyzed previously. As a result, a comprehensive "big picture" of the entire EA discipline still remains largely unclear. After a long time since the emergence of EA as an independent discipline it is time to review the available EA literature in order to analyze what we studied all that time and present a systematic view of the whole EA discipline.

In this paper, I conduct a comprehensive EA literature review and the purpose of this review is to look at the past and analyze all previous EA publications in order to structure, clarify and consolidate the whole EA research stream into a comprehensive, consistent and systematic picture of the EA discipline "on a page". In order to accomplish this goal and analyze the past, in line with other IS literature reviews,[34–40] I analyze what research methodologies are used in EA research, what narrow EA-related topics constitute the broad EA research stream, how they are related to each other, how the EA discipline develops over time and other relevant aspects (authors, citations, origins and geography of EA publications are not analyzed since they have already been addressed recently in the reviews of Refs. 29 and 32).

This paper continues as follows: (1) I discuss previous EA literature reviews and their limitations, (2) I describe my review methodology, (3) I describe the results of the review and analyze them, (4) I describe the identified EA-related topics discussed in EA publications and analyze them, (5) I present the map of EA research demonstrating the relationship between different EA-related topics, (6) I discuss the contribution of this paper to the EA literature, (7) I discuss the limitations of this paper and (8) I conclude the paper.

2. Previous EA Literature Reviews

Since the appearance of EA as an independent discipline there have been several attempts to analyze the general state of EA research with comprehensive EA literature reviews. In the next paragraphs, I will discuss in detail all the previous comprehensive reviews in a chronological order.

Langenberg and Wegmann[31] presented the first EA literature review. They reviewed 80 EA publications and analyzed their distribution according to time, topics (overview, usage, modeling, framework and design principles), communities (academics, consulting companies, research agencies, software houses, adopter companies, governmental players and other players), reference disciplines (business, IT, business and IT and other) and lifecycle activities (research, implementation and adoption). Langenberg and Wegmann[31] concluded that the EA discipline is driven largely by consulting companies, lacks basic research and focuses only on the top-down approach to EA, which implies organization-wide EA planning strictly following formal step-wise processes starting from identifying strategic business objectives.

Radeke[30] presented the EA literature review covering 341 publications intended to explore the claim that EA research is predominantly prescriptive in nature. For that purpose he classified EA publications into five theory types proposed by Gregor[41] (analysis, explanation, prediction, explanation and prediction, design and action). Additionally, he analyzed content and empirical validity of EA publications. Radeke[30] demonstrated that EA publications in general are prescriptive in nature and low on empirical validity.

Mykhashchuk *et al.*[32] reviewed 299 EA publications and analyzed their geographical distribution by country, distribution over time, types (conference proceeding, journal article, electronic article, book, book chapter, report and thesis), major EA research groups (academics, research organizations, consulting companies, IT companies, industry, public sector) and a number of citations. As a result, Mykhashchuk *et al.*[32] presented a decent analysis of the origins and geography of EA publications.

Simon *et al.*[29] presented the most comprehensive EA literature review up to date and analyzed 608 publications. They used bibliometric methods and qualitative interpretation to provide a "big picture" of the EA literature. As a result, they presented the outcomes of distribution-in-time analysis, co-authorship analysis,

Table 1. Summary of the comprehensive EA literature reviews.

Publication	Scope	Method(s)	Focus
Langenberg and Wegmann[31]	80 academic and industry publications referring the term "EA" between 1987 and 2004 found in the World Wide Web	Origin analysis Content analysis	Distribution in time Topics Communities Reference disciplines Lifecycle activities
Radeke[30]	341 academic and industry publications referring the term "EA" between 1987 and 2009 found in scientific databases (EBSCOhost, SpringerLink, etc.) and EA-related sources (JEA, TEAR, etc.)	Content analysis	Theory types Content Empirical validity
Mykhashchuk et al.[32]	299 academic and industry publications referring the terms "EA", "Enterprise Architecture Management (EAM)", and their German equivalents between 1987 and 2010 found in Google Scholar	Origin analysis	Geographical distribution Distribution in time Publication types EA research groups Citations
Simon et al.[29]	608 academic and industry publications referring the term "EA" and its German equivalent as well as related terms ("IT Architecture", "Data Architecture", etc.) between 1987 to 2010 found in Google Scholar, scientific databases and simple Google searches	Bibliometric analysis Content analysis	Distribution in time Co-authorship patterns Citations Co-citation patterns Content

citation analysis, co-citation analysis and content analysis. Therefore, Simon et al.[29] presented an exhaustive and rigorous bibliometric analysis (co-authorship, citation and co-citation analysis) of EA publications. The analysis of the previous comprehensive EA literature reviews is summarized in Table 1.

Besides the comprehensive EA literature reviews discussed above, many authors presented partial EA literature reviews addressing narrow EA-related topics or specific EA issues, however, I will not discuss them in detail. The analysis of the partial EA literature reviews is summarized in Table 2.

Table 2. Summary of the partial EA literature reviews.

Publication	Topic or Issue Addressed in the Review
Niemi[42]	EA benefits
Niemi[43]	EA stakeholders
Schoenherr[44]	EA terminology
Schelp and Winter[33]	EA language communities
Stelzer[45]	EA principles
Boucharas *et al.*[46]	EA benefits
Lucke *et al.*[47]	EA development process and its problems
Radeke[48]	EA and strategic change
Tamm *et al.*[21]	EA benefits
Haki and Legner[49]	EA principles
Lange *et al.*[50]	EA benefits
Labusch and Winter[51]	EA and enterprise transformations
Mueller *et al.*[52]	EA and network organizations
Schneider *et al.*[53]	EA goals
Andersen and Carugati[54]	EA evaluation
van den Berg and van Vliet[55]	EA and decision-making
Petrikina *et al.*[56]	EA and business models
Bakar *et al.*[57]	EA establishment process
Kotusev *et al.*[58]	EA management
Rouhani *et al.*[59]	EA implementation methodologies

Therefore, the previous comprehensive EA literature reviews (see Table 1) presented important general weaknesses of EA research,[30,31] decent analysis of the origins and geography of EA publications[32] and exhaustive bibliometric analysis.[29] However, the content analysis presented in these reviews,[29–31] unfortunately, was limited to classifying EA publications according to certain frameworks that were chosen deductively before the analysis rather than came out of it inductively. As a result, none of the previous comprehensive EA literature reviews, arguably, showed the full variety of topics discussed in EA publications and provided a systematic view of the whole EA discipline. At the same time, the partial EA literature reviews (see Table 2) addressed only narrow EA-related topics or issues that covered only a small fraction of all EA publications.

Consequently, at the present moment research methodologies used in EA research are largely unknown, the scope of the whole EA discipline is quite blurred, the spectrum of topics discussed in EA publications is rather vague and the progression of the EA research stream over time is obscure. Therefore, the past of EA research still remains largely unclear. Unsurprisingly, this conclusion resonates with the conclusion of the previous EA literature review: "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" (see p. 4 in Ref. 29).

3. Review Methodology

A comprehensive analysis of the EA discipline requires the selection of an exhaustive set of EA publications as well as a deep qualitative scrutiny of their contents.

3.1. *Selection of relevant publications*

Even though the publications from the pre-EA (BSP) period that started in the 1960s (Ref. 10) discussing similar architecture-based information systems planning methodologies[60–63] can be considered as relevant to EA, this research covers the EA discipline only since the early EA period that began in the late 1980s (Ref. 10), when the first widely known EA frameworks appeared,[16,22] and the term "EA" started to be consistently used.[64] Therefore, the PRISM architecture framework[16] is the earliest EA publication included into this review.

For this review, I searched for publications in English with the titles containing the following keywords: "Enterprise Architecture", "Enterprise Architectures", "Enterprise Architecting", "Enterprise Architectural", "Enterprise Architect", "Enterprise Architects" as well as the popular abbreviations "EA" and "EAM". Later searches for other related terms like "IT Architecture", "IS Architecture", "Business Architecture" or "Information Architecture" have been stopped because of their marginal effectiveness since the vast majority of their results were irrelevant to EA, while most of their relevant results[65–67] have been already found previously via studying references.

In order to conduct a comprehensive EA literature review I did not concentrate only on the top journals and conferences.[68] Due to the significant influence of non-academic EA publications,[21,29,32] industry EA publications have been also reviewed. Therefore, this literature review was based on 229 ranked IS journals recommended by the Australian IS research councils,[69,70] 234 ranked IS conferences recommended by the Australian Research Council[71] and available books for EA practitioners. Additionally, unranked but EA-related Journal of Enterprise Architecture (JEA), Trends in Enterprise Architecture Research Workshop (TEAR), International Workshop on Enterprise Modelling and Information Systems Architectures (EMISA), Working Conference on Practice-Driven Research on Enterprise Transformation (PRET) and EA research briefings of the MIT Center for Information Systems Research (CISR) have been also included as potential sources of relevant EA publications. The detailed list of the sources searched in this review can be found in Appendix A.

In the edited books with the titles containing the required keywords all the chapters were treated as relevant to EA regardless of their titles. In the sources specifically focused on EA (JEA, TEAR, CISR) all publications were treated as relevant regardless of their titles. Additionally, all the top-cited EA publications[29,32] were treated as relevant regardless of their titles or origins.

Google Scholar has been used as a primary search engine for this review. However, IEEE Xplore, AIS Electronic Library, SpringerLink and ACM Digital Library have been also used as secondary search engines to double check all the results. Additionally, books for EA practitioners have been searched from the Amazon website.

The main phase of the literature review started in the second half of 2013 and finished in the middle of 2014. After that, all the results had been double-checked

and updated in the end of 2015 and then in March of 2016 to ensure the inclusion of all late 2015 publications. Therefore, this review covers all the available EA publications from 1986 up to the end of 2015.

3.2. *Identification of EA-related topics*

The EA research stream is diverse and addresses very different EA-related topics. However, there are no established lists of EA-related topics or EA-focused keyword schemes similar to other keyword schemes generally used to classify IS publications.[72–75] Moreover, some key EA-related terms are not clearly defined and used inconsistently in the existing EA literature (see Appendix F for a detailed discussion of the main EA-related terminological problems).

Therefore, it is impossible to categorize EA publications according to any predefined classification framework in a straightforward deductive manner following the majority of other IS literature reviews.[34–37,39,76] Instead, purely inductive coding procedure should be used to establish the list of EA-related topics and classify the publications.[40,77] Consequently, I followed the inductive coding methodology identical to the one used by Swanson and Ramiller[40] for classifying publications with the only exception that I associated each EA publication with several topics if necessary rather than strictly with one topic. Although multi-topic classification is potentially more complex, it is necessary for the adequate categorization of EA publications since they include a significant number of EA books covering multiple topics. Moreover, a multi-topic classification is more precise.

In order to establish the list of EA-related topics in an inductive manner I applied the open coding procedure[78,79] to the set of identified EA publications. Following the open coding procedure, in line with Swanson and Ramiller,[40] I studied a portion of EA publications, classified them into topics, added new topics when new motives emerged (however, taking a parsimonious attitude), updated the previously established classification scheme, resolved conflicts, achieved convergence, reclassified corresponding publications and then repeated this procedure in an iterative manner until all publications had been studied and the list of topics converged to its final version. This coding procedure heavily relied on the constant comparative method,[78,80,81] i.e. continuous comparison of identified topics with each other, finding differences and similarities between them, merging and regrouping established subtopics into broader topics.

For each publication I read abstract, introduction and conclusions as well as extracted the main results and outcomes from the body of the publication. Studying was never limited only to examining titles, abstracts or keywords. Importantly, the topics coding was based on the essence and meaning of the information provided in EA publications, rather than on specific terms or keywords. This meaning-based coding approach helped minimize the potential problems with inconsistent terminology and homonyms (see Appendix F).

During the open coding procedure I used a review protocol describing all currently identified topics and subtopics to assure reliability, maintain consistency

and achieve better objectivity in the topics coding. At the end of the coding procedure this review protocol naturally evolved into the detailed description of identified EA-related topics provided in Appendix C.

In order to achieve earlier convergence, the most influential EA publications[29,32] largely defining the whole EA research stream had been studied in the first iterations. However, the list of topics underwent many iterative revisions before converging to its final state. Many publications were restudied and reclassified several times, but each publication was studied and classified independently at least twice. Publications were allocated to a certain topic only if they contained articulate and substantial information relevant to it. New topics were introduced when at least three distinct publications on the similar subject were identified. Importantly, publications were allocated to topics based on similarities between the questions they discuss, rather than on similarities between the answers they provide. This questions-based coding approach helped group EA publications providing different answers to similar questions into consistent topics.

At the end of the coding procedure the list of EA-related topics converged to its final stable version embracing all the considerable subjects discussed in EA publications, arguably, reflecting EA research comprehensively with a certain level of objectivity. As a result, I inductively coded the whole variety of issues discussed in all the identified EA publications and grouped them into 42 corresponding narrow EA-related topics representing the final result of the open coding procedure.[78,82] However, many EA publications had unclear motives, were too generic or discussed unique questions addressed in less than three publications. All these publications had been allocated to additional other topic. On average, one EA publication is relevant to 1.74 topics.

4. Review Results

The selection of a comprehensive set of available EA publications according to the selection methodology described above allows conducting an exhaustive statistical analysis of the EA research stream.

4.1. *Statistics of EA publications*

In the course of this review I identified the primary set of 1008 publications satisfying the required selection criteria according to the review methodology described above. Moreover, during the studies of the primary publications I identified 290 additional publications potentially relevant to EA referenced from the primary publications. Therefore, totally I identified 1298 publications (373 journal articles, 623 conference proceedings, 73 books, 134 book chapters and 95 other publications) potentially relevant to EA.

However, 199 of these 1298 publications were found irrelevant to EA and excluded from the analysis due to various reasons discussed further. Many publications[83,84] included the words "Enterprise" and "Architecture" in their titles which

were unrelated to each other and actually discussed the topics irrelevant to EA. Some publications[85–89] used the term "EA" when they had actually meant Software Architecture, System Architecture, IT Architecture or IT Landscape instead of EA. Some publications[90,91] were irrelevant to EA despite being published in the sources specifically focused on EA (JEA, TEAR, CISR).

Some publications,[92–96] though being relevant to EA, were reprinted copies of earlier publications, abridged versions of other publications, conference proceedings fast-tracked to journals or books containing collections of previously published articles and were excluded from further consideration. Totally I removed 24 duplicate publications.

Therefore, totally I identified and studied 1075 original publications relevant to EA including 309 (28.7%) journal articles, 539 (50.1%) conference proceedings, 56 (5.2%) books, 101 (9.4%) book chapters and 70 (6.5%) other publications. All further analysis and conclusions are based on the information found in these publications.

All the studied EA publications have been classified according to types of their sources into three broad non-overlapping categories: ranked general (published in academically ranked general IS journals and conferences, see Tables A.1 and A.2), unranked general (published in academically unranked general IS sources, for instance, IT Professional magazine or books for practitioners) and unranked EA-focused (published in academically unranked EA-focused sources: JEA, TEAR, CISR, see Table A.3). Of all 1075 EA publications, 436 (40.6%) have been classified as general ranked, 395 (36.7%) as general unranked and 244 (22.7%) as EA-focused unranked. The distribution of EA research by time and source type is shown in Fig. 1.
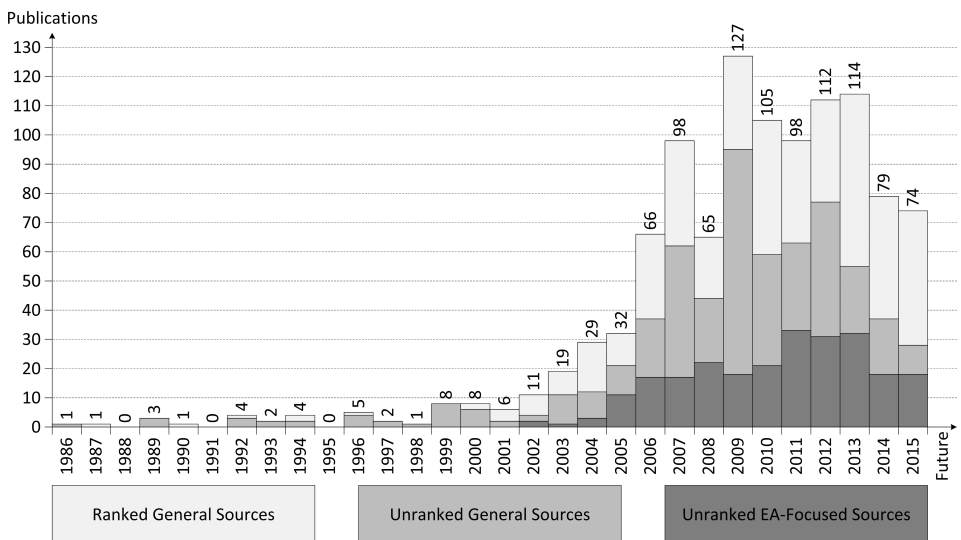

Fig. 1. Distribution of EA research by time and source type.

In line with other IS literature reviews,[97–101] all EA publications have been classified according to their research methodologies into the following categories relevant to EA research: conceptual (based on conceptual arguments or anecdotal evidence), literature review (based on formal literature reviews), interviews (based on separate interviews), single case study (based on single case studies), multiple case studies (based on multiple case studies), survey (based on surveys) and mixed (based on combinations of two or more methods). Of all 1075 EA publications, 583 (54.2%) have been classified as conceptual, 23 (2.1%) as literature review, 37 (3.4%) as interviews, 213 (19.8%) as single case study, 102 (9.5%) as multiple case studies, 72 (6.7%) as survey and 45 (4.2%) as mixed (other methods, for instance ethnography or experimental research, have never been used in the EA discipline). The conceptual and literature review methodologies represent non-empirical research methods, the interviews, single case study and multiple case studies methodologies represent qualitative empirical research methods, while the surveys methodology represents quantitative empirical research methods.

Additionally, all EA publications have also been classified according to their general attitudes along with two important orthogonal dimensions in the context of EA research. The first dimension is non-empirical (corresponds to the conceptual and literature review research methodologies) and empirical (corresponds to all other research methodologies). The second dimension is prescriptive (corresponds to theory for design and action which "says how to do something", see Ref. 41) and descriptive (corresponds to all other theory types, i.e. analyzing, explaining and predicting, which do not provide any actionable prescriptions, see Ref. 41. The intersection of these two orthogonal dimensions produces the classification of EA publications into four non-overlapping general attitudes: non-empirical descriptive, non-empirical prescriptive, empirical descriptive and empirical prescriptive. Of all 1075 EA publications, 266 (24.7%) have been classified as non-empirical descriptive, 340 (31.6%) have been classified as non-empirical prescriptive, 324 (30.1%) have been classified as empirical descriptive and 145 (13.5%) have been classified as empirical prescriptive. More detailed statistics on the distribution of EA publications by type, source type, source, research methodology and attitude can be found in Appendix B.

4.2. *Analysis of the EA publications statistics*

Several conclusions can be made from the detailed statistics of EA publications. Firstly, the time distribution of EA publications (see Fig. 1) clearly shows three different periods of EA research: (1) the period of little attention ranging from the appearance of the first EA publication in 1986,[16] till 1998 when annual numbers of EA publications did not exceed 5, (2) the period of rapid explosive growth in 1999–2006 when annual numbers of EA publications increased exponentially from 8 to 66 and (3) the peak period in 2007–2013 when annual numbers of EA publications oscillated around 100. The slight decline of the annual number of EA

publications to 79 in 2014 and to 74 in 2015 can, arguably, signify the beginning of a downward trend in publication numbers. This time distribution of EA publications highly correlates with the typical lifecycle of management fashions that "tend to have a lifecycle characterized by a long latency phase followed by a wave-like, often asymmetrical and ephemeral popularity curve" (see p. 731 in Ref. 102). Therefore, EA can be heavily hyped and can even be a typical management fad promoted by fashion-setting networks (consultancies, gurus, business mass media, etc.), especially if the decrease of the EA publications numbers in 2014–2015 indeed starts a long-term downward trend that will persist in the future.[103–108]

Secondly, less than one third (28.7%) of EA research was published in journals, while more than a half (50.1%) of it was presented on conferences (see Table B.1). Moreover, almost a half (47.9%) of all EA journal articles have been published in the EA-focused Journal of Enterprise Architecture (JEA) (see Table B.3), while only six EA articles[7,109–113] appeared in the leading IS journals.[114] The historical analysis (see Table B.1), arguably, does not suggest any clear improvements or changes in the publications patterns over the years. Therefore, EA research is significantly misrepresented in the leading IS journals.

Thirdly, less than a half (40.6%) of EA research was published in academically ranked general IS outlets, while more than half of it was published in unranked general IS outlets (36.7%) and in specific unranked EA-focused sources (22.7%) (see Table B.2). Moreover, the time distribution of EA publications by source type (see Fig. 1) suggests that the EA discipline started mostly from non-academic practitioner-oriented publications and only later attracted significant academic attention (arguably, in 2001) and established specialized EA-focused sources (Journal of Enterprise Architecture was established in 2005). Therefore, EA research is mostly represented by the publications in non-ranked outlets many of which are oriented toward EA practitioners and might be lacking sufficient academic rigor. However, the historical analysis (see Fig. 1), arguably, shows a recent trend toward the increased presence of EA publications in academically ranked general outlets.

Fourthly, almost a half (48.4%) of all EA publications appeared in the top 10 most popular sources (Journal of Enterprise Architecture, TEAR, EDOC, HICSS, Books for EA practitioners, AMCIS, ECIS, CAISE, Advances in Government Enterprise Architecture and IT Professional) (see Table B.3). Therefore, EA research is highly concentrated in a small number of specific sources.

Fifthly, more than a half (54.2%) of all EA research is purely conceptual, while only a small portion of it (6.7%) is based on surveys (see Table B.4). This distribution by research methodologies is significantly different from the methodological patterns of the leading IS journals,[39,97,115] where surveys is the dominant research methodology and conceptual articles are not that prevalent. Therefore, the empirical validity of the whole EA research stream is generally low because

it is mostly represented by the publications based only on speculative considerations or anecdotal evidence. However, the historical analysis (see Table B.4), arguably, shows a recent trend toward the increased use of empirical methods in EA research.

Sixthly, almost a half (45.1%) of all EA research is purely prescriptive. Moreover, more than two thirds (70.1%) of all prescriptive EA research is non-empirical (see Table B.5). Therefore, EA research is highly influenced by purely speculative or anecdotal prescriptions. This significant influence of empirically unsubstantiated prescriptions on the EA discipline supports the proposition formulated earlier that EA can be heavily hyped and can even be a management fad. Moreover, the time distribution of EA publications according to their attitudes demonstrates interesting historical patterns. The distribution of EA research by time and attitude is shown in Fig. 2.

The historical distribution of EA publications by their attitudes (see Fig. 2) shows that during its early period the EA research stream has been dominated by non-empirical prescriptive publications. Specifically, 31 of 46 or two thirds (67.4%) of all EA publications issued before 2002 are non-empirical and prescriptive in nature. Among these early non-empirical prescriptive EA publications is the well-known Zachman Framework,[22,116–118] which is considered as a seminal publication for the entire EA discipline by many authors.[17–21,29] However, Ylimaki and Halttunen (p. 189 in Ref. 119) argue that it is "hard to find scientific studies on applying or utilizing the Zachman framework". "We made a considerable effort in searching for scientific research on the Zachman framework. As a result, it seems
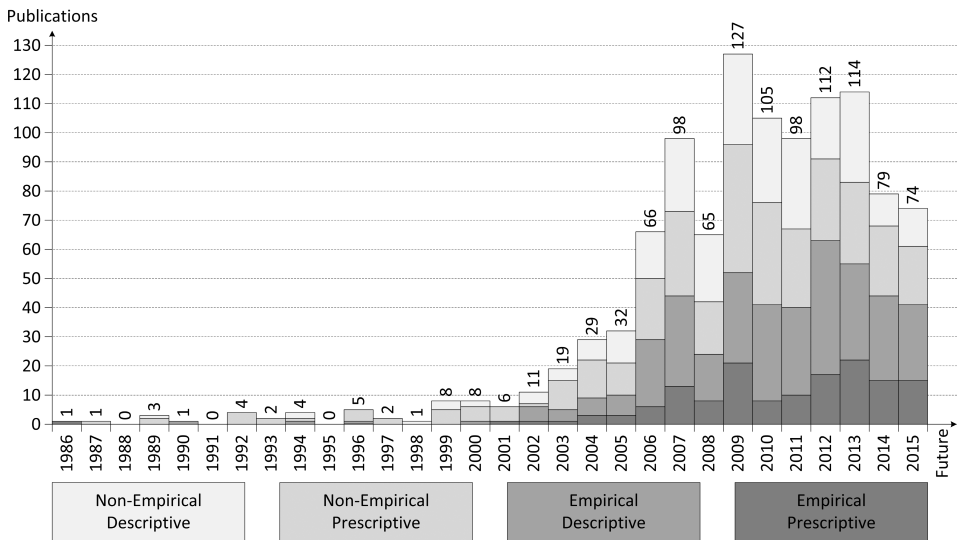

Fig. 2.   Distribution of EA research by time and attitude.

that there is a lack of scientific studies on the application of the Zachman framework — and analyzing its applicability — in practice" (see p. 190 in Ref. 119). This review completely supports the conclusions of Ylimaki and Halttunen[119] since no examples of the actual practical application of the Zachman Framework in real organizations have been found in the 1075 studied EA publications. Moreover, other highly cited early non-empirical prescriptive EA publications, including the Enterprise Architecture Planning (EAP) methodology[120] and the Federal Enterprise Architecture Framework (FEAF),[121,122] also have no scientifically validated examples of their successful practical implementation in the studied EA literature. This fact, arguably, suggests that many early non-empirical prescriptive EA publications, despite being widely cited,[29] have not been properly validated with independent empirical studies, but rather considered by the EA research community essentially as "self-evidently correct, somehow above the need for empirical proof" (see p. 13 in Ref. 123). These non-empirical, prescriptive, but not empirically validated origins of the EA discipline, arguably, suggest that the general empirical validity of the EA discipline might be less than perfect. However, the historical analysis (see Fig. 2), arguably, shows that the noticeable stream of empirical EA research started since 2002. Moreover, the historical analysis, arguably, shows a recent trend toward the decreased presence of non-empirical prescriptive EA publications.

To summarize, the analysis of the whole EA research stream shows that EA, despite its evident practical importance, high potential and widespread use,[5,124,125] is still highly influenced by speculative prescriptions, highly concentrated in specific sources, discussed mostly at conferences, poorly represented in the leading academic journals, somewhat isolated from the mainstream academic IS research and represented mostly by publications in non-ranked outlets. The majority of EA publications are non-empirical, the empirical validity of the EA discipline might be less than perfect and the whole EA research stream can even be heavily hyped.

These conclusions largely support the findings of the previous EA literature reviews.[21,30–32] However, recent trends toward the increased presence of EA publications in academically ranked general outlets, toward the increased use of empirical methods in EA research and toward the decreased presence of non-empirical prescriptive EA publications can, arguably, be noticed.

5. Topics Discussed in EA Publications

In the previous section, I presented and analyzed the basic statistics of EA publications including their distribution by time, type, source type, source, research methodology and attitude (see Appendix B). Now, in line with other IS literature reviews,[34–37,39,40] I will present the distribution of EA publications by the topics they discuss.

5.1. *List of identified EA-related topics*

Using the coding methodology described earlier for identifying EA-related topics I inductively coded the whole variety of issues discussed in 1075 EA publications and grouped them into 42 corresponding narrow EA-related topics. Additional other topic was added to group all unclear, overly generic or unique EA publications. On average, one EA publication is relevant to 1.74 topics. The resulting topics represent cohesive clusters of publications addressing similar EA-related issues and questions. Each topic is related to EA, but discusses a unique aspect of an EA practice. Therefore, the identified topics do not overlap with each other and can be potentially studied independently since a significant knowledge of one topic may require only a basic understanding of other EA-related topics.

The brief description of all identified EA-related topics sorted by the total number of relevant publications with exemplars representing the most articulate EA publications related to these topics is summarized in Table 3. The detailed description of these EA-related topics can be found in Appendix C.

Table 3. Summary of the topics discussed in EA publications.

Topic	Description	Exemplary Publications	Number
Modeling	Specific modeling languages, graphical notations and other methods to represent individual EA artifacts	Rohloff,[127] Holt and Perry,[128] Lankhorst[129]	143 (13.3%)
Structure[a]	How EA artifacts should be structured to be manageable and adequately describe enterprises, i.e. taxonomies and layers for organizing EA artifacts	PRISM,[16] Sowa and Zachman,[116] van't Wout *et al.*[130]	136 (12.7%)
EA in Public Sector	EA practice in public sector, national governments and other non-profit organizations	Peristeras and Tarabanis,[112] Gregor *et al.*,[131] Valtonen *et al.*[132]	111 (10.3%)
Development	More or less formal processes or sequences of steps necessary to plan and develop EA documentation based on some higher-level considerations (e.g. business strategy and operating model, see Basis topic), i.e. processes and steps for creating EA artifacts	Spewak and Hill,[120] Glissmann and Sanz,[133] TOGAF[134]	101 (9.4%)
Benefits	How EA practice benefits organizations	Boucharas *et al.*,[46] Tamm *et al.*,[21] Bradley *et al.*[110]	97 (9.0%)

[a]Among other publications, Structure topic includes all EA frameworks providing taxonomies for organizing EA artifacts, e.g. the Zachman Framework,[22] PRISM[16] and E2AF[126] (see Appendix F).

Table 3.   (*Continued*)

Topic	Description	Exemplary Publications	Number
Frameworks Analysis[b]	Analysis, comparison and selection of EA frameworks. Importantly, EA frameworks themselves are not related to this topic	Greefhorst *et al.*,[135] Alwadain *et al.*,[136] Zandi and Tavana[137]	87 (8.1%)
Application	Potential applications of EA in organizations	Pulkkinen *et al.*,[138] Barateiro *et al.*,[139] Abraham *et al.*[140]	81 (7.5%)
Maturity	How EA practice matures and how the maturity of EA practice can be measured or assessed	Ross,[67] NASCIO,[141] GAO[142]	76 (7.1%)
Analysis	Formal methods for analyzing EA documentation	Lagerström *et al.*,[143] Narman *et al.*,[111] Quartel *et al.*[144]	62 (5.8%)
Artifacts	Artifacts, documents, products or deliverables that can be used to describe EA (e.g. business capability models, application portfolios, data models, network diagrams, etc.) and their properties	Spewak and Hill,[120] van't Wout *et al.*,[130] Bernard[17]	54 (5.0%)
Tools	Tool support for EA practice	Ernst *et al.*,[145] Le and Wegmann,[146] Buschle *et al.*[147]	54 (5.0%)
EA and SOA	Relationship between EA and SOA, potential synergy between them and use of SOA in the EA context	Schelp and Aier,[148] Kistasamy *et al.*,[149] Alwadain *et al.*[150]	49 (4.6%)
Measurements	How the outcomes, effects and results of EA practice can be measured	Schekkerman,[151] Schelp and Stutz,[152] Lange *et al.*[153]	48 (4.5%)
Principles	How principles can be used to describe EA and the role of principles in EA practice	Richardson *et al.*,[113] Greefhorst and Proper,[12] Haki and Legner[154]	45 (4.2%)
Function	Organization of EA as an organizational function, i.e. EA governance structures, boards, committees, roles and their responsibilities	van der Raadt and van Vliet,[155] Turner *et al.*,[156] Hobbs[157]	44 (4.1%)

(*Continued*)

[b]Due to its ambiguity and inconsistent usage, the term "framework" can hardly be used for a meaningful classification of EA publications (see Appendix F). As a result, Frameworks Analysis topic was established merely to group all publications analyzing or comparing other publications titled as "frameworks", while "real" EA frameworks (Zachman, TOGAF, FEAF, etc.) have been allocated to other topics reflecting their true meaning, not titles. For instance, Zachman[22] is related only to Structure topic because it describes only a taxonomy for organizing EA artifacts, while TOGAF[134] is related to Development, Artifacts and other 18 topics because its ∼700 page manual provides articulate and substantial information relevant to 20 different topics (see Appendix F). This meaning-based classification approach, arguably, provides much more clear and accurate analysis of the EA discipline.

Table 3.   (*Continued*)

Topic	Description	Exemplary Publications	Number
Integration	How EA practice should be integrated with other organizational processes and activities	Radeke and Legner,[158] Lux and Ahlemann,[159] Legner and Lohe[160]	44 (4.1%)
Implementation	How EA should guide the actual information systems implementation, i.e. the development of IT systems according to the descriptions provided by EA artifacts	Armour and Kaisler,[161] Foorthuis and Brinkkemper,[162] Foorthuis *et al.*[163]	40 (3.7%)
Levels	How EA in large enterprises should be separated into several architectural levels (e.g. enterprise, segment and line-of-business) with different scopes and granularities	Hjort-Madsen and Gotze,[164] Pulkkinen,[165] Bruls *et al.*[166]	40 (3.7%)
Problems	Potential problems, challenges, worst practices, risks and common reasons for failure of EA practice	Kaisler *et al.*,[167] Zink,[168] Lohe and Legner[19]	39 (3.6%)
Management	General high-level underlying logic of EA practice	Wagter *et al.*,[169] Ross *et al.*,[125] TOGAF[134]	35 (3.3%)
Architects	Profession, skills, traits, attitudes, personality types, competences and responsibilities of enterprise architects	Steghuis and Proper,[170] Evans,[171] Gotze[172]	32 (3.0%)
Basis	What considerations should be taken as the basis for creating EA artifacts (e.g. business strategy and operating model), i.e. as an input for the EA development process	Sauer and Willcocks,[173] Ross,[174] Bernard[17]	26 (2.4%)
Success Factors	Factors influencing success of EA practice and facilitating the realization of expected benefits	Bricknall *et al.*,[175] Ylimaki,[176] Schmidt and Buxmann[7]	24 (2.2%)
Initiation	How to initiate and start EA practice from scratch	Armour *et al.*,[177] Blumenthal,[178] Ahlemann *et al.*[179]	22 (2.0%)
Stakeholders	EA stakeholders, ways to manage and involve them, their interests, needs, roles, concerns and communication	Niemi,[43] Thornton,[180] van der Raadt *et al.*[181]	21 (2.0%)
Design	How EA practice (as a set of all EA-related organizational structures, roles, processes, activities, documents, etc.) should be designed in order to fit the context of a particular organization, i.e. organization-specific design of EA practice	Saha,[182] Haki *et al.*,[183] Park *et al.*[184]	17 (1.6%)

Table 3.   (*Continued*)

Topic	Description	Exemplary Publications	Number
Coordination	How the efforts of different EA teams should be coordinated in decentralized or federated EA practices	Fonstad and Robertson,[185] van der Raadt and van Vliet,[155] Espinosa *et al.*[186]	15 (1.4%)
Patterns	General reusable solutions to commonly occurring problems in EA development	Cloutier and Verma,[187] Sasa and Krisper,[188] Perroud and Inversini[189]	14 (1.3%)
Reference Models	EA reference models for various industries or governments	Wilson *et al.*,[190] van der Beek *et al.*,[191] FEAF[192]	14 (1.3%)
Repository	Organization of a repository for EA artifacts or documents	Buckl *et al.*,[193] Hinkelmann *et al.*,[194] Darling[195]	14 (1.3%)
Culture	Cultural, political, social and psychological issues in EA practice	Nevelow,[196] Niemietz *et al.*,[197] Aier[198]	12 (1.1%)
Automation	Automation of the creation and maintenance of EA documentation	Buschle *et al.*,[199] Hauder *et al.*,[200] Farwick *et al.*[201]	11 (1.0%)
EA in SMEs	EA practice in small and medium enterprises (SMEs)	Alm and Wißotzki,[202] Ingelbeen and Bernaert,[203] Fallmyr and Bygstad[204]	11 (1.0%)
EA and Cloud	Relationship between EA and cloud computing and potential synergy between them	Farwick *et al.*,[205] Mahmood,[206] Raj and Periasamy[207]	10 (0.9%)
EA in Virtual Enterprises	EA practice in virtual enterprises	Goel *et al.*,[208] Mueller *et al.*,[52] Bakhtiyari *et al.*[209]	10 (0.9%)
EA and ITIL	Relationship and potential synergy between EA, ITIL and ITSM in general	Braun and Winter,[210] Vicente *et al.*,[211] Vicente *et al.*[212]	9 (0.8%)
Education	Issues related to EA education and teaching EA at universities	Stewart,[213] Gamble,[214] Steenkamp *et al.*[215]	9 (0.8%)
EA and BPM	Relationship between EA and BPM and potential synergy between them	Flender and Rosemann,[216] Jensen,[217] von Rosing *et al.*[218]	6 (0.6%)
Review	EA literature reviews discussing and analyzing EA research in general, its status, characteristics, problems, issues, terminology and other questions	Langenberg and Wegmann,[31] Mykhashchuk *et al.*,[32] Simon *et al.*[29]	6 (0.6%)
Acceptance	Acceptance, adoption and institutionalization of EA practice in organizations in a long-run	Ahlemann *et al.*,[179] Weiss *et al.*,[219] Hazen *et al.*[220]	5 (0.5%)
EA and Outsourcing	Relationship and interaction between EA and IT outsourcing	Ross and Westerman,[221] Ross and Beath,[222] Hamlett[223]	4 (0.4%)

(*Continued*)

Table 3.   (*Continued*)

Topic	Description	Exemplary Publications	Number
Audit	Audit of the quality of EA practice encompassing both EA documentation and EA-related processes	Bernard and Grasso,[224] Bernard and Grasso,[225] Grasso[226]	3 (0.3%)
Other	Publications that are relevant to EA but cannot be allocated to any particular topic or grouped into separate topics	Jha and Mowbry,[227] Murchland,[228] Nakakawa *et al.*[229]	188 (17.5%)

Table 3 presents a 10000-feet view of the present EA research stream and demonstrates what questions have been discussed since the appearance of EA as an independent discipline as well as which questions attracted the most attention. The detailed description of all EA-related topics can be found in Appendix C. More detailed statistics on the distribution of EA-related topics by first appearance, time, publication type, research methodology and attitude can be found in Appendix D.

5.2. *Analysis of EA-related topics*

Two general conclusions can be made from the detailed statistics of EA-related topics. Firstly, the EA research stream is very diverse and contains a large number of articulate topics representing the clusters of publications discussing similar EA-related issues. The historical analysis (see Table D.1) shows that different EA-related topics constituting the whole research stream emerged gradually over time. Consequently, there is a clear trend suggesting that EA research gradually becomes more diverse since the number of EA-related topics is continuously increasing. Moreover, the sequence of topics emergence (see Table D.1) shows that the EA discipline has started from the discussion of basic topics including Structure (1986), Development (1986) and Modeling (1989) of EA, then progressed to intermediate topics including Stakeholders of EA (1999), organization of EA Function (1999), profession of Architects (2000) and Measurements of EA practice (2000), and later developed to highly-specific topics including the relationship between EA and specific management practices like Outsourcing (2004), BPM (2007) or ITIL (2007) and specific technologies like SOA (2006) or Cloud (2010). This sequence, arguably, reflects the natural evolution of any discipline from foundational topics to more advanced ones.

Secondly, the historical analysis of EA-related topics (see Table D.2), arguably, suggests that all EA-related topics can be classified into four categories according to their lifecycle phases within the broader EA research stream: saturated, active, faddish and emerging. Saturated topics emerged relatively long ago, passed through periods of peak attention at some moments in the past and the interest to them is currently declining. These topics are typically foundational and well-understood topics of the EA discipline with little novelty, disagreement and controversy around

them, for instance Development, Implementation and Structure. Researchers aiming to focus their efforts on saturated topics, arguably, should provide a compelling motivation or need for some additional studies of these common place topics before commencing their research. Active topics emerged certain time ago and are currently on their peaks of attention. These topics are typically relatively basic and well-understood topics of the EA discipline with some unresolved problems, open questions and controversy around them, for instance Artifacts, Modeling and Tools. Researchers aiming to focus their efforts on active topics, arguably, should understand current problems, questions and controversial points in these established topics before commencing their research. Faddish topics emerged certain time ago, achieved their attention peaks very quickly and then faded away quickly as well. These topics are typically short-lived tangential topics of the EA discipline largely inspired by passing bursts of interest to specific technologies or management practices, for instance EA and BPM, EA and Outsourcing, EA and SOA. Researchers aiming to focus their efforts on faddish topics, arguably, should ensure that these topics are still relevant and really deserve any long-term attention before commencing their research. Emerging topics emerged relatively recently and the interest to them is currently growing. These topics are typically novel, risky and poorly understood topics of the EA discipline with little agreement, established concepts or theories, for instance Acceptance, Automation and Culture. Researchers aiming to focus their efforts on emerging topics, arguably, should be prepared for an inductive exploration and consider carefully the potential long-term impact of selected topics before commencing their research since some of these topics might later turn out faddish with little real importance.

Additionally, the analysis of the identified EA-related topics suggests that some seemingly important topics might be undeservingly missing in the current EA research stream, even though this conclusion is largely speculative and highly subjective.[c] Firstly, despite the existence of multiple established EA methodologies and frameworks,[17,120,130,134] the strict following of these EA methodologies and frameworks is recognized as one of the worst EA practices.[230] Unsurprisingly, most companies simplify and adapt them to their specific needs or even use them only as idea contributors.[231–237] However, the practical adaptation of the existing EA methodologies to the needs of specific organizations is not described in the available EA literature.[237] Consequently, adaptation topic might be an important future topic in the EA discipline addressing the questions related to the practical adaptation of the existing EA methodologies. Secondly, EA is practiced in

[c]The three future topics discussed in this paper (Adaptation, EA in Different Industries and Standards) represent merely the speculative opinion of the author regarding the potential future EA research directions. These topics should be considered only as selective examples of some insufficiently studied areas of the EA discipline, rather than as an exhaustive and substantiated list of directions for future research. There might be many more other future topics considered as important by other authors. However, a comprehensive analysis of the potential future EA research directions is not the goal of this paper.

very diverse industries including banking,[233,238,239] agriculture,[240,241] healthcare,[242] insurance,[236,243] retail[244] and even oil industry.[113] At the same time, it is generally acknowledged that there are no universal one-size-fits-all approaches to EA practice suitable for all organizations and industries.[58,182,184] However, features and peculiarities of the EA approaches suitable for different industries have not been studied in the current EA research. Consequently, EA in different industries topic might be an important future topic in the EA discipline addressing the questions related to the industry-specific differences in EA practices across various industries. Thirdly, similarly to EA principles, EA standards are essential components of an EA practice and their usage is implied by most EA methodologies.[17,120,130,134] However, unlike EA principles which are actively studied in the EA literature,[12,45,113,154,245] there is arguably only one publication[109] deliberately addressing the usage of EA standards. Consequently, standards topic might be an important future topic in the EA discipline addressing the questions related to the role and usage of EA standards. Therefore, adaptation, EA in different industries and standards might be undeservingly missing EA-related topics of both theoretical and practical importance. Even though currently there are little or no publications in the whole EA research stream that can be related to these topics, these topics arguably can be considered as important future topics representing fruitful directions for EA research. Researchers aiming to focus their efforts on these future topics, arguably, should start from inductive, qualitative and exploratory studies and consider using grounded theory approaches[78,80,81] to establish initial analytical frameworks suitable for these topics.

The classification of all EA-related topics according to their lifecycle phases (including potential future topics) is presented in Table 4.

Table 4. Classification of all EA-related topics according to their lifecycle phases.

Category	Topics	Description	Considerations
Saturated	Basis, Benefits, Coordination, Development, EA in Public Sector, Frameworks Analysis, Function, Implementation, Levels, Management, Maturity, Reference Models, Stakeholders, Structure	Emerged relatively long ago, passed through periods of peak attention at some moments in the past and the interest to them is currently declining	Researchers should provide a compelling motivation or need for some additional studies of these common place topics
Active	Architects, Artifacts, Design, Education, Initiation, Integration, Measurements, Modeling, Principles, Problems, Repository, Review, Success Factors, Tools	Emerged certain time ago and are currently on their peaks of attention	Researchers should understand current problems, questions and controversial points in these established topics

Table 4.   (*Continued*)

Category	Topics	Description	Considerations
Faddish	Audit, EA and BPM, EA and Cloud, EA and Outsourcing, EA and SOA, Patterns	Emerged certain time ago, achieved their attention peaks very quickly and then faded away quickly as well	Researchers should ensure that these topics are still relevant and really deserve any long-term attention
Emerging	Acceptance, Analysis, Application, Automation, Culture, EA and ITIL, EA in SMEs, EA in Virtual Enterprises	Emerged relatively recently and the interest to them is currently growing	Researchers should be prepared for an inductive exploration and consider carefully the potential long-term impact of selected topics since some of these topics might later turn out faddish with little real importance
Future	Adaptation, EA in Different Industries, Standards (currently non-existing)	Currently missing in the EA research stream, but arguably represent fruitful directions for future research	Researchers should start from inductive, qualitative and exploratory studies and consider using grounded theory approaches to establish initial analytical frameworks suitable for these topics

6. Map of EA Research

In the previous section, I described and analyzed the list of topics discussed in EA publications (see Table 3). Now, in line with Swanson and Ramiller,[40] I will establish the high-level conceptual relationship between these EA-related topics.

In order to identify high-level conceptual themes representing EA research I followed the inductive open coding procedure similar to the coding procedure used earlier to identify EA-related topics. Specifically, I applied the constant comparative method[78,80,81] to the previously established list of EA-related topics (future topics were not included) in order to find the differences and similarities between various topics and then group them into a smaller number of non-overlapping broader themes. As a result of this procedure, I combined all EA-related topics into 11 broad higher-order themes comprehensively covering the entire EA research stream. Importantly, some EA-related topics can be considered as relevant to more than one theme. These topics have been related to the single most relevant theme. The description of the broad conceptual EA-related themes with underlying topics and relevant explanations is summarized in Table 5.

This grouping of all EA-related topics into broader conceptual themes allows establishing the high-level logical relationship between these themes similar to the one established by Swanson and Ramiller.[40] Organization deploys Instruments[17,193], institutionalizes Processes[219,246] and establishes EA

Practice[57,247]. EA Practice involves Actors[43,248] who work at Organization,[180,249] carry out Processes,[158,159] develop and use Documentation[250,251] and employ Instruments.[171,252] Instruments facilitate EA Practice,[145,253] help manage Documentation[193,254] and support Processes.[255,256] Processes constitute EA

Table 5.   Summary of the conceptual themes discussed in EA publications.

Theme	Description	Underlying Topics	Explanation
Actors	Actors involved in EA practice and their skills	Architects Education Stakeholders	Architects and Stakeholders describe main actors of EA practice and Education describes their formal education
Processes	Processes constituting EA practice and their relationship	Coordination Development Implementation Integration Management	Development describes how to develop EA, Implementation describes how to implement EA, Coordination describes how to coordinate EA processes in decentralized organizations, Integration describes how to integrate EA processes with other organizational processes and Management describes the general high-level logic of their work and interaction
Documentation	Documentation used in EA practice, its organization, representation and usage	Analysis Artifacts Modeling Principles Structure	Artifacts describes various EA documents, Modeling describes how to represent EA documents, Principles describes EA principles as a special type of documents, Structure describes how to organize EA documents and Analysis describes how to analyze EA documents
Instruments	Instruments facilitating EA practice	Automation Repository Tools	Tools describes software tools for EA practice, Repository describes the organization of a repository for EA documents and Automation describes how EA activities can be automated
Organization	Organizational aspects of EA practice	Audit Basis Culture Function Levels Measurements	Function describes EA practice as an organizational function, Culture describes the influence of organizational culture on EA practice, Levels describes the EA partitioning in large organizations, Measurements describes organizational KPIs relevant to EA, Audit describes the EA audit in organizations and Basis describes what organizational considerations should be taken as the basis for EA

Table 5. (*Continued*)

Theme	Description	Underlying Topics	Explanation
EA Practice	EA practice in general	Application Benefits Design Frameworks Analysis Patterns Problems Reference Models Success Factors	Application, Benefits, Problems and Success Factors describe applications, benefits, problems and critical success factors of EA practice, Frameworks Analysis, Reference Models and Patterns describe frameworks, reference models and patterns for EA practice and Design describes how EA practice should be designed to fit specific organizations
Evolution	Evolution of EA practice	Acceptance Initiation Maturity	Initiation describes the first steps of EA practice, Acceptance describes the later institutionalization of EA practice and Maturity describes the progression of EA practice over maturity stages
Specific Management Practices	Relationship between EA practice and other specific management practices	EA and BPM EA and ITIL EA and Outsourcing	EA and BPM, EA and ITIL and EA and Outsourcing describe the relationship between EA practice and corresponding management practices: BPM, ITIL and outsourcing
Specific Technologies	Relationship between EA practice and specific technologies	EA and Cloud EA and SOA	EA and Cloud and EA and SOA describe the relationship between EA practice and corresponding technologies: cloud computing and SOA
Specific Organizations	Specifics of EA practice in particular types of organizations	EA in Public Sector EA in SMEs EA in Virtual Enterprises	EA in Public Sector, EA in SMEs and EA in Virtual Enterprises describe the specifics of EA practice in corresponding types of organizations: public sector, small and medium enterprises and virtual enterprises
Miscellaneous	Other aspects of EA practice	Review Other	All topics unrelated to other themes

Practice[134,257] and leverage Documentation.[19,258] Documentation describe Organization[120,130] and underpin EA Practice[259,260] that undergoes Evolution.[67,242] Specific organizations influence on EA Practice,[131,202] specific technologies synergize with EA Practice,[148,207] specific management practices integrate with EA Practice[222,261] and Miscellaneous help EA Practice.[262,263] Placing all the conceptual EA-related themes with underlying topics and relevant logical relationships between them on a single diagram I derive the map of EA research showing the abstract
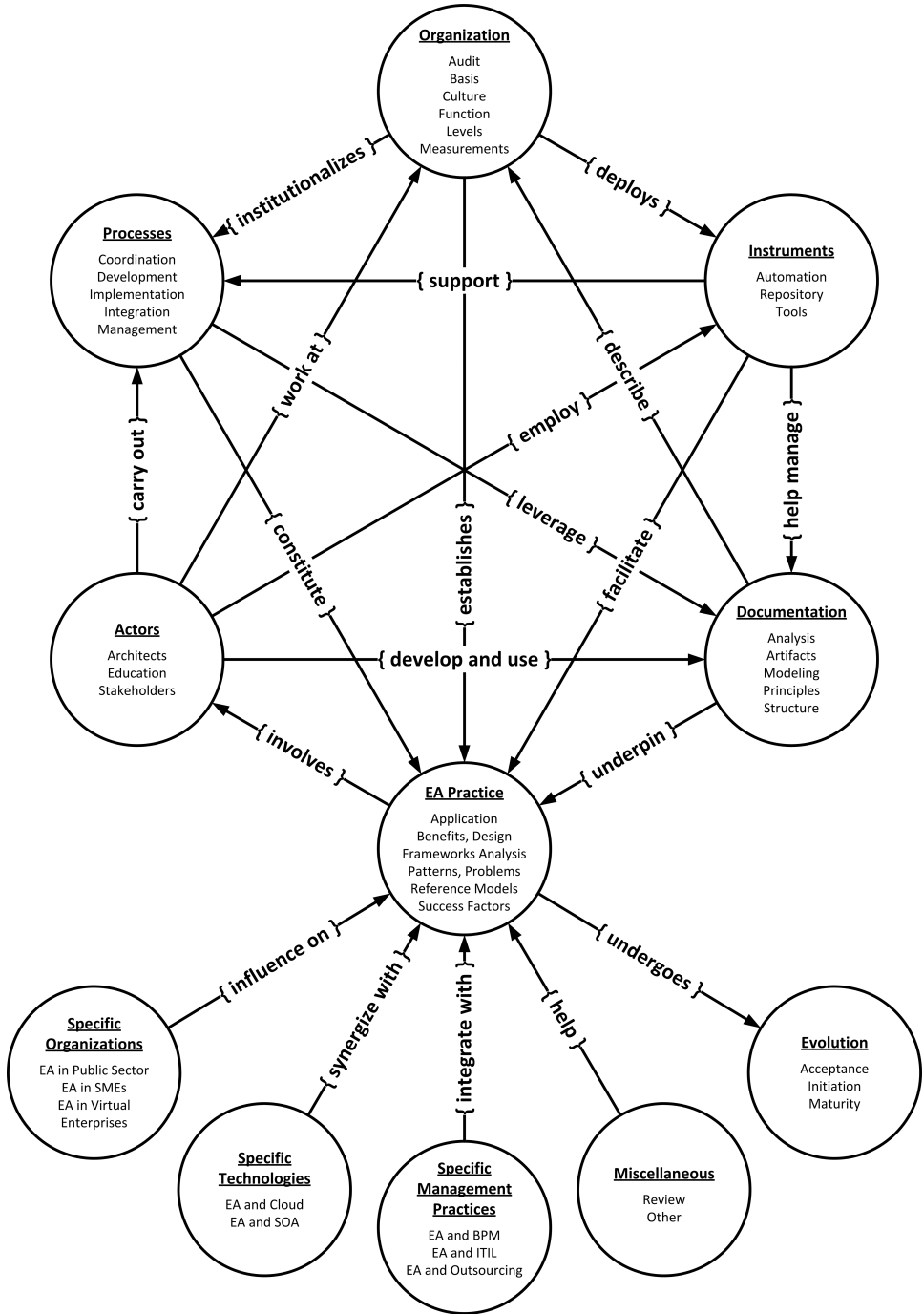
Fig. 3.   The map of EA research.

representation of the whole EA research stream. The map of EA research is shown in Fig. 3.

Figure 3 represents the map of EA research showing the high-level abstract view of the whole EA research stream including all conceptual EA-related themes, their underlying topics and their logical relationship to each other. Importantly, the map of EA research merely structures and organizes the EA research stream, but does not suggest which topics or themes are more important for the EA discipline. The detailed statistics on the distribution of EA-related themes by time, publication type, research methodology and attitude can be found in Appendix E.

Therefore, EA is a truly complex, multifaceted and overarching organizational practice having multiple aspects including people, processes, documents and instruments, related to other specific management practices and technologies, and dependent on specific types of organizations. Various aspects of EA practice have complex interrelationship between each other.

7. Contribution

In this review, I looked at the past and analyzed all previous EA publications in order to structure, clarify and consolidate the whole EA research stream. The essential findings regarding the EA discipline presented in different sections of this review are summarized in Table 6.

This paper makes four specific contributions to the EA literature. Firstly, I presented the exhaustive statistical analysis of the whole EA research stream (see Fig. 1, Appendix B, Appendix D and Appendix E), including the distribution of EA publications according to time, type, source, research methodology and attitude, which can help better understand the current state of the EA discipline, its position in IS research, its general problems, peculiarities, trends and directions.

Secondly, I presented the analysis of the issues discussed in all previous 1075 EA publications for almost three decades and coded them into the list of 42 narrow EA-related topics (see Table 3 and Appendix C). On the one hand, the list of EA-related topics structures the whole EA research stream, delineates its scope, introduces a framework for studying its evolution, presents a common vocabulary and gives a 10000-feet view of existing EA publications providing a good starting point for newbie EA researchers striving to delve quickly into the discipline. On the other hand, the list of EA-related topics can be used by other authors for classifying EA publications or serve as a basis for developing a more detailed EA-oriented hierarchical keyword scheme similar to other keyword schemes for IS publications.[72–75]

Thirdly, I classified all EA-related topics into four categories according to their lifecycle phases: saturated, active, faddish and emerging (see Table 4). This classification explains the temporal positions of different narrow EA-related topics in

Table 6.   Summary of the essential findings of this review.

Subject	Findings
EA research stream (see section Review Results)	EA as an academic discipline is rooted in practice (see Fig. 1), highly influenced by speculative prescriptions (see Table B.5), highly concentrated in specific sources (see Table B.3), discussed mostly at conferences and poorly represented in the leading academic journals (see Table B.1), somewhat isolated from the mainstream academic IS research and represented mostly by publications in non-ranked outlets (see Table B.2). The majority of EA publications are non-empirical (see Table B.4), the empirical validity of the EA discipline might be less than perfect (see Fig. 2) and the whole EA research stream can even be heavily hyped (see Fig. 1).
EA-related topics (see section Topics Discussed in EA Publications)	The EA research stream is very diverse and contains 42 articulate EA-related topics (see Table 3). EA research gradually becomes more diverse since the number of EA-related topics is continuously increasing (see Table D.1). The sequence of topics emergence suggests that the EA discipline naturally evolves from foundational to advanced topics (see Table D.1). All EA-related topics can be classified into four categories according to their lifecycle phases: saturated, active, faddish and emerging (see Table 4). Adaptation, EA in Different Industries and Standards, though currently missing, can be considered as important future topics (see Table 4).
EA-related themes (see section Map of EA Research)	EA research revolves around 11 broad conceptual themes: Actors, Processes, Documentation, Instruments, Organization, EA Practice, Evolution, Specific Management Practices, Specific Technologies, Specific Organizations and Miscellaneous (see Table 5). EA is a truly complex, multifaceted and overarching organizational practice having multiple aspects with complex interrelationship between each other (see Fig. 3).

the broad EA research stream, helps understand which topics are established and relatively well-understood as well as which topics are relatively new and poorly explored. Moreover, I identified three potential future EA-related topics that might represent fruitful directions for EA research (see Table 4). For each category of EA-related topics, I described potential considerations relevant for EA researchers willing to study these topics. Therefore, this classification of EA-related topics can help EA researchers deliberately concentrate their efforts on studying the most appropriate topics and approach them properly in order to make the maximum possible future contribution to the EA discipline.

Fourthly, I combined all EA-related topics into 11 broad higher-order themes (see Table 5), established the conceptual relationship between them and presented the map of EA research (see Fig. 3). The map of EA research shows the high-level abstract view of the whole EA discipline on a single diagram, thereby, helping future EA researchers orientate better in diverse and numerous EA publications.

8. Limitations

This literature review has a number of inherent limitations related to the selection of EA publications, the focus of their analysis and the method of their analysis. Firstly, from the publication selection perspective this review covers the EA literature only since the early EA period that began in the late 1980s,[10] but it does not cover earlier publications related to the pre-EA (BSP) period, which included multiple architecture-based information systems planning methodologies[19,61–63] highly resembling modern EA methodologies. Moreover, the selection of only English publications can be considered as a limitation of this review since a significant portion of available EA publications are written in other languages. For instance, the previous review of 608 EA publications by Simon *et al.*[29] covered English and German publications and identified that 9.5% of them were in German.

Secondly, from the analysis focus perspective this review focuses mostly on sources, research methodologies, attitudes and topics of the EA discipline, but it does not provide any bibliographic, citations, origins and geographic analysis of EA publications similar to the analysis presented by the previous comprehensive EA literature reviews.[29,31,32] The limited focus of the conducted analysis can be considered as a limitation of this review.

Thirdly, from the analysis method perspective this review was conducted by a single author and can hardly be free of subjective bias, especially in the topics and themes coding. Even though I did my best to ensure the maximum objectivity of the topics analysis, the inherent subjectivity of the coding procedure carried out by a single author can be considered as a limitation of this review since its complete objectivity can hardly be achieved despite all the measures taken to avoid subjective bias. Additionally, this review only identifies a set of consistent EA-related topics in the broad EA research stream, but it does not provide an in-depth content analysis of these topics. As a result, this review does not offer any discussion of contradictions, problems and open questions existing in various EA-related topics. Moreover, the future EA-related topics suggested in this review (Adaptation, EA in Different Industries and Standards, see Table 4) are highly subjective, largely speculative and essentially represent only an "educated guess".

9. Conclusion

EA is an important organizational instrument for improving business and IT alignment. EA is used in the majority of large companies and makes a significant contribution to their success. However, even though the previous EA literature reviews have analyzed many important aspects of the EA discipline, a comprehensive "big picture" of the entire EA discipline still remains largely unclear.

In this paper, I conducted a comprehensive EA literature review covering 1075 publications aiming to look at the past and analyze all previous EA research in order to structure, clarify and consolidate the whole EA research stream and, thereby, to address the aforementioned problems. Firstly, I analyzed the distribution of the

whole EA research stream by time, type, source, research methodology and attitude. Secondly, I coded all the issues discussed in EA publications, grouped them into 42 narrow EA-related topics (see Table 3) and analyzed the lifecycles of these topics (see Table 4). Finally, I grouped all EA-related topics into 11 broad higher-order themes (see Table 5) and established the conceptual relationship between them (see Fig. 3).

I concluded that EA as an academic discipline is rooted in practice. It emerged largely from practitioner-oriented publications and only later attracted considerable attention in academia. The EA discipline is still significantly influenced by speculative prescriptions, although the recent trend toward the decreased presence of non-empirical prescriptive EA publications can be noticed. EA research is highly concentrated in a small number of specific outlets, discussed mostly at conferences and under represented in leading academic journals. It is somewhat isolated from the mainstream academic IS research and represented largely by publications in non-ranked sources, although the recent trend toward the increased presence of EA publications in academically ranked sources can be noticed. The majority of available EA publications are non-empirical, although the recent trend toward the increased use of empirical methods in EA research can be noticed. The general empirical validity of the EA discipline might be less than perfect since many early, widely cited, non-empirical and prescriptive EA publications have not been properly validated with independent empirical studies. The whole EA research stream can even be heavily hyped since the time distribution of EA publications highly correlates with the typical lifecycle of management fashions.

The EA research stream contains 42 articulate EA-related topics, naturally evolves from foundational to advanced topics and revolves around 11 broad conceptual themes. However, different EA-related topics within the broader EA research stream can be classified into saturated, active, faddish and emerging categories. Additionally, potential future EA-related topics (Adaptation, EA in Different Industries and Standards) can also be identified as a separate category. This classification explains the specific features of different EA-related topics, can help future EA researchers better understand the evolution of the EA discipline and make the maximum contribution to it.

Appendix A. Sources of EA Publications

This Appendix contains a detailed list of primary sources of EA publications included in this review: journals, conferences and additional sources.

A.1. *Journals*

This review included all ranked IS journals recommended by the Australian Council of Professors and Heads of Information Systems[70] and Australian Business Deans Council,[69] 229 journals in total. The full list of journals is shown in Table A.1.

Table A.1. Full list of journals included in the review.

Journal	ABDC	ACPHIS
Academy of Information and Management Sciences Journal	C	.
ACM Transactions on Asian Language Information Processing	.	C
ACM Transactions on Computer Systems	.	B
ACM Transactions on Computer–Human Interaction	A*	B
ACM Transactions on Database Systems	B	B
ACM Transactions on Design Automation of Electronic Systems	.	B
ACM Transactions on Graphics	B	B
ACM Transactions on Information and System Security	B	B
ACM Transactions on Information Systems	C	C
ACM Transactions on Internet Technology	B	B
ACM Transactions on Mathematical Software	.	B
ACM Transactions on Modeling and Computer Simulation	.	B
ACM Transactions on Programming Languages and Systems	B	B
ACM Transactions on Software Engineering and Methodology	.	B
Applied Ontology	A	.
Applied Soft Computing	C	.
Australasian Journal of Educational Technology	.	C
Australasian Journal of Information Systems	A	B
Australian Journal of Educational Technology	.	C
Australian Journal of Emerging Technologies and Society	C	C
Behaviour and Information Technology	A	A
BMC Medical Informatics and Decision Making	B	.
British Journal of Educational Technology	B	B
Business & Information Systems Engineering	A	.
Business Intelligence Journal	C	C
Business Process Management Journal	B	B
California Management Review	.	A
Campus-Wide Information Systems	C	C
China Journal of Information Systems	.	C
Communications of the ACM	.	A
Communications of the Association for Information Systems	A	A
Computer Supported Cooperative Work	B	B
Computers and Education	.	B
Computers and Security	A	C
Computers in Human Behavior	B	C
Data and Knowledge Engineering	A	A
DATA BASE for Advances in Information Systems	.	A
Decision Support Systems	A*	A*
Educational Technology and Society	.	C
eHealth International	C	C
Electronic Commerce Research	A	A
Electronic Commerce Research and Applications	C	C
Electronic Journal of IS Evaluation	B	B
Electronic Journal of Knowledge Management	C	C
Electronic Journal on Information Systems in Developing Countries	C	C
Electronic Markets	A	A
Enterprise Information Systems	A	C
e-Service Journal	B	B
Ethics and Information Technology	C	C
European Journal of Information Systems	A*	A*
European Journal of Operational Research	A	A
Expert Systems with Applications	C	C
First Monday	B	.
Group Decision and Negotiation	A	B
Harvard Business Review	.	A

Table A.1.   (*Continued*)

Journal	ABDC	ACPHIS
Health Informatics Journal	C	C
Health Policy and Technology	B	.
Human IT	.	B
Human–Computer Interaction	A	A
IBM Systems Journal	A	A
IEEE Transactions on Computers	.	B
IEEE Transactions on Engineering Management	.	B
IEEE Transactions on Information Technology in Biomedicine	.	B
IEEE Transactions on Knowledge and Data Engineering	.	B
IEEE Transactions on Pattern Analysis and Machine Intelligence	.	B
IEEE Transactions on Professional Communication	B	B
IEEE Transactions on Software Engineering	.	B
IEEE/ACM Transactions on Networking	.	B
IMA Journal of Mathematical Control and Information	.	C
info	B	B
INFOR	B	B
Informatics for Health and Social Care	C	.
Information-Knowledge-Systems Management	C	.
Information and Communications Technology Law	C	C
Information and Computation	B	B
Information and Management	A*	A*
Information and Organization	A*	A
Information and Software Technology	A	A
Information Communication and Society	A	.
Information Economics and Policy	B	B
Information Management and Computer Security	C	C
Information Processing and Management	B	C
Information Processing Letters	C	C
Information Resources Management Journal	C	C
Information Retrieval	C	C
Information Systems	.	A
Information Systems and e-Business Management	B	C
Information Systems Frontiers	A	A
Information Systems Journal	A*	A*
Information Systems Management	B	C
Information Systems Research	A*	A*
Information Technology & Development	B	.
Information Technology and Libraries	C	C
Information Technology and Management	B	C
Information Technology and People	A	A
Information Technology Management	B	B
Information Visualization	C	C
INFORMS Journal on Computing	B	B
Interacting with Computers	C	C
Interfaces	C	C
International Journal of Accounting Information Systems	B	C
International Journal of Actor-Network Theory and Technological Innovation	C	.
International Journal of Applied Management and Technology	C	C
International Journal of Business Information Systems	C	C
International Journal of Cases on Electronic Commerce	C	C
International Journal of Cooperative Information Systems	A	C
International Journal of Data Warehousing and Mining	C	C
International Journal of Education and Development using Information and Communication Technology	C	C

Table A.1. (*Continued*)

Journal	ABDC	ACPHIS
International Journal of Electronic Business	C	C
International Journal of Electronic Commerce	A	A
International Journal of Electronic Customer Relationship Management	C	C
International Journal of Electronic Government Research	C	C
International Journal of Enterprise Information Systems	C	C
International Journal of Forecasting	.	A
International Journal of Healthcare Information Systems and Informatics	C	C
International Journal of Healthcare Technology and Management	C	C
International Journal of Human–Computer Interaction	B	.
International Journal of Human–Computer Studies	B	B
International Journal of Information and Communication Technology Education	C	C
International Journal of Information Management	A	C
International Journal of Information Security	B	C
International Journal of Information Security and Privacy	C	C
International Journal of Information Systems and Change Management	C	C
International Journal of Information Technology and Decision Making	C	C
International Journal of Information Technology and Web Engineering	C	C
International Journal of Intelligent Information Technologies	C	C
International Journal of Internet and Enterprise Management	C	C
International Journal of Internet Science	C	.
International Journal of Knowledge and Learning	C	.
International Journal of Knowledge Management	B	C
International Journal of Knowledge Management Studies	C	C
International Journal of Management and Systems	C	C
International Journal of Man–Machine Studies	C	C
International Journal of Medical Informatics	A	A
International Journal of Social Humanistic Computing	C	.
International Journal of Technology and Human Interaction	C	C
International Journal of Technology Management	C	C
International Journal of Technology Management and Sustainable Development	C	C
International Journal of Technology, Knowledge and Society	C	.
International Journal of Web Based Communities	B	C
International Review of Information Ethics	C	.
Internet Research: Electronic Networking, Applications and Policy	A	A
IT and Society: An Online Journal	C	C
Journal of Behavioral Decision Making	A	A
Journal of Cases on Information Technology	C	C
Journal of Community Informatics	B	.
Journal of Computer and System Sciences	C	C
Journal of Computer Information Systems	A	A
Journal of Computing and Information Technology	C	C
Journal of Database Management	B	B
Journal of Decision Systems	B	C
Journal of Electronic Commerce in Organizations	B	B
Journal of Electronic Commerce Research	B	C
Journal of End User Computing	.	B
Journal of Enterprise Information Management	B	C
Journal of Global Information Management	A	A
Journal of Global Information Technology Management	B	B
Journal of Hospitality and Tourism Technology	B	.
Journal of Informatics Education and Research	C	C
Journal of Information and Knowledge Management	C	C
Journal of Information and Optimization Sciences	C	C

(*Continued*)

Table A.1.   (*Continued*)

Journal	ABDC	ACPHIS
Journal of Information Communication and Ethics in Society	B	.
Journal of Information Systems	A	A
Journal of Information Systems and Small Business	.	C
Journal of Information Systems and Technology Management	C	C
Journal of Information Systems Education	B	C
Journal of Information Systems Security	C	.
Journal of Information Technology	A*	A*
Journal of Information Technology and Tourism	C	C
Journal of Information Technology Case and Application Research	C	C
Journal of Information Technology Cases and Applications	.	C
Journal of Information Technology Education	C	C
Journal of Information Technology Theory and Application	A	C
Journal of Intelligent Information Systems	B	B
Journal of International Technology and Information Management	C	C
Journal of Internet Commerce	B	.
Journal of Knowledge Management	A	B
Journal of Knowledge Management Practice	B	.
Journal of Management Information Systems	A*	A*
Journal of Management Systems	C	C
Journal of Organizational and End User Computing	B	B
Journal of Organizational Computing and Electronic Commerce	A	A
Journal of Research and Practice in Information Technology	C	C
Journal of Research on Technology in Education	C	C
Journal of Software Maintenance and Evolution	C	C
Journal of Strategic Information Systems	A*	A
Journal of Systems and Information Technology	C	C
Journal of Systems and Software	B	C
Journal of Technology Management and Innovation	C	C
Journal of the ACM	C	C
Journal of the American Medical Informatics Association	A	B
Journal of the American Society for Information Science and Technology	A*	C
Journal of the Association for Information Systems	A*	A*
Journal of the Operational Research Society	B	B
Journal of Theoretical and Applied Electronic Commerce Research	B	.
Journal on Educational Resources in Computing	C	C
Journal on Information Technology in Healthcare	C	C
Knowledge and Information Systems	C	C
Knowledge and Process Management	B	C
Knowledge Management Research and Practice	A	B
Knowledge-Based Systems	A	C
Library Review	B	.
MIS Quarterly	A*	A*
MISQ Discovery	.	B
MIS Quarterly Executive	A	A
MIT Sloan Management Review	.	A
Mobile Information Systems	.	C
New Technology, Work and Employment	A	.
OMEGA	.	A
Online Information Review	B	.
Operations Research	B	B
Pacific Asia Journal of the Association for Information Systems	B	.
Personal and Ubiquitous Computing	A	.
Quarterly Journal of Electronic Commerce	C	C
Review of Business Information Systems	C	C
Scandinavian Journal of Information Systems	A	A

Table A.1.   (*Continued*)

Journal	ABDC	ACPHIS
Science, Technology and Society	B	.
SIAM Journal on Computing	C	C
Strategic Outsourcing Journal	B	.
Technology in Society	C	.
Telematics and Informatics	C	.
The Computer Journal	C	C
The Electronic Library	B	.
The Information Management Journal	B	B
The Information Society	A	C
Transforming Government: People, Process and Policy	B	.
Universal Access in the Information Society	C	C
VINE: The Journal of Information and Knowledge Management Systems	B	B
World Wide Web: Internet and Web Information Systems	C	C

A.2. *Conferences*

This review included all ranked IS conferences recommended by the Australian Research Council,[71] 234 conferences in total. The full list of conferences is shown in Table A.2.

Table A.2.   Full list of conferences included in the review.

Conference	Acronym	ERA
Accounting and Finance Association of Australia and New Zealand Conference	AFAANZ	C
ACM Conference on Computer Supported Cooperative Work	CSCW	A
ACM Conference on Electronic Commerce	EC	B
ACM International Conference on Advances in Geographic Information Systems	SIGSPATIAL	B
ACM International Conference on Information and Knowledge Management	CIKM	A
ACM International Conference on Recommender Systems	RecSys	B
ACM International Conference on Research and Development in Information Retrieval	SIGIR	A
ACM SIGCHI_NZ Conference on Human–Computer Interaction	CHINZ	C
ACM Special Interest Group on Supporting Group Work	Group	B
ACM Symposium on User Interface Software and Technology	UIST	A
ACM Workshop on Web Information and Data Management	WIDM	B
ACM-SIGMIS CPR Conference	ACM-SIGMIS	B
Advances in Information Systems	ADVIS	C
Americas Conference on Information Systems	AMCIS	A
Annual Conference of the International Academy for Information Management	IAIM	C
Annual Meeting of the Decision Sciences Institute	DSI	C
Annual PPIG Workshop	PPIG	B
AoM Organizational Communication and Information Systems	OCIS	A
Applications of Natural Language to Data Bases	NLDB	C
Asia Information Retrieval Symposium	AIRS	C
Asia Pacific Research Symposium on Accounting Information Systems	APRSAIS	C
Australasia Conference on Information Security and Privacy	AISP	C

Table A.2. (*Continued*)

Conference	Acronym	ERA
Australasian Conference on Information Systems	ACIS	A
Australasian Urban and Regional Information Systems Association Conference	AURISA	C
Australasian User Interface Conference	AUIC	B
Australian and New Zealand Academy of Management Conference	ANZAM	C
Australian and New Zealand Intelligent Information Systems Conference	ANZIIS	C
Australian and New Zealand Marketing Academy Conference	ANZMAC	C
Australian Computer Human Interaction Conference	OZCHI	B
Australian Game Developers Conference	AGDC	C
Australian Information Warfare and Security Conference	WarSec	C
Australian Institute of Computer Ethics Conference	AICE	C
Australian Workshop on Mobile Computing, Databases and Applications	MCDA	C
Bled Electronic Commerce Conference	BECC	B
Body Sensor Networks	BSN	C
British Computer Society Conference on Human-Computer Interaction	HCI	A
Collaborative Electronic Commerce Technology and Research	CollECTeR	B
Computer Supported Collaborative Learning	CSCL	A
Conference on Algorithmic Aspects in Information and Management	AAIM	C
Conference on Information Science, Technology and Management	CISTM	B
Conference on Information Sciences and Systems	CISS	C
Conference on Innovative Data Systems Research	CIDR	A
Conference on Office Information Systems	SIGOA	C
Cultural Attitudes towards Technology and Communications	CATAC	B
Data Semantics in Web Information Systems	DASWIS	C
Design for User Experience	DUX	B
Designing Interactive Systems	DIS	B
Digital Arts and Culture	DAC	C
Digital Games Research Conference	DIGRA	C
Distributed Communities on the Web Workshop	Dcw	C
Ershov Conference	PSI	B
ETHICOMP Conference	ETHICOMP	B
European Conference of Information Warfare	ECIW	C
European Conference on Computer Supported Cooperative Work	ECSCW	B
European Conference on e-Government	ECEG	C
European Conference on Information Management and Evaluation	ECIME	C
European Conference on Information Retrieval	ECIR	B
European Conference on Information Systems	ECIS	A
European Conference on Knowledge Management	EKM	B
European Conference on Research Methodology for Business and Management Studies	ECRM	C
European Natural Language Generation Workshop	EuroNLG	B
European SPI	EuroSPI	B
European, Mediterranean and Middle Eastern Conference on Information Systems	EMCIS	B
Exploring Modelling Methods in Systems Analysis and Design	EMMSAD	C
Game Developers Conference	GDC	C
GIS Planet Conference	GISPlanet	C
Global Information Technology Management Association World Conference	GITMA	B
Hawaii International Conference on System Sciences	HICSS	A
Health Informatics Conference	HIC	C
Human System Interaction	HIS	C
IEEE Conference on Electronic Commerce Technology	CEC	C

Table A.2.   (*Continued*)

Conference	Acronym	ERA
IEEE Conference on Systems, Man and Cybernetics	SMC	B
IEEE Congress on Services	SERVICES	B
IEEE European Conference on Web Services	ECOWS	C
IEEE International Augmented Reality Toolkit Workshop	IARTW	C
IEEE International Conference on Cloud Computing	CLOUD	B
IEEE International Conference on Digital EcoSystems and Technologies	IEEE DEST	C
IEEE International Conference on Enterprise Computing, E-Commerce and E-Services	EEE	C
IEEE International Conference on Peer to Peer Computing	P2P	C
IEEE International Conference on Service-Oriented Computing Applications	SOCA	C
IEEE International Conference on Services Computing	SCC	A
IEEE International Conference on Web Services	ICWS	A
IEEE International Enterprise Distributed Object Computing Conference	EDOC	B
IEEE International Symposium on Wearable Computing	ISWC	A
IEEE International Symposium on Web Systems Evolution	WSE	C
IEEE Symposium on Advanced Management of Information for Globalized Enterprises	AMIGE	C
IEEE Symposium on Visual Languages and Human-Centric Computing	VL/HCC	A
IEEE Workshop on Hot Topics in Web Systems and Technologies	HotWeb	B
IEEE Workshop On Mobile Computing Systems And Applications	WMCSA	C
IEEE/IFIP International Conference on Embedded and Ubiquitous Computing	EUC	C
IFIP Working Conferences on Virtual Enterprises	PRO-VE	C
Industrial Simulation Conference	ISC	C
Information Integration and Web-based Applications and Services	IIWAS	C
Information Security Workshop	ISW	C
Information Systems Education Conference	ISECON	B
Information Systems Research Seminar in Scandinavia	IRIS	C
Innovative Internet Computer Systems	IICS	C
Institute for Small Business and Entrepreneurship Annual Conference	ISBE	C
Interaction	Interaction	C
International Business Information Management	IBIMA	B
International Conference in Business Process Management	BPM	A
International Conference of Society for Group Decision and Negotiation	GDN	B
International Conference on Advanced Information Management	IMS	C
International Conference on Advanced Information Systems Engineering	CAISE	A
International Conference on Advanced Language Processing and Web Information Technology	ALPIT	C
International Conference on Advances in Computer–Human Interactions	ACHI	C
International Conference on Advances in Infrastructure for Electronic Business, Science, and Education on the Internet	SSGRR	C
International Conference on Business Information Systems	BIS	B
International Conference on Cloud Computing	CloudCom	C
International Conference on Collaborative Computing: Networks, Applications and Worksharing	CollaborateCom	C
International Conference on Computer Information Systems and Industrial Management Applications	CISIM	C

(*Continued*)

Table A.2.   (*Continued*)

Conference	Acronym	ERA
International Conference on Computer Supported Cooperative Work in Design	CSCWD	B
International Conference on Computing and Informatics	ICOCI	C
International Conference on Cooperative Information Systems	CoopIS	A
International Conference on Creating Connecting and Collaborating through Computing	C5	C
International Conference on Design Science Research in Information Systems and Technology	DESRIST	A
International Conference on Digital Content, Multimedia Technology and its Applications	IDC	C
International Conference on Digital Government Research	DGO	B
International Conference on e-Business	ICEB	B
International Conference on Electronic Commerce	ICEComm	C
International Conference on Electronic Commerce and Web Technology	ECWeb	B
International Conference on Email and Anti-Spam	CEAS	B
International Conference on Enterprise Information Systems	ICEIS	C
International Conference on Enterprise Information Systems and Web Technologies	EISWT	C
International Conference on Enterprise Integration and Modelling Technology	ICEIMT	C
International Conference on Entertainment Computing	ICEC	C
International Conference on Formal Ontology in Information Systems	FOIS	A
International Conference on Health Informatics	Healthinf	C
International Conference on Human Factors in Computing Systems	CHI	A
International Conference on Human–Computer Interaction with Mobile Devices and Services	MobileHCI	B
International Conference on Informatics Education and Research	ICIER	B
International Conference on Information and Communication Technologies in Tourism	ENTER	C
International Conference on Information Processing and Management of Uncertainty	IPMU	C
International Conference on Information Resources Management	Conf-IRM	B
International Conference on Information Systems	ICIS	A
International Conference on Information Systems Analysis and Synthesis	ISAS	C
International Conference on Information Systems Development	ISD	A
International Conference on Information Systems Technology and its Application	ISTA	B
International Conference on Information, Communications and Signal Processing	ICICS	B
International Conference on Intelligent Agents, Web Technologies, and Internet Commerce	IAWTIC	B
International Conference on Intelligent User Interfaces	IUI	A
International Conference on Interaction Sciences: Information Technology, Culture and Human	ICIS	C
International Conference on Internet and Web Applications and Services	ICIW	C
International Conference on Internet Computing	IC	B
International Conference on Internet Technologies and Applications	ITA	B
International Conference on Knowledge Engineering and Knowledge Management	EKAW	B
International Conference on Knowledge-Based and Intelligent Information and Engineering Systems	KES	B
International Conference on Legal Knowledge-based Systems	JURIX	C
International Conference on Management of Data	COMAD	B
International Conference on Multimedia Modelling	MMM	C

Table A.2.   (*Continued*)

Conference	Acronym	ERA
International Conference on Multimodal Interfaces	ICMI	B
International Conference on New Trends of Information and Service Science	NISS	C
International Conference on Next Generation Web Services Practices	NWESP	C
International Conference on Persuasive Technology	Persuasive	B
International Conference on Qualitative Research in IT & IT in Qualitative Research	QualIT	B
International Conference on Research Challenges in Information Science	RCIS	B
International Conference on Rules and Rule Markup Languages for the Semantic Web	RuleML	C
International Conference on Security in Pervasive Computing	ICSPC	A
International Conference on Semantic and Digital Media Technologies	SAMT	C
International Conference on Semantics Knowledge and Grid	SKG	C
International Conference on Systems Research, Informatics and Cybernetics	ICSRIC	C
International Conference on Systems Thinking in Management	STM	C
International Conference on Technology and Business Management	ICTBM	C
International Conference on the Unified Modelling Language	MODELS	B
International Conference on User Modelling, Adaptation, and Personalization	UMAP	B
International Conference on Virtual Systems and MultiMedia	VSMM	B
International Conference on Web Engineering	ICWE	C
International Conference on Web Information Systems and Technologies	WEBIST	C
International Conference on Web-Age Information Management	WAIM	C
International Conference on Wirtschaftsinformatik	DITW	C
International Forum on Applied Wearable Computing	IFAWC	C
International Joint Conference on e-Business and Telecommunications	ICETE	C
International Symposium on Computer and Information Sciences	ISCIS	C
International Symposium on Information Processing	ISIP	C
International Symposium on Intelligent and Interactive Multimedia: Systems and Services	KES IIMSS	C
International Symposium on Intelligent Systems and Informatics	SISY	C
International Symposium on System Synthesis	ISSS	C
International Web Conference	IWC	C
International Workshop on Advanced Architectures and Algorithms for Internet Delivery and Applications	AAA-IDEA	C
International Workshop on Business Process Design	BPD	C
International Workshop on Business Process Intelligence	BPI	C
International Workshop on Business Process Modelling, Development, and Support	BPMDS	C
International Workshop on Enterprise and Organizational Modelling and Simulation	EOMAS	C
International Workshop on Enterprise Networking and Computing in Health Care Industry	HealthCom	C
International Workshop on Entertainment Computing	WEC	C
International Workshop on Formal Methods for Interactive Systems	FMIS	C
International Workshop on Horizontal Interactive Human–Computer Systems	Tabletop	B
International Workshop on Interactive Entertainment	IDET	C
International Workshop on Mobile Commerce and Services	WMCS	C
International Workshop on Modelling, Simulation, Verification and Validation of Enterprise Information Systems	MSVVEIS	C
International Workshop on Multimedia Data Storage, Retrieval, Integration and Applications	MDSRIA	C

(*Continued*)

Table A.2.   (*Continued*)

Conference	Acronym	ERA
International Workshop on Pattern Recognition in Information Systems	PRIS	C
International Workshop on Quality of Information Systems	QOIS	C
International Workshop on Software Technology for Augmented Reality Systems	IWSTAR	C
International Workshop on the Web and Databases	WebDB	C
International Workshop on Web Content Caching and Distribution	WCW	B
International Workshop on Web Information Systems Modelling	WISM	C
Internet Measurement Conference	IMC	A
Internet Research	AOIR	C
Internet Society Conference	INET	C
Interoperating Geographic Information Systems	INTEROP	C
Joint Conference on Information Sciences	JCIS	C
Joint International Conference on CyberGames and Interactive Entertainment	CGIE	C
Knowledge Acquisition, Modelling and Management Workshop	KAW	C
Latin American Conference on Informatics	CLEI	C
Latin American Web Congress	LA-WEB	C
Mining for Enhanced Web Search	MEWS	C
Multimedia Content Access: Algorithms and Systems	MCA:AS	C
National Conference on Computer and Information Systems	NCCIS	C
National Health Informatics Conference	NHIC	C
Network and OS Support for Digital A/V	NOSSDAV	A
New Zealand Game Developers Conference	FUSE	C
Norwegian Computer–Human Interaction	NORDCHI	C
Organisations and Society in Information Systems Workshop	OASIS	C
Pacific-Asia Conference on Information Systems	PACIS	A
Pacific-Asia Workshop on Electronic Commerce	PAWEC	C
Pan Pacific Conference on Information Systems	PPCIS	C
Passive and Active Measurement Conference	PAM	B
SIGIR workshop: Stylistic Analysis of Text For Information Access	Style	C
Symposium on Information Technology and Information Systems	ITIS	C
Symposium on Requirements Engineering for Information Security	SREIS	C
Tangible, Embedded, and Embodied Interaction	TEI	A
The organizational semiotics Conference	ORGSEM	B
UK Academy for Information Systems Conference	UKAIS	C
United Kingdom Systems Society	UKSS	B
United Kingdom Virtual Reality Special Interest Group Conference UK-VRSIG	VR-SIG	C
Virtual Reality Annual International Symposium	VRAIS	C
Western Australian Workshop on Information Systems Research	WAWISR	C
Western Decision Sciences Institute Conference	WDSI	C
Workshop on Information Hiding	INFH	C
Workshop on Security and Privacy in e-Commerce	SPEC	C
Workshop on Web Usage Analysis	WebKDD	C
World Conference on the WWW and Internet	WebNet	C
World Congress on Medical Informatics	MEDINFO	B

A.3. *Additional sources*

This review included several additional sources of EA publications. The full list of additional sources and the reasons for their inclusion are shown in Table A.3.

Table A.3.   Full list of additional sources included in the review.

Source	Acronym	Reason
Books for EA Practitioners	—	Highly influential
EA Research Briefings of MIT Center for Information Systems Research	CISR	Focused on EA
International Workshop on Enterprise Modelling and Information Systems Architectures	EMISA	Related to EA
Journal of Enterprise Architecture	JEA	Focused on EA
Trends in Enterprise Architecture Research Workshop	TEAR	Focused on EA
Working Conference on Practice-Driven Research on Enterprise Transformation	PRET	Related to EA

Appendix B. Distribution of EA Publications

This Appendix contains the detailed distribution of EA publications by type, source type, source, research methodology and attitude.

B.1. *Distribution of EA publications by type*

Distribution of EA publications by type is shown in Table B.1.

B.2. *Distribution of EA publications by source type*

Distribution of EA publications by source type is shown in Table B.2.

B.3. *Distribution of EA publications by source*

Distribution of EA publications by source is shown in Table B.3.

Table B.1.   Distribution of EA publications by type.

Year	Journal Articles	Conference Proceedings	Books	Book Chapters	Other Publications
1985	—	—	—	—	—
1986	—	—	—	—	1 (100.0%)
1987	1 (100.0%)	—	—	—	—
1988	—	—	—	—	—
1989	—	—	—	3 (100.0%)	—
1990	1 (100.0%)	—	—	—	—
1991	—	—	—	—	—
1992	1 (25.0%)	1 (25.0%)	1 (25.0%)	1 (25.0%)	—
1993	—	—	2 (100.0%)	—	—
1994	2 (50.0%)	2 (50.0%)	—	—	—
1995	—	—	—	—	—
1996	2 (40.0%)	—	2 (40.0%)	—	1 (20.0%)
1997	1 (50.0%)	—	—	—	1 (50.0%)
1998	—	—	—	—	1 (100.0%)
1999	4 (50.0%)	—	1 (12.5%)	—	3 (37.5%)
2000	2 (25.0%)	2 (25.0%)	—	1 (12.5%)	3 (37.5%)
2001	3 (50.0%)	2 (33.3%)	—	—	1 (16.7%)
2002	5 (45.5%)	4 (36.4%)	—	—	2 (18.2%)

Table B.1.   (*Continued*)

Year	Journal Articles	Conference Proceedings	Books	Book Chapters	Other Publications
2003	7 (36.8%)	5 (26.3%)	4 (21.1%)	—	3 (15.8%)
2004	7 (24.1%)	16 (55.2%)	2 (6.9%)	—	4 (13.8%)
2005	9 (28.1%)	14 (43.8%)	3 (9.4%)	—	6 (18.8%)
2006	30 (45.5%)	25 (37.9%)	6 (9.1%)	—	5 (7.6%)
2007	25 (25.5%)	41 (41.8%)	2 (2.0%)	17 (17.3%)	13 (13.3%)
2008	17 (26.2%)	36 (55.4%)	6 (9.2%)	1 (1.5%)	5 (7.7%)
2009	18 (14.2%)	60 (47.2%)	6 (4.7%)	36 (28.3%)	7 (5.5%)
2010	29 (27.6%)	55 (52.4%)	7 (6.7%)	11 (10.5%)	3 (2.9%)
2011	33 (33.7%)	50 (51.0%)	6 (6.1%)	5 (5.1%)	4 (4.1%)
2012	35 (31.3%)	47 (42.0%)	2 (1.8%)	26 (23.2%)	2 (1.8%)
2013	32 (28.1%)	79 (69.3%)	2 (1.8%)	—	1 (0.9%)
2014	19 (24.1%)	54 (68.4%)	3 (3.8%)	—	3 (3.8%)
2015	26 (35.1%)	46 (62.2%)	1 (1.4%)	—	1 (1.4%)
Total	309 (28.7%)	539 (50.1%)	56 (5.2%)	101 (9.4%)	70 (6.5%)

Table B.2.   Distribution of EA publications by source type.

Year	Ranked General	Unranked General	Unranked EA-Focused
1985	—	—	
1986	—	1 (100.0%)	—
1987	1 (100.0%)	—	—
1988	—	—	—
1989	—	3 (100.0%)	—
1990	1 (100.0%)	—	—
1991	—	—	—
1992	1 (25.0%)	3 (75.0%)	—
1993	—	2 (100.0%)	—
1994	2 (50.0%)	2 (50.0%)	—
1995	—	—	—
1996	1 (20.0%)	4 (80.0%)	—
1997	—	2 (100.0%)	—
1998	—	1 (100.0%)	—
1999	—	8 (100.0%)	—
2000	2 (25.0%)	6 (75.0%)	—
2001	4 (66.7%)	2 (33.3%)	—
2002	7 (63.6%)	2 (18.2%)	2 (18.2%)
2003	8 (42.1%)	10 (52.6%)	1 (5.3%)
2004	17 (58.6%)	9 (31.0%)	3 (10.3%)
2005	11 (34.4%)	10 (31.3%)	11 (34.4%)
2006	29 (43.9%)	20 (30.3%)	17 (25.8%)
2007	36 (36.7%)	45 (45.9%)	17 (17.3%)
2008	21 (32.3%)	22 (33.8%)	22 (33.8%)
2009	32 (25.2%)	77 (60.6%)	18 (14.2%)
2010	46 (43.8%)	38 (36.2%)	21 (20.0%)
2011	35 (35.7%)	30 (30.6%)	33 (33.7%)
2012	35 (31.3%)	46 (41.1%)	31 (27.7%)
2013	59 (51.8%)	23 (20.2%)	32 (28.1%)
2014	42 (53.2%)	19 (24.1%)	18 (22.8%)
2015	46 (62.2%)	10 (13.5%)	18 (24.3%)
Total	436 (40.6%)	395 (36.7%)	244 (22.7%)

Table B.3.   Distribution of EA publications by source.

Publication Type	Source Type	Source	Number
Journal Article	EA-Focused	Journal of Enterprise Architecture	148
Conference Proceeding	EA-Focused	TEAR	79
Conference Proceeding	Ranked	EDOC	68
Conference Proceeding	Ranked	HICSS	58
Book	Unranked	Books for EA practitioners	56
Conference Proceeding	Ranked	AMCIS	30
Conference Proceeding	Ranked	ECIS	23
Conference Proceeding	Ranked	CAISE	22
Book Chapter	Unranked	Advances in Government Enterprise Architecture	18
Journal Article	Unranked	IT Professional	18
Publication	EA-Focused	CISR	17
Book Chapter	Unranked	Coherency Management: Architecting the Enterprise for Alignment, Agility and Assurance	17
Book Chapter	Unranked	Handbook of Enterprise Systems Architecture in Practice	17
Book Chapter	Unranked	Enterprise Architecture for Connected E-Government: Practices and Innovations	16
Conference Proceeding	Ranked	ECIME	15
Conference Proceeding	Unranked	PRET	15
Conference Proceeding	Ranked	ACIS	14
Conference Proceeding	Unranked	EMISA	14
Journal Article	Ranked	MIS Quarterly Executive	14
Conference Proceeding	Ranked	Wirtschaftsinformatik	13
Conference Proceeding	Unranked	IEEE Conference on Business Informatics	12
Journal Article	Ranked	Enterprise Information Systems	11
Book Chapter	Unranked	The SIM Guide to Enterprise Architecture	11
Conference Proceeding	Unranked	ACM Symposium on Applied Computing	10
Book Chapter	Unranked	Strategic Enterprise Architecture Management: Challenges, Best Practices, and Future Developments	10
Conference Proceeding	Unranked	Enterprise Systems Conference	9
Conference Proceeding	Ranked	ICEIS	9
Journal Article	Ranked	Information Systems Frontiers	9
Conference Proceeding	Unranked	ACIS International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing	8
Conference Proceeding	Ranked	BIS	8
Conference Proceeding	Ranked	ICIS	8
Conference Proceeding	Unranked	IEEE Conference on Commerce and Enterprise Computing	8
Conference Proceeding	Ranked	PACIS	8
Conference Proceeding	Ranked	SMC	8
Journal Article	Ranked	Information Systems and e-Business Management	7
Conference Proceeding	Unranked	Advances in Enterprise Engineering	6
Publication	Unranked	Department of Defense	6
Journal Article	Ranked	Journal of Systems and Software	6
Conference Proceeding	Unranked	Mediterranean Conference on Information Systems	6
Publication	Unranked	Microsoft	6

(*Continued*)

Table B.3. (*Continued*)

Publication Type	Source Type	Source	Number
Book Chapter	Unranked	Cloud Computing for Enterprise Architectures	5
Journal Article	Ranked	IBM Systems Journal	5
Publication	Unranked	Office of Management and Budget	5
Conference Proceeding	Unranked	Perspectives in Business Informatics Research	5
Conference Proceeding	Ranked	DGO	4
Conference Proceeding	Ranked	IBIMA	4
Journal Article	Ranked	Information, Knowledge, Systems Management	4
Publication	Unranked	Infosys	4
Conference Proceeding	Unranked	International Conference on Computer and Information Science	4
Conference Proceeding	Unranked	International Conference on Research and Practical Issues of Enterprise Information Systems	4
Journal Article	Unranked	International Journal of Computer Science Issues	4
Conference Proceeding	Ranked	SCC	4
Publication	Unranked	Zachman International	4
Conference Proceeding	Ranked	CLEI	3
Conference Proceeding	Ranked	CLOUD	3
Publication	Unranked	Chief Information Officers Council	3
Journal Article	Ranked	Communications of the Association for Information Systems	3
Journal Article	Unranked	Computers in Industry	3
Conference Proceeding	Unranked	Conference on Pattern Languages of Programs	3
Conference Proceeding	Ranked	ECEG	3
Journal Article	Ranked	European Journal of Information Systems	3
Journal Article	Ranked	Expert Systems with Applications	3
Conference Proceeding	Ranked	IRIS	3
Journal Article	Ranked	Information Systems Management	3
Journal Article	Ranked	International Journal of Cooperative Information Systems	3
Journal Article	Unranked	Issues in Information Systems	3
Conference Proceeding	Ranked	RCIS	3
Publication	Unranked	Software Engineering for Business Information Systems	3
Conference Proceeding	Ranked	UKAIS	3
Conference Proceeding	Unranked	Asia-Pacific Software Engineering Conference	2
Conference Proceeding	Ranked	DESRIST	2
Journal Article	Unranked	Electronic Journal of Information Systems Evaluation	2
Publication	Unranked	Gartner	2
Journal Article	Unranked	Government Information Quarterly	2
Conference Proceeding	Unranked	Hybrid Intelligent Systems	2
Conference Proceeding	Ranked	ISD	2
Book Chapter	Unranked	Information Management Directions: The Integration Challenge (NIST Special Publication 500-167)	2
Journal Article	Ranked	Information and Management	2
Journal Article	Ranked	Information and Software Technology	2

Table B.3.   (*Continued*)

Publication Type	Source Type	Source	Number
Publication	Unranked	Institute for Enterprise Architecture Developments	2
Journal Article	Ranked	International Journal of Intelligent Information Technologies	2
Journal Article	Ranked	Journal of Organizational and End User Computing	2
Conference Proceeding	Ranked	MODELS	2
Conference Proceeding	Ranked	PRO-VE	2
Conference Proceeding	Ranked	SERVICES	2
Journal Article	Unranked	South African Journal of Industrial Engineering	2
Journal Article	Ranked	Transforming Government: People, Process and Policy	2
Book Chapter	Unranked	Advanced Information Technologies for Industrial Material Flow Systems	1
Publication	Unranked	Advanced Topics in Software Engineering	1
Conference Proceeding	Unranked	Advances in Information Systems Development	1
Journal Article	Unranked	African Journal of Business Management	1
Journal Article	Unranked	Annual Reviews in Control	1
Journal Article	Ranked	Australasian Journal of Information Systems	1
Book Chapter	Unranked	Business Process Management	1
Journal Article	Ranked	Business Process Management Journal	1
Journal Article	Unranked	Business Strategy Series	1
Publication	Unranked	CSC Index	1
Journal Article	Unranked	Computer Integrated Manufacturing Systems	1
Journal Article	Unranked	Database Programming and Design	1
Publication	Unranked	Department of Commerce	1
Publication	Unranked	Department of the Treasury	1
Journal Article	Unranked	Dr. Dobb's Journal	1
Conference Proceeding	Ranked	ECRM	1
Conference Proceeding	Ranked	EKAW	1
Publication	Unranked	Ecole Polytechnique Federale de Lausanne	1
Journal Article	Unranked	Economic Alternatives Journal	1
Conference Proceeding	Unranked	European Conference on Management, Leadership and Governance	1
Conference Proceeding	Unranked	European Conference on Software Architecture	1
Journal Article	Unranked	European Management Journal	1
Conference Proceeding	Ranked	FMIS	1
Publication	Unranked	Federal Minister of the Interior	1
Publication	Unranked	Government Accountability Office	1
Conference Proceeding	Unranked	IADIS International Conference on Information Systems	1
Publication	Unranked	IBM	1
Journal Article	Unranked	IBM Journal of Research and Development	1
Conference Proceeding	Ranked	ICEComm	1
Conference Proceeding	Ranked	ICIW	1
Conference Proceeding	Ranked	ICOCI	1
Conference Proceeding	Ranked	IEEE DEST	1
Publication	Unranked	IFIP-IFAC	1

(*Continued*)

Table B.3. (*Continued*)

Publication Type	Source Type	Source	Number
Conference Proceeding	Ranked	ISTA	1
Journal Article	Unranked	ITNOW Computing Journal	1
Book Chapter	Unranked	Industrial and Engineering Applications of Artificial Intelligence and Expert Systems	1
Journal Article	Ranked	Information Resources Management Journal	1
Journal Article	Ranked	Information Systems	1
Journal Article	Ranked	Information Systems Journal	1
Journal Article	Ranked	Information Technology and People	1
Publication	Unranked	Institute For Enterprise Architecture Developments	1
Journal Article	Unranked	Intelligent Information Management	1
Conference Proceeding	Unranked	International Command and Control Research and Technology Symposium	1
Conference Proceeding	Unranked	International Conference on Electronic Government	1
Conference Proceeding	Unranked	International Conference on Enterprise Integration Modeling	1
Conference Proceeding	Unranked	International Conference on Informatics and Systems	1
Conference Proceeding	Unranked	International Conference on Service Oriented Computing	1
Conference Proceeding	Unranked	International Conference on Software Engineering	1
Conference Proceeding	Unranked	International Conference on System of Systems Engineering	1
Journal Article	Ranked	International Journal of Cases on Electronic Commerce	1
Journal Article	Unranked	International Journal of Computer Science and Applications	1
Journal Article	Unranked	International Journal of Computer Science and Information Technology	1
Journal Article	Unranked	International Journal of Computer Science and Network Security	1
Journal Article	Unranked	International Journal of Computer and Information Technology	1
Journal Article	Ranked	International Journal of Information Management	1
Journal Article	Unranked	International Journal of Software Engineering and Applications	1
Conference Proceeding	Unranked	International Systems Conference	1
Conference Proceeding	Unranked	International Workshop on Interoperability of Heterogeneous Information Systems	1
Publication	Unranked	Ivar Jacobson International	1
Journal Article	Ranked	Journal of Computer Information Systems	1
Journal Article	Unranked	Journal of Computer Science	1
Journal Article	Ranked	Journal of Database Management	1
Journal Article	Ranked	Journal of Enterprise Information Management	1
Journal Article	Ranked	Journal of Information Systems	1
Journal Article	Ranked	Journal of Information Systems Education	1

Table B.3. (*Continued*)

Publication Type	Source Type	Source	Number
Journal Article	Unranked	Journal of Information and Organizational Sciences	1
Journal Article	Ranked	Journal of Management Information Systems	1
Journal Article	Unranked	Journal of Software	1
Journal Article	Unranked	Journal of Software Engineering and Applications	1
Journal Article	Ranked	Journal of Strategic Information Systems	1
Journal Article	Ranked	Journal of Systems and Information Technology	1
Journal Article	Ranked	Journal of Theoretical and Applied Electronic Commerce Research	1
Journal Article	Ranked	Knowledge and Information Systems	1
Journal Article	Ranked	MIS Quarterly	1
Journal Article	Ranked	MIT Sloan Management Review	1
Journal Article	Unranked	Management Science Letters	1
Publication	Unranked	Ministry of Defence	1
Publication	Unranked	Ministry of Finance Finland	1
Publication	Unranked	NASCIO	1
Book Chapter	Unranked	On the Move to Meaningful Internet Systems: OTM 2009 Workshops	1
Publication	Unranked	Oracle	1
Journal Article	Unranked	Problems and Perspectives in Management	1
Book Chapter	Unranked	Quality of Software Architectures — Models and Architectures	1
Conference Proceeding	Unranked	Research Forum to Understand Business in Knowledge Society	1
Journal Article	Unranked	Review of European Studies	1
Conference Proceeding	Ranked	SOCA	1
Journal Article	Unranked	Social Science Computer Review	1
Publication	Unranked	Software AG	1
Conference Proceeding	Unranked	Software Engineering	1
Publication	Unranked	Technology Matters	1
Journal Article	Ranked	Telematics and Informatics	1
Journal Article	Unranked	Total Quality Management	1
Conference Proceeding	Unranked	Twente Student Conference on IT	1
Publication	Unranked	Via Nova Architectura	1
Conference Proceeding	Ranked	WSE	1
Conference Proceeding	Unranked	Wireless Communications, Networking and Mobile Computing	1
Conference Proceeding	Unranked	Workshop on Enabling Technologies: Infrastructure for Collaborative Enterprises	1

B.4. *Distribution of EA publications by research methodology*

Distribution of EA publications by research methodology is shown in Table B.4.

B.5. *Distribution of EA publications by attitude*

Distribution of EA publications by attitude is shown in Table B.5.

Table B.4. Distribution of EA publications by research methodology.

Year	Conceptual	Literature Review	Interviews	Single Case Study	Multiple Case Studies	Survey	Mixed
1985	—	—	—	—	—	—	—
1986	—	—	—	—	—	—	—
1987	1 (100.0%)	—	—	1 (100.0%)	—	—	—
1988	—	—	—	—	—	—	—
1989	3 (100.0%)	—	—	—	—	—	—
1990	—	—	—	1 (100.0%)	—	—	—
1991	—	—	—	—	—	—	—
1992	4 (100.0%)	—	—	—	—	—	—
1993	2 (100.0%)	—	—	—	—	—	—
1994	3 (75.0%)	—	1 (25.0%)	—	—	—	—
1995	—	—	—	—	—	—	—
1996	4 (80.0%)	—	—	—	—	—	1 (20.0%)
1997	2 (100.0%)	—	—	—	—	—	—
1998	1 (100.0%)	—	—	—	—	—	—
1999	8 (100.0%)	—	—	—	—	—	—
2000	7 (87.5%)	—	—	1 (12.5%)	—	—	—
2001	5 (83.3%)	—	—	—	1 (16.7%)	—	—
2002	5 (45.5%)	—	—	2 (18.2%)	3 (27.3%)	—	1 (9.1%)
2003	14 (73.7%)	—	—	1 (5.3%)	2 (10.5%)	—	2 (10.5%)
2004	19 (65.5%)	1 (3.4%)	2 (6.9%)	2 (6.9%)	3 (10.3%)	2 (6.9%)	—
2005	22 (68.8%)	—	1 (3.1%)	4 (12.5%)	1 (3.1%)	4 (12.5%)	—
2006	37 (56.1%)	—	1 (1.5%)	11 (16.7%)	6 (9.1%)	3 (4.5%)	8 (12.1%)
2007	54 (55.1%)	—	3 (3.1%)	25 (25.5%)	10 (10.2%)	4 (4.1%)	2 (2.0%)
2008	40 (61.5%)	1 (1.5%)	—	11 (16.9%)	9 (13.8%)	3 (4.6%)	1 (1.5%)
2009	73 (57.5%)	2 (1.6%)	4 (3.1%)	26 (20.5%)	16 (12.6%)	3 (2.4%)	3 (2.4%)
2010	61 (58.1%)	3 (2.9%)	4 (3.8%)	17 (16.2%)	6 (5.7%)	11 (10.5%)	3 (2.9%)
2011	55 (56.1%)	3 (3.1%)	2 (2.0%)	21 (21.4%)	6 (6.1%)	8 (8.2%)	3 (3.1%)
2012	48 (42.9%)	1 (0.9%)	3 (2.7%)	24 (21.4%)	21 (18.8%)	9 (8.0%)	6 (5.4%)
2013	55 (48.2%)	4 (3.5%)	6 (5.3%)	22 (19.3%)	7 (6.1%)	14 (12.3%)	6 (5.3%)
2014	31 (39.2%)	4 (5.1%)	4 (5.1%)	22 (27.8%)	8 (10.1%)	6 (7.6%)	4 (5.1%)
2015	29 (39.2%)	4 (5.4%)	6 (8.1%)	22 (29.7%)	3 (4.1%)	5 (6.8%)	5 (6.8%)
Total	583 (54.2%)	23 (2.1%)	37 (3.4%)	213 (19.8%)	102 (9.5%)	72 (6.7%)	45 (4.2%)

Table B.5.   Distribution of EA publications by attitude.

Year	Non-Empirical Descriptive	Non-Empirical Prescriptive	Empirical Descriptive	Empirical Prescriptive
1985	—	—	—	—
1986	—	—	—	1 (100.0%)
1987	—	1 (100.0%)	—	—
1988	—	—	—	—
1989	1 (33.3%)	2 (66.7%)	—	—
1990	—	—	1 (100.0%)	—
1991	—	—	—	—
1992	—	4 (100.0%)	—	—
1993	—	2 (100.0%)	—	—
1994	2 (50.0%)	1 (25.0%)	1 (25.0%)	—
1995	—	—	—	—
1996	—	4 (80.0%)	1 (20.0%)	—
1997	—	2 (100.0%)	—	—
1998	1 (100.0%)	—	—	—
1999	3 (37.5%)	5 (62.5%)	—	—
2000	2 (25.0%)	5 (62.5%)	1 (12.5%)	—
2001	—	5 (83.3%)	—	1 (16.7%)
2002	4 (36.4%)	1 (9.1%)	5 (45.5%)	1 (9.1%)
2003	4 (21.1%)	10 (52.6%)	4 (21.1%)	1 (5.3%)
2004	7 (24.1%)	13 (44.8%)	6 (20.7%)	3 (10.3%)
2005	11 (34.4%)	11 (34.4%)	7 (21.9%)	3 (9.4%)
2006	16 (24.2%)	21 (31.8%)	23 (34.8%)	6 (9.1%)
2007	25 (25.5%)	29 (29.6%)	31 (31.6%)	13 (13.3%)
2008	23 (35.4%)	18 (27.7%)	16 (24.6%)	8 (12.3%)
2009	31 (24.4%)	44 (34.6%)	31 (24.4%)	21 (16.5%)
2010	29 (27.6%)	35 (33.3%)	33 (31.4%)	8 (7.6%)
2011	31 (31.6%)	27 (27.6%)	30 (30.6%)	10 (10.2%)
2012	21 (18.8%)	28 (25.0%)	46 (41.1%)	17 (15.2%)
2013	31 (27.2%)	28 (24.6%)	33 (28.9%)	22 (19.3%)
2014	11 (13.9%)	24 (30.4%)	29 (36.7%)	15 (19.0%)
2015	13 (17.6%)	20 (27.0%)	26 (35.1%)	15 (20.3%)
Total	266 (24.7%)	340 (31.6%)	324 (30.1%)	145 (13.5%)

Appendix C. Detailed Description of EA-Related Topics

This Appendix contains the detailed description of all 42 EA-related topics identified in EA publications. The topic descriptions provided below resulted from the review protocol used by the author to assure reliability and maintain consistency in topics coding during the review. All EA-related topics are described in the following sections in an alphabetical order.

Acceptance topic includes all publications discussing acceptance, adoption and further institutionalization of EA practice in organizations in a long-run. These publications discuss what affects the intention of employees to use EA, how acceptance of EA should be facilitated, how to make EA an institutionalized practice, what institutionalization is and what factors influence it.[219,220,246] These discussions include various organizational as well as individual psychological factors.[179]

Analysis topic includes all publications discussing more or less formal methods for analyzing EA documentation in order to produce useful results. The proposed methods for EA analysis include the analysis of security threats,[264] response times,[111] application usage,[265] interoperability,[266] modifiability,[143] maintainability[267] and other methods.[268,269] EA analysis methods often rely on existing general-purpose EA modeling languages[111] or propose their own extensions for existing languages suitable for the purposes of their analysis.[144]

Application topic includes all publications discussing potential applications of EA in organizations suggesting what specific problems can be solved or alleviated with EA. The spectrum of potential applications of EA is very diverse and includes the following applications: support change management,[270] promote security,[138] guide enterprise transformations,[51] facilitate Sarbanes-Oxley compliance,[271] alleviate mergers and acquisitions,[272] improve organizational self-awareness,[273] facilitate project risk management,[274] assist IT portfolio valuation,[144] support ERP implementation,[275] strengthen coordination,[140] support requirements engineering,[276] drive innovations[277] as well as a multitude of other applications.[139,278]

Architects topic includes all publications discussing the profession, skills, traits, attitudes, personality types, competences and responsibilities of enterprise architects.[170–172,279–281]

Artifacts topic includes all publications discussing artifacts, documents, products or deliverables that can be used to describe EA and their properties. These publications provide specific lists of EA artifacts that can be used in EA practices,[17,120,130,134] discuss their usage,[250,251,282] properties[259] and other related questions.[260]

Audit topic includes all publications discussing the audit of the quality of EA practice encompassing both EA documentation and EA-related processes.[224–226]

Automation topic includes all publications discussing the automation of the creation and maintenance of EA documentation. These publications discuss potential sources of information for automation,[201] enterprise service bus (ESB) as a potential information source for EA documentation automation,[199] meta-models for automated EA model maintenance,[283] conflict resolution for automated EA documentation[284] and other related questions.[206,285]

Basis topic includes all publications discussing what considerations should be taken as the basis for creating EA artifacts and how EA documentation should be derived from this basis. Essentially, these publications discuss the inputs of the EA development process. A business strategy is often mentioned as the basis for EA development[18,286–288] and many methods describing how to derive EA from a business strategy are proposed.[17,173] However, an operating model,[174,222,289] business components[239] or concrete strategic initiatives[158,169] can also be used as a basis for EA development.

Benefits topic includes all publications discussing how EA practice benefits organizations. These publications discuss the value of EA,[46,290] how exactly the value of EA is generated,[21,50,291] what goals and objectives motivate EA endeavors,[234,237] what affects the potential benefits from EA practice,[110,219] what positive outcomes could be obtained from EA practice as well as many other questions. These discussions include both expected and actual benefits.

Coordination topic includes all publications discussing how the efforts of different EA teams should be coordinated in decentralized or federated EA practices. These publications discuss coordination in geographically distributed EA practice,[292,293] linkage mechanisms to coordinate activities at different organizational levels,[185] the role of group cognition in coordination,[294] challenges with coordination in very large organizations[164] as well as other questions.[155,165,295]

Culture topic includes all publications discussing cultural, political, social and psychological issues in EA practice. These publications discuss the role of subcultures in EA practice,[197] the relationship between organizational culture and EA principles,[198] management of culture and politics in EA practice[196] and other questions.[179,296]

Design topic includes all publications discussing how EA practice, as a complex set of all EA-related organizational structures, roles, processes, activities and documents, should be designed in order to fit the context of a particular organization. These publications discuss contextual organizational contingency factors influencing the design of EA practice,[297,298] the design options of EA practice which can vary depending on the relevant organizational factors[182–184] and other issues.[299,300]

Development topic includes all publications discussing more or less formal processes or sequences of steps necessary to plan and develop EA documentation based on some higher-level considerations. These publications discuss processes and steps for creating EA artifacts.[17,120,133,134,301]

EA and BPM topic includes all publications discussing the relationship between EA and business process management (BPM) and potential synergy between them.[216–218,302]

EA and Cloud topic includes all publications discussing the relationship between EA and cloud computing and potential synergy between them.[205–207,303]

EA and ITIL topic includes all publications discussing the relationship and potential synergy between EA, IT infrastructure library (ITIL) and IT service management (ITSM) in general.[210–212,304,305]

EA and Outsourcing topic includes all publications discussing the relationship and interaction between EA and IT outsourcing. These publications discuss how EA can guide outsourcing arrangements,[222] how outsourcing impacts on EA[223] and other issues.[221]

EA and SOA topic includes all publications discussing the relationship between EA and service-oriented architecture (SOA), potential synergy between them and use of SOA in the EA context.[148–150,306]

EA in Public Sector topic includes all publications discussing various issues related to EA practice in public sector, national governments and other non-profit organizations. These publications discuss models for EA in public administrations,[112,307] specific problems with EA practice in government agencies,[308] interoperability in e-government initiatives,[309] successful EA efforts in governmental and non-profit organizations,[131,310,311] EA practice in police, armed forces and universities,[247,312,313] Federal Enterprise Architecture (FEA) program[314] as well as other relevant questions.[132,315,316]

EA in SMEs topic includes all publications discussing various issues related to EA practice in small and medium enterprises (SMEs). These publications discuss the applicability of general-purpose EA methods for SMEs,[202] tool support for EA practice in SMEs,[203,317] benefits of using EA for SMEs[204] as well as other relevant questions.[318–320]

EA in Virtual Enterprises topic includes all publications discussing various issues related to EA practice in virtual enterprises (also called virtual companies, virtual organizations or networked organizations). These publications discuss specific EA methods developed for virtual enterprises,[208,321,322] the applicability of general-purpose EA methods for virtual enterprises,[52] virtual enterprises modeling issues[209] as well as other relevant questions.[323]

Education topic includes all publications discussing various issues related to EA education and teaching EA at universities. Issues discussed in these publications include EA teaching cases,[215] curriculums for EA university programs,[324] textbooks for EA university courses[325] and other questions related to teaching EA to students.[213,214,326]

Frameworks Analysis topic includes all publications discussing the analysis, comparison and selection of EA frameworks. These publications include general analyses and comparisons of EA frameworks,[20,135,327,328] analyses and comparisons of specific aspects of EA frameworks, for instance, support of services[136] or decentralization,[329] as well as methods or guidelines for choosing EA frameworks[137,330,331] and other issues related to EA frameworks.[332,333] Importantly, Frameworks Analysis topic *does not* include publications presenting EA frameworks,[22,122,134] but deals only with the analysis, comparison and selection of EA frameworks. Instead, publications discussing or proposing specific EA frameworks are related to the corresponding topics addressed in these frameworks. For instance, the publications presenting the Zachman Framework[22,116] and other similar taxonomies[16,126] are related to Structure topic instead of Frameworks Analysis topic because these publications discuss how EA artifacts should be structured, not analyzed or compared with EA frameworks.

Function topic includes all publications discussing the organization of EA as an organizational function. These publications describe EA governance structures, boards, committees, bodies, roles, their responsibilities and relationship to each other[157] as well as the operation of EA function[155] and other questions related to the organization of EA function.[156,334]

Implementation topic includes all publications discussing how EA should guide the actual information systems implementation. These publications discuss the development of IT systems according to the descriptions provided by EA artifacts, including the implementation of transition plans,[161] preparation of project-start architectures,[162] achieving conformance to EA,[335] EA compliance checks and assessments[163,336] and other related questions.[109,337]

Initiation topic includes all publications discussing how to initiate and start EA practice from scratch. These publications describe how to start EA journey, what first steps should be taken, how to introduce EA practice into organizations and what preparations should be made before initiating EA practice.[177–179]

Integration topic includes all publications discussing how EA practice should be integrated with other organizational processes and activities. These publications describe how EA practice should be integrated with strategic management,[158,338] project management,[159] operations management,[160] IT portfolio management,[339] IT investments management,[340] acquisitions management,[341] corporate risk management[139] and other organizational activities and processes.[342,343]

Levels topic includes all publications discussing how EA in large enterprises with considerable scopes should be separated into several architectural levels (enterprise, segment, line-of-business, business unit, etc.) with different scopes and granularities where higher architectural levels cover wider scopes in less detail and lower architectural levels cover narrower scopes in more detail.[164–166]

Management topic includes all publications discussing the general high-level underlying logic of EA practice as well as patterns of interaction and temporal relationship between the processes constituting EA practice. These publications describe certain ways to establish EA practice and the rules which make all the elements of EA practice work consistently with each other.[17,120,125,134,169,177,286,288]

Maturity topic includes all publications discussing how EA practice matures and how the maturity of EA practice can be measured or assessed. Some of these publications understand EA maturity as the maturity of the existing IT landscape,[67,242,344] while others understand EA maturity as the maturity of EA-related processes including EA quality issues.[141,142,345]

Measurements topic includes all publications discussing how the outcomes, effects and results of EA practice can be measured. These publications include discussions on key performance indicators (KPIs) for EA practice,[346] adaptations of the balanced scorecard (BSC) concept to EA practice,[152,347] return on investments (ROI)

in EA and other financial measures of EA practice[151,348] as well as other metrics and ways to measure efficiency and effectiveness of EA initiatives.[153,349,350]

Modeling topic includes all publications discussing specific modeling languages, graphical notations and other methods to represent individual EA artifacts. These publications describe full-fledged modeling languages designed specifically for EA,[129,351] adaptations of general-purpose modeling languages to EA domain,[128,352,353] ontology-based EA modeling notations[354–356] and other ways to model EA artifacts.[127,357,358]

Patterns topic includes all publications discussing general reusable solutions to commonly occurring problems in EA development.[187–189,359]

Principles topic includes all publications discussing how principles can be used to describe EA and the role of principles in EA practice.[12,49,113,360,361]

Problems topic includes all publications discussing the potential problems, challenges, worst practices, risks and common reasons for failure of EA practice.[19,47,167,168,362,363]

Reference Models topic includes all publications discussing EA reference models for various industries or governments.[190–192,364]

Repository topic includes all publications discussing the organization of a repository for EA artifacts or documents. These publications include both the logical aspects[17,194] and technical aspects[193,195] of EA repositories.

Review topic includes all EA literature reviews discussing and analyzing EA research in general, its status, characteristics, problems, issues, terminology and other questions.[29–33,44] These publications have been discussed in Sec. 2. At the same time, publications reviewing narrow EA-related topics are related to the corresponding topics instead of Review topic. For instance, publications reviewing EA benefits[21,46] or principles[45,49] are related to Benefits and Principles topics instead of Review topic because these publications discuss EA benefits and principles, not EA research in general. These publications have been summarized in Table 2.

Stakeholders topic includes all publications discussing EA stakeholders, ways to manage and involve them, their interests, needs, roles, concerns and communication between or with them.[48,180,181,248,365]

Structure topic includes all publications discussing how EA artifacts should be structured to be manageable and adequately describe enterprises. These publications propose taxonomies for organizing EA artifacts[16,22,116,126,130] and discuss typical EA domains or layers.[366,367]

Success Factors topic includes all publications discussing the factors influencing success of EA practice and facilitating the realization of expected benefits.[7,175,176,368,369]

Tools topic includes all publications discussing the tool support for EA practice. These publications discuss the tools for EA analysis,[147,253] tools for EA modeling,[146,370] other tools[203,371] and related issues.[145,254,372,373]

Other topic includes all publications that are relevant to EA but cannot be allocated to any particular topics or grouped into separate topics having at least three publications on the similar subject. These publications discuss the questions which are too unique,[227,374] too specific,[229,375] too generic[228,376] or having unclear motives.[13,377]

Appendix D. Distribution of EA-Related Topics

This Appendix contains the detailed distribution of EA-related topics by first appearance, time, publication type, research methodology and attitude.

D.1. *Distribution of EA-related topics by first appearance*

Distribution of EA-related topics by first appearance is shown in Table D.1.

D.2. *Distribution of EA-related topics by time*

Distribution of EA-related topics by time is shown in Table D.2.

D.3. *Distribution of EA-related topics by publication type*

Distribution of EA-related topics by publication type is shown in Table D.3.

Table D.1.   Distribution of EA-related topics by first appearance.

Year	Topics	New Topics
1986	3	Development, Principles, Structure
1989	7	Application, Benefits, Modeling, Problems
1993	14	Artifacts, Basis, Implementation, Initiation, Management, Success Factors, Tools
1994	15	EA in Virtual Enterprises
1996	16	Frameworks Analysis
1999	22	Coordination, EA in Public Sector, Function, Levels, Maturity, Stakeholders
2000	27	Architects, Integration, Measurements, Reference Models, Repository
2004	30	EA and Outsourcing, Education, Review
2005	32	Analysis, Culture
2006	35	Design, EA and SOA, Patterns
2007	37	EA and BPM, EA and ITIL
2009	40	Acceptance, Audit, EA in SMEs
2010	42	Automation, EA and Cloud

Table D.2.   Distribution of EA-related topics by time.

Topic	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	2010 to 2012	2013 to 2015
Acceptance	—	—	—	—	—	—	—	1	2	2
Analysis	—	—	—	—	—	—	4	20	14	24
Application	—	1	—	—	—	—	5	24	26	25
Architects	—	—	—	—	1	1	5	7	8	10
Artifacts	—	—	1	1	3	4	10	12	10	13
Audit	—	—	—	—	—	—	—	2	1	—
Automation	—	—	—	—	—	—	—	—	6	5
Basis	—	—	1	—	—	3	8	7	5	2
Benefits	—	1	2	2	3	2	15	16	38	18
Coordination	—	—	—	—	1	1	4	4	3	2
Culture	—	—	—	—	—	—	1	—	3	8
Design	—	—	—	—	—	—	2	4	9	2
Development	1	—	3	3	4	8	17	28	25	12
EA and BPM	—	—	—	—	—	—	—	2	4	—
EA and Cloud	—	—	—	—	—	—	—	—	7	3
EA and ITIL	—	—	—	—	—	—	—	2	4	3
EA and Outsourcing	—	—	—	—	—	—	3	1	—	—
EA and SOA	—	—	—	—	—	—	1	18	22	8
EA in Public Sector	—	—	—	—	5	4	13	39	37	13
EA in SMEs	—	—	—	—	—	—	—	2	2	7
EA in Virtual Enterprises	—	—	1	—	—	—	—	2	2	5
Education	—	—	—	—	—	—	3	3	2	1
Frameworks Analysis	—	—	—	2	2	3	15	24	27	14
Function	—	—	—	—	2	3	7	17	13	2
Implementation	—	—	1	1	1	4	8	13	9	3
Initiation	—	—	1	—	1	1	5	5	5	4
Integration	—	—	—	—	2	2	4	11	17	8
Levels	—	—	—	—	3	2	8	12	13	2
Management	—	—	1	—	3	3	10	7	9	2
Maturity	—	—	—	—	1	3	13	25	24	10
Measurements	—	—	—	—	1	—	5	14	15	13
Modeling	—	1	5	3	5	6	20	22	30	51
Patterns	—	—	—	—	—	—	1	6	6	1
Principles	1	1	—	—	2	2	4	9	15	11
Problems	—	1	2	—	1	1	5	8	12	9
Reference Models	—	—	—	—	1	1	1	3	7	1
Repository	—	—	—	—	1	—	2	3	5	3
Review	—	—	—	—	—	—	1	2	2	1
Stakeholders	—	—	—	—	1	—	2	9	6	3
Structure	2	4	8	7	8	11	30	32	22	12
Success Factors	—	—	2	—	—	—	8	4	4	6
Tools	—	—	1	—	2	1	10	14	5	21
Other	—	—	1	—	2	10	18	53	55	49

Table D.3. Distribution of EA-related topics by publication type.

Topic	Journal Articles	Conference Proceedings	Books	Book Chapters	Other Publications
Acceptance	1	3	—	1	—
Analysis	13	47	2	—	—
Application	22	48	4	6	1
Architects	11	8	11	1	1
Artifacts	12	7	20	1	14
Audit	2	—	—	1	—
Automation	—	11	—	—	—
Basis	5	3	12	2	4
Benefits	26	33	19	5	14
Coordination	2	9	2	2	—
Culture	3	4	3	2	—
Design	—	13	2	2	—
Development	18	32	30	7	14
EA and BPM	1	4	1	—	—
EA and Cloud	1	5	—	4	—
EA and ITIL	3	4	1	1	—
EA and Outsourcing	3	—	1	—	—
EA and SOA	9	28	7	4	1
EA in Public Sector	36	30	2	31	12
EA in SMEs	3	7	—	1	—
EA in Virtual Enterprises	2	8	—	—	—
Education	2	5	2	—	—
Frameworks Analysis	24	30	20	2	11
Function	8	5	15	4	12
Implementation	6	10	17	1	6
Initiation	7	1	10	2	2
Integration	11	13	7	7	6
Levels	14	12	9	2	3
Management	8	7	15	—	5
Maturity	20	19	14	9	14
Measurements	14	21	6	1	6
Modeling	24	82	20	7	10
Patterns	3	9	2	—	—
Principles	12	15	13	1	4
Problems	10	14	8	2	5
Reference Models	1	1	5	2	5
Repository	2	3	5	1	3
Review	1	4	—	—	1
Stakeholders	3	9	5	3	1
Structure	36	29	32	13	26
Success Factors	11	6	5	—	2
Tools	2	28	12	2	10
Other	66	85	4	23	10

D.4. *Distribution of EA-related topics by research methodology*

Distribution of EA-related topics by research methodology is shown in Table D.4.

D.5. *Distribution of EA-related topics by attitude*

Distribution of EA-related topics by attitude is shown in Table D.5.

Table D.4. Distribution of EA-related topics by research methodology.

Topic	Conceptual	Literature Review	Interviews	Single Case Study	Multiple Case Studies	Survey	Mixed
Acceptance	1	—	—	—	2	2	—
Analysis	39	—	—	15	4	2	2
Application	38	3	5	21	7	6	1
Architects	23	—	5	—	—	3	1
Artifacts	35	—	—	10	2	5	2
Audit	2	—	—	1	—	—	—
Automation	5	—	1	2	—	2	1
Basis	16	—	—	2	4	—	4
Benefits	31	3	4	12	5	30	12
Coordination	4	—	3	1	6	—	1
Culture	5	—	1	3	1	2	—
Design	7	—	1	—	3	5	1
Development	62	2	3	18	10	—	6
EA and BPM	4	—	—	2	—	—	—
EA and Cloud	9	—	—	1	—	—	—
EA and ITIL	7	—	—	—	2	—	—
EA and Outsourcing	—	—	—	1	1	—	2
EA and SOA	36	—	—	8	2	—	3
EA in Public Sector	33	—	3	55	15	3	2
EA in SMEs	5	—	—	2	2	2	—
EA in Virtual Enterprises	5	1	—	2	2	—	—
Education	6	—	1	2	—	—	—
Frameworks Analysis	59	—	1	4	6	14	3
Function	18	—	2	8	6	8	2
Implementation	22	—	1	6	4	5	2
Initiation	14	—	—	4	3	—	1
Integration	19	2	2	7	10	3	1
Levels	19	—	5	8	6	—	2
Management	20	1	—	7	4	2	1
Maturity	36	1	1	11	8	11	8
Measurements	22	1	—	6	5	7	7
Modeling	98	—	—	28	5	4	8
Patterns	14	—	—	—	—	—	—
Principles	23	2	1	9	5	5	—
Problems	20	2	2	4	3	6	2
Reference Models	7	—	1	4	1	—	1
Repository	12	—	—	1	—	1	—
Review	—	6	—	—	—	—	—
Stakeholders	12	—	1	6	1	—	1
Structure	88	—	4	21	10	10	3
Success Factors	6	1	3	4	3	4	3
Tools	36	1	—	4	4	7	2
Other	123	2	5	33	15	2	8

Table D.5.   Distribution of EA-related topics by attitude.

Topic	Non-Empirical Descriptive	Non-Empirical Prescriptive	Empirical Descriptive	Empirical Prescriptive
Acceptance	—	1	4	—
Analysis	1	38	1	22
Application	20	21	26	14
Architects	18	5	8	1
Artifacts	5	30	13	6
Audit	—	2	1	—
Automation	—	5	4	2
Basis	2	14	8	2
Benefits	18	16	59	4
Coordination	1	3	9	2
Culture	2	3	7	—
Design	2	5	9	1
Development	6	58	11	26
EA and BPM	4	—	1	1
EA and Cloud	4	5	—	1
EA and ITIL	4	3	1	1
EA and Outsourcing	—	—	3	1
EA and SOA	17	19	9	4
EA in Public Sector	9	24	73	5
EA in SMEs	2	3	3	3
EA in Virtual Enterprises	5	1	2	2
Education	1	5	2	1
Frameworks Analysis	39	20	22	6
Function	5	13	24	2
Implementation	—	22	13	5
Initiation	1	13	7	1
Integration	7	14	17	6
Levels	2	17	16	5
Management	1	20	10	4
Maturity	14	23	29	10
Measurements	7	16	13	12
Modeling	13	85	15	30
Patterns	1	13	—	—
Principles	12	13	15	5
Problems	13	9	14	3
Reference Models	—	7	7	—
Repository	2	10	2	—
Review	6	—	—	—
Stakeholders	3	9	6	3
Structure	17	71	31	17
Success Factors	3	4	16	1
Tools	14	23	10	7
Other	77	48	48	15

Appendix E. Distribution of EA-Related Themes

This Appendix contains the detailed distribution of EA-related themes by time, publication type, research methodology and attitude.

E.1. *Distribution of EA-related themes by time*

Distribution of EA-related themes by time is shown in Table E.1.

Table E.1. Distribution of EA-related themes by time.

Theme	1986 to 1988	1989 to 1991	1992 to 1994	1995 to 1997	1998 to 2000	2001 to 2003	2004 to 2006	2007 to 2009	2010 to 2012	2013 to 2015
Actors	—	—	—	—	2	1	10	19	16	14
Processes	1	—	5	4	11	18	43	63	63	27
Documentation	3	6	14	11	18	23	68	95	91	111
Technology	—	—	1	—	3	1	12	17	16	29
Organization	—	—	1	—	6	8	29	52	50	27
EA Practice	—	3	6	4	7	7	52	89	129	76
Evolution	—	—	1	—	2	4	18	31	31	16
Specific Management Practices	—	—	—	—	—	—	3	5	8	3
Specific Technologies	—	—	—	—	—	—	1	18	29	11
Specific Organizations	—	—	1	—	5	4	13	43	41	25
Miscellaneous	—	—	1	—	2	10	19	55	57	50

E.2. *Distribution of EA-related themes by publication type*

Distribution of EA-related themes by publication type is shown in Table E.2.

E.3. *Distribution of EA-related themes by research methodology*

Distribution of EA-related themes by research methodology is shown in Table E.3.

E.4. *Distribution of EA-related themes by attitude*

Distribution of EA-related themes by attitude is shown in Table E.4.

Table E.2. Distribution of EA-related themes by publication type.

Theme	Journal Articles	Conference Proceedings	Books	Book Chapters	Other Publications
Actors	16	22	18	4	2
Processes	45	71	71	17	31
Documentation	97	180	87	22	54
Technology	4	42	17	3	13
Organization	46	45	45	12	25
EA Practice	97	154	65	19	38
Evolution	28	23	24	12	16
Specific Management Practices	7	8	3	1	—
Specific Technologies	10	33	7	8	1
Specific Organizations	41	45	2	32	12
Miscellaneous	67	89	4	23	11

Table E.3.   Distribution of EA-related themes by research methodology.

Theme	Conceptual	Literature Review	Interviews	Single Case Study	Multiple Case Studies	Survey	Mixed
Actors	41	—	7	8	1	3	2
Processes	127	5	9	39	34	10	11
Documentation	283	2	5	83	26	26	15
Technology	53	1	1	7	4	10	3
Organization	82	1	8	28	22	17	15
EA Practice	182	9	17	49	28	65	23
Evolution	51	1	1	15	13	13	9
Specific Management Practices	11	—	—	3	3	—	2
Specific Technologies	45	—	—	9	2	—	3
Specific Organizations	43	1	3	59	19	5	2
Miscellaneous	123	8	5	33	15	2	8

Table E.4.   Distribution of EA-related themes by attitude.

Theme	Non-Empirical Descriptive	Non-Empirical Prescriptive	Empirical Descriptive	Empirical Prescriptive
Actors	22	19	16	5
Processes	15	117	60	43
Documentation	48	237	75	80
Technology	16	38	16	9
Organization	18	65	69	21
EA Practice	96	95	153	29
Evolution	15	37	40	11
Specific Management Practices	8	3	5	3
Specific Technologies	21	24	9	5
Specific Organizations	16	28	78	10
Miscellaneous	83	48	48	15

Appendix F. Terminological Problems in the EA Discipline

The EA discipline, arguably, suffers from significant terminological problems. More-over, these problems relate to the key terms of the entire EA discipline. The modern EA discipline emerged largely from early EA frameworks[16,22] and essentially still revolves around popular EA frameworks.[29] An EA framework was initially clearly defined as "a logical structure for classifying and organizing the descriptive repre-sentations of an Enterprise that are significant to the management of the Enterprise as well as to the development of the Enterprise's systems" (see p. 2 in Ref. 378) and both the seminal EA frameworks[16,22] perfectly matched this definition. However, later the meaning of the term "framework" has been blurred and now this term is used inconsistently by different authors, including both authors of EA frameworks and analysts of EA frameworks.

From the perspective of the authors of EA frameworks, different types of EA-related recommendations have been titled as EA "frameworks" by their authors. For instance, Zachman,[22] Pulkkinen[165] and Schekkerman[126] title their one-page taxonomies for organizing EA artifacts as EA "frameworks". The authors of FEAF title their 80-page document, which provides both the taxonomy and a high-level methodology for using it, as an EA "framework".[199] The authors of TOGAF title their 692-page manual, which provides a step-by-step EA development methodology, detailed list of EA artifacts, EA maturity model, guidance for developing service-oriented architecture (SOA), skills classifications for architects and other diverse EA-related recommendations, as an EA "framework".[134] Bernard,[17] who provides a 340-page detailed methodology for developing EA, detailed structure of EA and detailed list of EA artifacts, titles only the proposed structure of EA as an EA "framework" (EA^{3}Cube). At the same time, Spewak and Hill[120] also provide a detailed methodology for developing EA, detailed structure of EA and detailed list of EA artifacts, but do not title any parts of their 367-page EA methodology as an EA "framework". Therefore, most authors of different EA frameworks title very diverse (in terms of both content and volume) sets of EA-related recommendations as "frameworks", while other authors do not title similar sets of recommendations as "frameworks".

From the perspective of the analysts of EA frameworks, the situation is even more complex since many analysts consider as EA "frameworks" various publications that (1) do not provide taxonomies for organizing EA artifacts, (2) have not been titled as "frameworks" by their authors, (3) have nothing in common with other "frameworks" and (4) sometimes even not relevant to EA in any real sense. For instance, ArchiMate is included in the list of EA "frameworks" by Kallgren *et al.*[379] and the book of Ross *et al.*[222] is included in the list of EA "frameworks" by Bui[380] even though they neither provide taxonomies for organizing EA artifacts, nor have been titled as "frameworks" by their authors. Schekkerman[381] discusses 14 different EA "frameworks" including JTA and DoD TRM, even though they do not provide taxonomies for organizing EA artifacts and have not been titled previously as EA "frameworks". Matthes[382] discusses 34 different EA "frameworks" including EAP[120] (which was not originally titled as an EA "framework"), EAAF[383] and EAMMF (Ref. 384) (which provide only EA maturity models), ARIS[25] (which is essentially an EA modeling language) and even POSIX open-system environment reference model (POSIX OSE RM) (which is even hardly relevant to EA). Gall[385] considers RM-ODP, ITIL and COBIT as EA "frameworks", even though none of these standards has any real relationship to EA.

The examples provided above demonstrate that essentially any source can be considered as an EA "framework" by some authors. These examples suggest that the very meaning of the term "framework" in the EA discipline has evolved from its original clear and unambiguous meaning as "a logical structure for classifying and organizing the descriptive representations of an Enterprise" (see p. 2 in Ref. 378) to a very vague umbrella term embracing all possible collections of EA-related and

even non-EA-related recommendations. For instance, the specific examples of the inconsistent usage of the term "framework" in different EA publications provided above suggest that currently an EA framework can be formally defined only as "any arbitrary set of EA-related or non-EA-related recommendations", or even recursively as "anything that can be considered by someone to be an EA framework". Surprisingly, even though EA "frameworks" constitute the core of the EA discipline,[29] the very term EA "framework" essentially has no meaningful definition. It is, arguably, hardly possible to clearly distinguish "frameworks" from not "frameworks" in the current EA literature. Similarly, many other related terms (e.g. EA "methodology", "guidance", "approach", etc.) are often used inconsistently in the EA literature.

Due to the specific terminological problems described above and the general lack of a clearly defined terminology in the EA discipline, this review intentionally avoids using any unclear and ambiguous EA-related terms, including "frameworks", "methodologies", "approaches" and "conceptualizations", in the topics and themes coding. Instead, for classification and coding purposes this review uses more specific, narrow and tangible terms reflecting some real "organizational" meaning. As a consequence, frameworks is missing in the resulting list of EA-related topics (see Table 3) due to the considerable ambiguity of the term "framework", while other topics reflecting the real nature of EA frameworks' recommendations are articulated instead. For instance, Structure topic includes all publications providing taxonomies and layers for organizing EA, including both one-page taxonomy EA "frameworks"[22,126] and other publications describing the structure of EA not classified as "frameworks".[366,386] Similarly, Development topic includes all publications providing processes and steps for developing EA, including both comprehensive EA "frameworks"[122,134] and other publications describing how to develop EA not classified as "frameworks".[17,120]

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