2011

Charting the landscape of enterprise architecture management

Mariana Mykhashchuk
Technische Universität München, mariana.mykhashchuk@mytum.de

Sabine Buckl
Technische Universität München, sabine.buckl@mytum.de

Thomas Dierl
Technische Universität München, dierl@mytum.de

Christian M. Schweda
Technische Universität München, christian.m.schweda@mytum.de

Charting the landscape of enterprise architecture management

An extensive literature analysis

Mariana Mykhashchuk
Chair for Software Engineering for Business Information Systems
Technische Universität München
Boltzmannstr. 3
85748 Garching, Germany
mariana.mykhashchuk@mytum.de

Sabine Buckl
Chair for Software Engineering for Business Information Systems
Technische Universität München
Boltzmannstr. 3
85748 Garching, Germany
sabine.buckl@mytum.de

Thomas Dierl
Chair for Software Engineering for Business Information Systems
Technische Universität München
Boltzmannstr. 3
85748 Garching, Germany
dierl@mytum.de

Christian M. Schweda
Chair for Software Engineering for Business Information Systems
Technische Universität München
Boltzmannstr. 3
85748 Garching, Germany
christian.m.schweda@mytum.de

ABSTRACT

Todays enterprises are faced with the challenge of an ever changing environment, which they continuously have to adapt to. A commonly accepted means to support an enterprise in the transformation process and furthermore enhance the alignment between business and IT is enterprise architecture (EA) management, which provides a holistic perspective on the enterprise. In order to support an enterprise in the transformation process, EA management creates architectural descriptions of current, planned, and future states of the enterprise. Reflecting the aforementioned importance of EA management a plurality of approaches for establishing an EA management function in an enterprise have been proposed by researchers, practitioners, and standardization bodies. The approaches vary widely in respect to the proposed methods, models, and languages.

The objective of this article is to analyze the state-of-the-art in EA and EA management respectively. Therefore, an extensive literature survey on publications in the area is performed. Criteria for the analysis are inter alia the distribution of papers over time, their regional distribution, type of publication, number of references of an article, and the involved authors groups. Thereby the article seeks to give an overview on the current research occupation in the field of EA management.

Keywords

Enterprise architecture, enterprise architecture management, survey, literature review

1. INTRODUCTION

In recent years the topic enterprise architecture (EA) management has gained considerable importance as well as acceptance in practice and academia [21]. As prominent means to enable and support enterprise transformation in response to ongoing change, triggered among others by globalized markets, specialized customer demands, shorter time to markets, and emerging legal regulations, EA management enables the managed evolution of the enterprise by providing means to describe current, planned, and future states of the EA. Despite the plurality of available publications on the subject, still no common understanding of what EA management really is has yet developed, as the term is often used by authors without a proper definition or explanation [21, f]. Caused by the missing terminological clearness, different *language communities* (in terms of Kamlah and Lorenzen in [b]) have formed among the research groups. This circumstance can be easily demonstrated by the ongoing discussion on the constituents that make up an EA. While *The Open Group Architecture Framework (TOGAF)* proposes a struc-

10^{th} International Conference on Wirtschaftsinformatik,
$16^{th} - 18^{th}$ February 2011, Zurich, Switzerland

turing consisting of a *business, data, application*, and *technology architecture* (cf. [e]), Zachman proposes a framework consisting of five *layers* and six *perspectives* (cf. Zachman in [h]), and Matthes et al. present a structure consisting of *layers* and *crosscutting functions* in [189].

Some reviews targeting the state-of-the-art in EA management literature have been conducted in the last years (cf. Aier et al. in [21], Schönherr in [f], and Schelp and Winter in [248]). While each of them focuses on a dedicated area-of-interest, e.g. Schönherr in [f] focuses on definitions for EA or EA management, whereas Schelp and Winter in [248] emphasize on the research methods of the academic groups, the concluding call for developing a common understanding, i.e. forming the basis for a common language community, remains the same.

At the same time, the multitude of approaches published in the area of EA management and the different terminologies of the EA research groups raise the entrance barriers for young scholars in the field. In particular as the core literature in the area is not known, i.e. the fundamental sources on the subject of EA management providing an introduction are not identified. The latter is backed by the absence of a high-ranking journal dedicated to the field of EA management. Extending the work of Langenberg and Wegman in [167], this paper provides a first step to a consolidation of the area. Building on a review synthesis of over 300 articles on the topic, it analyzes the maturity of the discipline, identifies major EA research groups, and core publications in the area. Analysis criteria regarding the discipline are the number of publications over time, the type of publication, and the regional origin.

In line with the idea of "analyzing the past to prepare for the future" [g], Section 2 details on the method used to conduct the analysis as well as discusses limitations of the utilized approach. Subsequent Section 3 presents the results of the analysis and sketches the findings. Final Section 4 concludes with a summary and critical reflection of the presented analysis and discusses potential future areas of research in particular in respect to fostering a common understanding and supporting integration of existing approaches.

2. ANALYSIS METHOD

In line with the guidelines of Webster and Watson in [g, page xv], we make explicit the scope and limits of the literature included in the synthesis by discussing the way the literature was identified. In the area of EA management the identification of literature is complicated by the vasts amount of literature published in this area (first indications towards the growing interest have been presented by Langenberg and Wegman in [167]) resulting from the increasing importance of the topic of EA management in recent years. As EA management topic is very copious, only a limited set of publications was included in the analysis process. The literature analysis has been executed in four process steps shown in Figure 1. The restricted scope of the *search for sources* is further discussed subsequently.

As discussed by Langenberg and Wegman in [167], EA management is a new discipline, for which different terms, e.g. strategic alignment (cf. Henderson and Venkatraman in [a]),

Figure 1: Process steps

information systems architecture (cf. Zachman in [i]), or business IT alignment (cf. Luftman in [d]) have been used in the past, before the term *enterprise architecture* was coined. The identification of relevant literature accordingly can be regarded as complex task, as a simple search in existing databases, e.g. the web of science[1], the ACM digital library[2], or IEEE Explore[3] using a dedicated search string will strongly limit the scope of the synthesis. In addition research results concerning the topic of EA management are until now typically published as books in case of practitioners' experiences or presented on workshops (cf. Trends in Enterprise Architecture Management Research (TEAR) or the Enterprise Architecture Challenges and Responses (WEACR) international workshop) as already discussed above and are therefore not included in scientific databases, which typically focus on journal publications. Due to this fact, we identified literature relevant for our synthesis by identifying sources, i.e. publications with titles including the keywords *enterprise architecture, enterprise architecture management*, abbreviations thereof (*EA*, *EAM*), and their translations to German (*Unternehmensarchitektur*, *Unternehmensarchitekturmanagement* and *Management der Unternehemensarchitektur*) via a search in *Google Scholar*[4]. The search was compiled at May, 2nd 2010 and the results of the first twenty pages have been added to the initial set of sources after a check for duplicates.

After the set of publications has been identified, each of the sources was indexed with additional information in the second process step. Thereby, we distinguished between the sources' *primary* and *secondary information*. Information that could be immediately retrieved from the source, such as

- name of author(s),
- title,
- publication type, journal paper, workshop paper, technical report, etc. and
- the year of the publication,

was stored as *primary information*.

The *secondary* information includes all information that could not immediately be retrieved from the sources and required further investigation. The *secondary information* includes

- number of citations of the source[5],

[1]www.webofscience.com
[2]http://portal.acm.org
[3]http://ieeexplore.ieee.org
[4]http://scholar.google.com
[5]The number of citations was identified utilizing the "quoted by" information from *Google Scholar*.

- the academic research group, and
- the regional origin of the publication.

During the third step, the analysis of the included sources was performed. Thereby, the stored *primary* and *secondary* information was used to analyze the publications in respect to the following analysis criteria

distribution over time This criteria was analyzed to identify the level of maturity of the topic EA management.

type of publication The level of publication in workshop, conference, journal or book.

EA research groups The name of the research group issuing the publication.

geographical distribution The location, where the publication and the researchers originate.

number of citations The total number of citations linking to the publication.

Due to the limited number of research groups targeting the area of EA management, a frequent exchange of researchers among this groups happens. To reflect this circumstance in our analysis, articles that have been written by a number of co-authors employed at different institutions were attributed to all corresponding groups. Based on the number of publications per group, the productivity of each group, i.e. the entire number of publications issued by the authors of the group, was ascertained. For each group geographical attribution and background information (e.g. academics, public sector, industry etc.) were made explicit as well in order to answer the above issued questions.

3. RESULTS

In this section the results of the literature analysis of the 299 papers identified are presented and discussed. Trying to answer the question, if the interest in EA (management) is a local or global phenomena, the geographical distribution of the authors of our article set is investigated in Section 3.1. Further, the actuality of the EA management topic is discussed in Section 3.2, which details how the publication activity evolves over time. The identified maturity stage of EA management is backed by a type analysis of the identified publications in Section 3.3. While publications targeting a new and young discipline are typically presented on workshops or in conference proceedings more mature disciplines poses dedicated journal in which more mature research results can be presented. To enable young researchers the entering of the field, the major research groups targeting the area of EA management are identified in Section 3.4.

3.1 Geographical distribution

As the first criterion for the literature analysis the geographical distribution of the sources was chosen, which also reflects the distribution of research groups in this field.

As seen in Figure 2 the most productive countries are Germany, Switzerland, and the United States of America. It

Table 1: Geographical distribution of publications

Country	Contribution	#
Germany	[1, 2, 5, 4, 7, 9, 11, 10, 18, 19, 29, 31, 25, 28, 27, 24, 26, 22, 23, 30, 47, 41, 64, 67, 65, 66, 68, 69, 70, 71, 72, 74, 73, 75, 76, 77, 78, 87, 94, 95, 97, 121, 125, 134, 155, 176, 178, 186, 188, 189, 191, 194, 195, 98, 226, 225, 224, 233, 249, 252, 250, 251, 260, 269, 288, 291]	66
Switzerland	[6, 32, 7, 8, 9, 12, 13, 14, 15, 17, 16, 18, 19, 21, 20, 29, 31, 46, 45, 58, 59, 60, 63, 290, 84, 83, 85, 99, 100, 101, 158, 159, 167, 175, 174, 173, 213, 221, 222, 223, 230, 231, 244, 245, 246, 248, 247, 266, 281, 282, 284, 285, 283, 286, 289, 290, 293, 292, 291]	59
USA	[38, 39, 36, 37, 40, 44, 49, 50, 51, 52, 56, 57, 62, 79, 82, 273, 199, 86, 93, 96, 102, 113, 114, 118, 120, 122, 123, 124, 127, 133, 137, 138, 151, 187, 190, 192, 193, 200, 214, 219, 227, 228, 229, 256, 262, 272, 287, 296, 297, 298, 299]	51
Sweden	[9, 14, 77, 88, 89, 90, 105, 106, 107, 108, 109, 110, 119, 134, 129, 130, 141, 142, 143, 144, 145, 146, 157, 152, 160, 161, 162, 163, 184, 197, 198, 194, 211, 212, 218, 258, 259, 261, 270, 271, 283]	41
the Netherlands	[35, 104, 135, 138, 139, 140, 147, 148, 149, 166, 165, 170, 171, 168, 169, 276, 241, 235, 234, 239, 236, 240, 238, 242, 243, 237, 263, 264, 275, 279]	30
Finland	[131, 126, 136, 177, 180, 179, 181, 182, 183, 215, 216, 254, 255, 274]	14
Australia	[39, 48, 53, 54, 55, 103, 115, 157, 156, 196, 268]]	11
Greece	[117, 203, 204, 206, 207, 208, 205, 209, 267]	9
UK	[3, 91, 92, 111, 140, 164, 257, 264]	8
Denmark	[81, 86, 128, 139, 172]	5
Portugal	[201, 202, 210, 217]	4
Singapore	[56, 86, 164, 232]	4
Canada	[61, 86, 294]	3
India	[42, 43]	2
Japan	[153, 154]	2
Austria	[41]	1
Belgium	[116]	1
Brazil	[210]	1
Bulgaria	[277]	1
China	[280]	1
France	[169]	1
Lichtenstein	[278]	1
Luxembourg	[275]	1

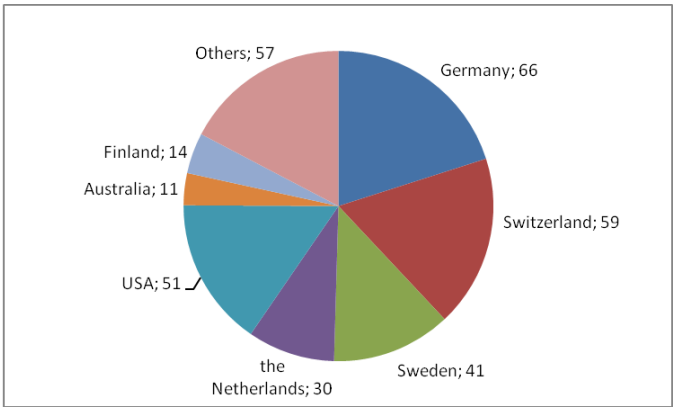

Figure 2: Publications' geographical distribution

Figure 3: The general hype cycle of Gartner (Source: [c])

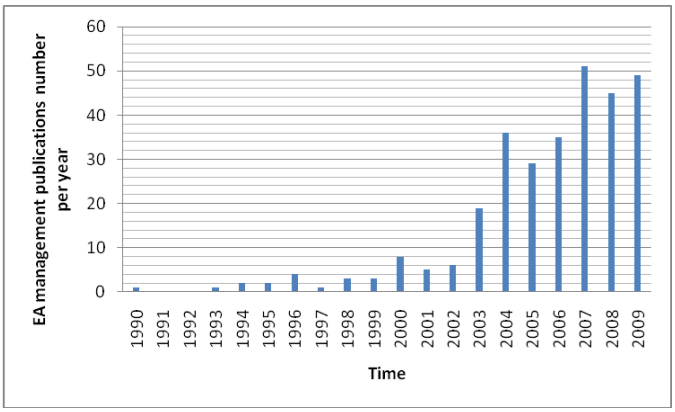

Figure 4: Number of EA (management) publications issued over time

is remarkable that more than a half of all articles considered in this analysis set have a background in one of these three countries. Further, it is interesting that more than two thirds of the publications have a European background. The most productive non-European country are the United States of America. Overall twenty five countries are represented by the considered publication set, namely: Germany, Switzerland, Austria, Lichtenstein, Luxembourg, Belgium, Denmark, France, Spain, Portugal, UK, Sweden, the Netherlands, Finland, Greece, Bulgaria, USA, Canada, Brazil, New Zealand, Australia, Singapore, China, Japan, and India. This means that the interest in EA management topic is not a local phenomenon, but a global one.

3.2 Distribution over time

Investigating the actuality and maturity of the topic EA management and the respective research area, a criterion of interest in our analysis is the publications' distribution over time. Following the basic idea as incorporated in the *Gartner Hype Cycle* [c], which consists of the phases *technology trigger, peak of inflated expectations, through of disillusionment, slope of enlightenment*, or *plateau of productivity* as shown below in Figure 3, the aim of this analysis is to determine the phase of the hype cycle in which the topic EA management is currently positioned. Based on the identified phase, a maturity level of the EA management topic can be deduced.

Based on the identified publication set, a growth of publications targeting the area of EA management can be stated, although some minor regressions can be stated, e.g. for the years 2005 and 2006 as well as in 2008 and 2009 (see Figure 4). Starting with the year 2003 a significant larger number of publications concerned with EA or EA management respectively has been issued. The first half of the year 2010, which was not included in the analysis set indicates again indicates a growing number of publications.

If we compare the dynamics of EA management publications per year number growth (Figure 5) with the hype cycle (Figure 3), no stagnation in growth can be identified. Although the detailed analysis of publications per year (Figure 4) illustrates waves of interest. A mapping to the hype cycle can thus not be performed directly. A hint that the topic is still on the first phase of positive hype can be found as still a large number of publications targeting the area are still published every year and the topic is currently widely discussed by media articles, which are trying to reveal its potential impact on business [c]. However, the light droppings in the number of new publications might also be a hint of starting disillusionment.

Another aspect which was taken into account during this analysis stage was the combined analysis of EA management publications' *distribution over time* and their *geographical attribution*. During this analysis phase was ascertained, that most of early publications do have American background. On the contrary, later publications mainly come from European countries. That means that initial interest to EA management topic arose in the United States of America and was further successfully picked up by European countries since the year 2003.

3.3 Type of publication

As the above analysis of the publication activity, did not deliver unambiguous results in respect to the maturity stage of EA management, we use the criterion of the publication type. A young research discipline is typically reflected by a vast amount of research results published in workshop and

Table 2: Publication timeline

Year	Contribution	#
1990	[219]	1
1991		0
1992		0
1993	[262]	1
1994	[87, 227]	2
1995	[111, 214]	2
1996	[187, 233, 296, 297]	4
1997	[299]	1
1998	[44, 265, 295]	3
1999	[36, 37, 273]	3
2000	[47, 48, 57, 80, 199, 172, 205, 213]	8
2001	[38, 82, 190, 217, 267]	5
2002	[62, 124, 127, 132, 251, 287]	6
2003	[30, 39, 53, 54, 83, 118, 122, 149, 178, 185, 192, 196, 200, 234, 268, 281, 284, 288, 298]	19
2004	[4, 10, 22, 23, 34, 40, 50, 51, 61, 88, 123, 133, 135, 137, 142, 147, 153, 156, 167, 171, 276, 191, 193, 201, 206, 207, 208, 224, 241, 235, 236, 249, 250, 260, 264, 269]	36
2005	[11, 25, 28, 27, 24, 26, 33, 42, 45, 52, 59, 85, 102, 138, 151, 170, 174, 173, 188, 195, 202, 210, 238, 237, 259, 263, 279, 282, 289]	29
2006	[1, 5, 43, 46, 49, 63, 79, 84, 95, 112, 113, 116, 117, 125, 128, 140, 144, 146, 148, 175, 176, 184, 203, 204, 215, 220, 228, 229, 239, 240, 253, 275, 272, 292, 294]	35
2007	[2, 32, 29, 31, 35, 56, 58, 60, 290, 69, 70, 71, 81, 91, 92, 93, 100, 101, 103, 104, 114, 120, 126, 139, 141, 143, 145, 155, 160, 161, 164, 169, 177, 179, 182, 198, 211, 216, 98, 230, 245, 246, 256, 257, 258, 266, 285, 286, 290, 293, 291]	51
2008	[6, 8, 15, 18, 21, 20, 55, 41, 278, 67, 65, 66, 86, 94, 97, 99, 109, 131, 134, 136, 157, 154, 165, 180, 181, 183, 186, 189, 194, 209, 212, 218, 221, 223, 226, 225, 232, 242, 247, 252, 254, 261, 271, 277, 283]	45
2009	[3, 7, 9, 12, 13, 14, 17, 16, 19, 64, 68, 72, 74, 73, 75, 76, 77, 78, 89, 90, 96, 105, 106, 107, 108, 110, 115, 119, 121, 129, 130, 150, 152, 158, 159, 162, 163, 166, 168, 197, 222, 231, 243, 244, 248, 255, 270, 274, 280]	49

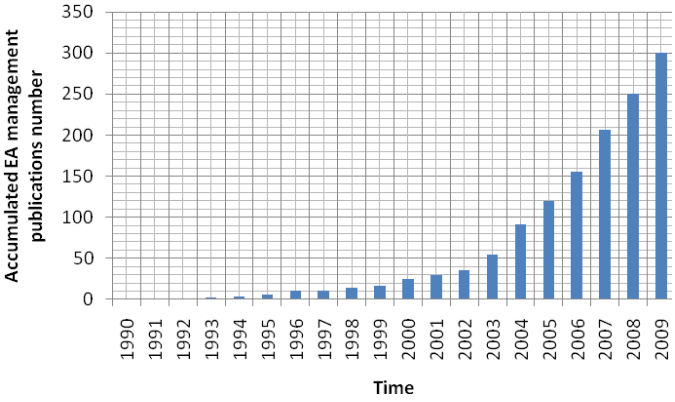

Figure 5: EA management publications' number growth

conference proceedings. More mature research areas publish results in established IS journals or dedicated journals evolve in which results can be presented. Therefore, we analyzed the identified publication set according to their publication type, thereby, we distinguish between *conference proceedings, journal articles, electronic articles, books, book chapters, reports* and *theses*.

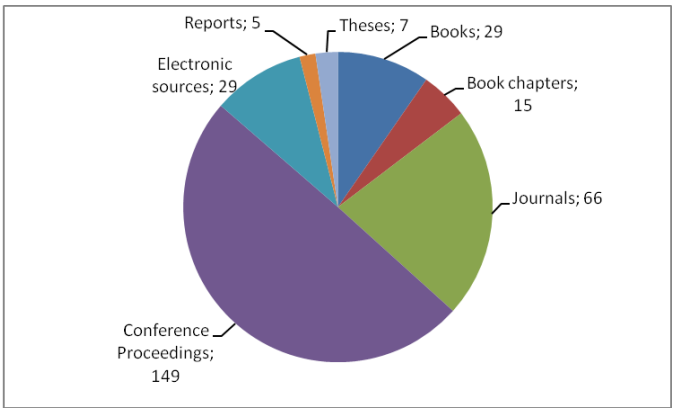

Figure 6: Distribution over types articles

Figure 6 presents results of the analysis. As two biggest groups of publications appeared in the form of conference proceedings or journal article and these two forms are mostly used for academia publications, the assumption can be made, that the majority of the whole researched articles have an academic background and that academia indeed has been very intensively involved in the process of EA management development. This aspect will be further investigated during the authors groups' analysis.

The results of publications types' analysis were further investigated in combination with the results of distribution over time analysis. It was ascertained that the early EA management publications were issued mainly in a form of book, electronic article or journal, which could be an evidence of the practical background of the early period. On the contrary, the majority of later publications appeared in a form of conference proceedings, which reveals their academic background.

Table 3: Distribution over types of articles

Type of article	Contribution	#
Conference proceedings	[1, 2, 3, 5, 4, 7, 8, 9, 12, 13, 14, 15, 18, 19, 31, 27, 24, 26, 22, 33, 39, 44, 48, 50, 51, 59, 60, 63, 64, 67, 70, 71, 72, 74, 73, 75, 77, 79, 78, 83, 89, 90, 92, 93, 94, 95, 96, 100, 102, 103, 105, 106, 107, 108, 109, 110, 111, 115, 114, 117, 119, 131, 131, 125, 126, 128, 134, 129, 130, 136, 138, 139, 140, 142, 143, 144, 146, 149, 150, 151, 152, 153, 154, 156, 159, 161, 163, 168, 175, 174, 173, 276, 177, 178, 180, 179, 181, 183, 197, 198, 194, 201, 202, 204, 206, 207, 208, 209, 210, 211, 212, 214, 215, 218, 227, 98, 221, 226, 225, 224, 230, 231, 244, 246, 248, 247, 252, 250, 254, 255, 259, 261, 264, 266, 267, 268, 275, 270, 271, 274, 277, 280, 281, 282, 284, 283, 286, 288, 292, 294]	149
Journal articles	[6, 17, 21, 20, 29, 23, 34, 35, 38, 36, 37, 46, 49, 53, 56, 57, 278, 290, 65, 69, 76, 81, 86, 91, 97, 101, 112, 113, 116, 120, 132, 133, 135, 137, 145, 147, 148, 160, 162, 171, 176, 184, 186, 191, 192, 193, 196, 205, 216, 219, 220, 222, 223, 228, 245, 253, 257, 260, 265, 269, 272, 285, 290, 293, 291, 299]	66
Books	[32, 28, 30, 47, 52, 54, 55, 80, 121, 141, 155, 164, 165, 170, 185, 188, 189, 190, 195, 200, 213, 229, 232, 241, 242, 237, 262, 279, 295]	29
Electronic sources	[40, 42, 43, 41, 61, 62, 82, 273, 199, 118, 122, 123, 124, 127, 169, 172, 187, 235, 234, 239, 236, 240, 238, 243, 256, 287, 296, 297, 298]	29
Book chapters	[11, 10, 16, 25, 84, 85, 87, 166, 217, 233, 249, 251, 258, 263, 289]	15
Theses	[45, 58, 88, 99, 157, 158, 203]	7
Reports	[66, 68, 104, 167, 182]	5

3.4 EA research groups

Facilitating young scholars in entering the research field of EA management, this section identifies major research groups on the area. Thereby, institutions, which have been active in the research field of EA (management) are identified to provide researchers with guidance 'where to search for new and innovative ideas in the area of EA management'. The research groups are thus identified by the institutions at which the authors of the article have been employed at the time of the publication. For the initial set of articles 142 authors' groups have been identified. For each of these groups three research perspectives have been studied: *background, regional distribution*, and *productivity*.

Throughout the groups' background analysis a distinction between groups with

- *academic* background e.g. universities, institutes, high schools
- *research* background e.g. research organizations and scientific companies,
- *consultancy* background incl. IT-consulting,
- *public sector* i.e. state-owned institutions, and
- *enterprises* from different industry sectors

was made. The results of groups' background analysis are shown in Figure 7.

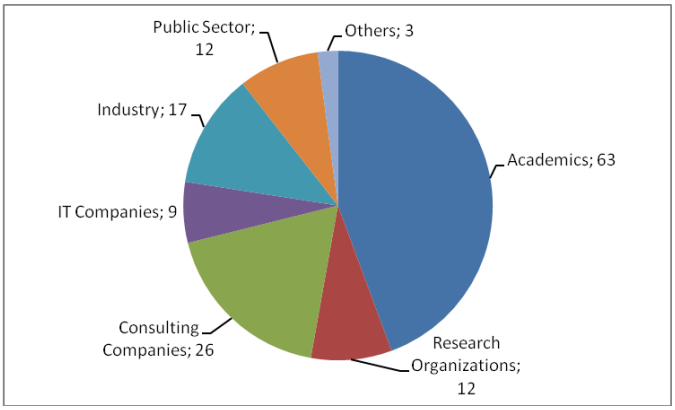

Figure 7: Groups' background analysis

According to the figure the largest group of authors has an academic background, and almost eighty percent thereof are universities. These results confirm that academics shape the research field of EA management and drive the development of the subject. The second largest group is represented by consulting companies, of which more than a half have an IT specialization. The strong inclusion of consultancies reflects the industry need for EA management solutions. The third largest group is represented by enterprises from different industry sectors, among which the telecommunications, insurance, logistics, airline, healthcare, and energetic industries form a large group, reflecting the interest of practitioners.

Further the results of groups' regional distribution are shown (see Figure 8). As seen in the figure the majority of groups

Table 4: Top 10 cited sources

Name of the institution	Country	# of publications
University of St. Gallen	Switzerland	44
KTH Royal Institute of Technology	Sweden	41
Technical University of Berlin	Germany	23
Technische Universität München	Germany	18
University of Jyväskylä	Finland	14

have American background. The second most saturated with authors' groups region is represented by Germany and the third one by the Netherlands.

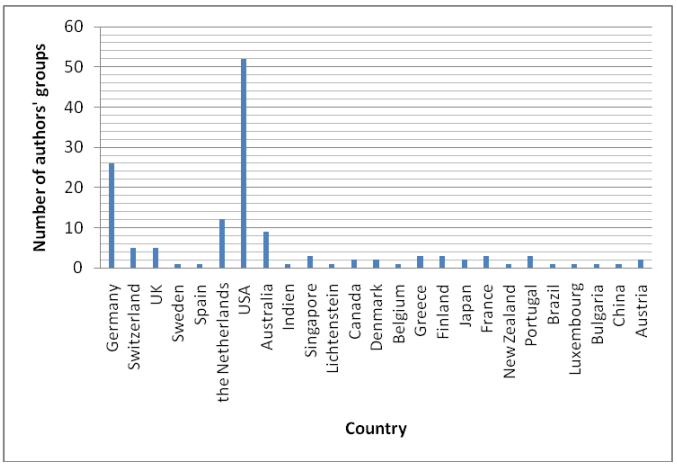

Figure 8: Groups' regional distribution

It's important to mention that the number of authors' groups referring to a geographical region does not represent the productivity of the region absolutely. If we compare the results of *geographical distribution analysis* with results of *groups' regional distribution analysis*, this circumstance becomes obvious. For example, Sweden with its forty one publications was considered during the geographical distribution analysis as very productive country. However, during the groups' regional distribution analysis it was represented solely by one group. This group nevertheless has a high productivity, explaining the aforementioned fact.

Further investigating the productivity of EA groups and their involvement in the EA management topic, it becomes obvious that the vast majority of groups have no more than a couple of publications in the area of EA management. Leading to a set of only ten groups that have assigned more than eight articles from our initial publication set. The five most productive groups of of our data set have been analyzed more in depth. Interestingly, these five research groups, namely the *University of St. Gallen*, *KTH Royal Institute of Technology*, the *Technical University of Berlin*, *Technische Universität München* and *University of Jyväskylä* are located in Europe and have an academic background.

Then each of these groups has been researched from the perspective of the publication history. The results of this analysis are represented in Figure 9.

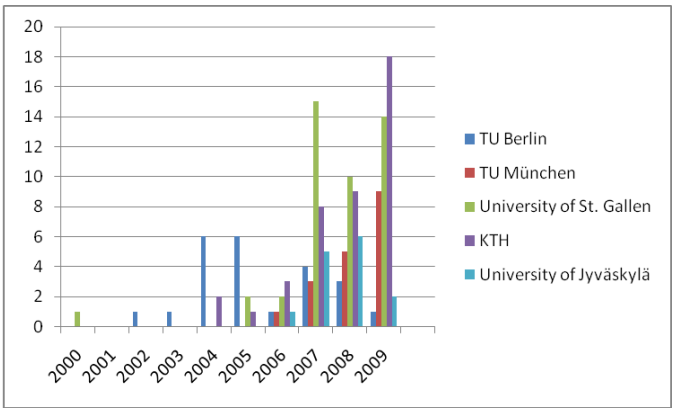

Figure 9: Publication history for the most active authors' groups

As seen in the figure the publishing behavior of groups under consideration in the field of EA management varies considerably. The majority of groups are active in the field since the years 2005-2006 and they are remaining very productive till now. Among them are the *University of St. Gallen, KTH* and *TU München*. These three universities do have very similar behaviors, especially the *University of St. Gallen* and *KTH*. Since 2006 both universities took the leadership in publishing on the topic and are remaining the leaders till now. While the *TU München* is currently increasing the investment in the area of EA managementand the amount of publications targeting the area, other groups, e.g. the *University of Jyväskylä* greatly varies in the investments and publications in the area.

As an example of an early active publishing, the *TU Berlin* can be taken, which started its activity in the field of EA management relatively early. *TU Berlin* was active on the topic already in the year 2002, on the contrary to most of the other groups which have not been active at all in this time. In the years 2004 and 2005 *TU Berlin* was an absolute leader in publishing EA management-related articles. However, since 2006 it has been losing its leadership in the area, which might be ascribed to an exchange of people from Berlin to St. Gallen.

3.5 Number of citations

One of the most interesting criteria was the publications' citations number. This stage of analysis aims at identifying the most cited articles. Thus, the core literature in the field of EA management, which could be reckoned as a good entry point for the topic. For this evaluation *Google Scholar*[6] with its embedded function showing citation numbers for given articles, was used. Alternatively it could be done by researching the references part of each article from the set. However, this way was avoided deliberately, as the citations comparison within the set of 300 sources, defined from the beginning, would constantly lead outside this set. By means of *Google Scholar* we could count on its considerable

[6]http://scholar.google.com

Table 5: Top 10 cited sources

Sources index	Citations Number	Year	Country	Type
[170]	225	2005	the Netherlands	Book
[262]	187	2008	USA	Book
[241]	158	1996	the Netherlands	Book
[229]	157	2006	USA	Book
[299]	117	1997	USA	Journal
[190]	79	2001	USA; New Zealand	Book
[147]	72	2004	the Netherlands	Journal
[281]	72	2003	Switzerland	Conference
[292]	67	2006	Switzerland	Conference
[54]	67	2003	Australia	Book

database and thus on more representative results omitting an error prone manual search.

According to this method a citation number has been identified for each article. The most cited ten publications are represented in Table 5. To combine this analysis stage with the previous three analysis stages the information about the year of publication, geographical background of author, and the type of the publication have been depicted in the table as well.

According to Table 5 some regular occurrence is observed in geographical aspect as well as in aspect of publication type. It is interesting that the majority of the most referenced articles appeared as a book, which could be caused by books' better availability and distribution as well as by content generalization peculiar to them while articles and conference papers are often dedicated to specific problems. Furthermore, the authors of the most cited articles again come from three countries, namely: the Netherlands, the United States of America, and Switzerland.

4. SUMMARY AND CRITICAL REFLECTION

The analyses in this article showed the plurality of literature in the field on EA management. In addition to the core groups, a large number of researchers and practitioners contributing to the body of knowledge could be identified. The analysis with respect to the temporal distribution of the publication activity, we could diagnose in line with previous literature analyses a still rising activity and interest in the field of EA management. The analysis of the types of publications nevertheless showed that EA management as research topic is yet to arrive in the core of IS research, as the proliferation in high-ranking journals is yet rather low. The analysis with respect to the geographic distribution of the EA management-related publication reveals an interesting development. From being a mainly USA-based topic in its early days, recently European scientists and practitioners have taken over the thought-leadership in this field.

Any analysis of this kind finds itself limited with respect to the coverage of the existing publications. Especially, the described problems in finding the publications in the relevant libraries and search engines, make it hard to assure that all relevant publications have been discovered. Young scholars in this field will in turn experience similar difficulties when starting their EA management-related research endeavors. With the enduring importance of the field, this calls for the establishment of a community of researchers that maintain and develop the understanding of the field. A first attempt in this direction has already been undertaken by the participating members and academic institutions of `http://www.ea-network.org`.

5. REFERENCES

[a] J. C. Henderson and N. Venkatraman. Strategic alignment: leveraging information technology for transforming organizations. *IBM Systems Journal* 31(1), p.472–484, 1993.

[b] W. Kamlah and P. Lorenzen. *Logische Propädeutik: Vorschule des vernünftigen Redens*. 3rd edition, Metzler, Stuttgart, Germany, 1996

[c] A. Linden and J. Fenn. Understanding gartner's hype cycles. `http://www.botanischergarten.ch/Discourse/Linden-HypeCycle-2003.pdf` (retrieved on 12.04.2010), 2003.

[d] J. N. Luftman. *Competing in the Information Age – Align in the Sand.* 2nd edition, Oxford University Press, New York, USA, 2003.

[e] The Open Group. *TOGAF "Enterprise Edition" Version 9* `http://www.togaf.org` (cited 2010-10-30), 2010

[f] M. Schönherr. Towards a common terminology in the discipline of enterprise architecture. In S. Aier, P. Johnson, and J. Schelp, editors, *Pre-Proceedings of the 3rd Workshop on Trends in Enterprise Architecture Research*, pages 107–123, Sydney, Australia, 2008.

[g] J. Webster and R. T. Watson. Analyzing the Past to Prepare for the Future: Writing a Literature Review. *MIS Quarterly*, 26(2), p. xiii–xxiii, 2002.

[h] Zachman Institute for Framework Advancement *The Zachman Enterprise Framework* `http://www.zachmaninternational.com/index.php/the-zachman-framework` (cited 2010-02-25) 2010

[i] J. A. Zachman. A framework for information systems architecture. *IBM Systems Journal* 26(3), p.276–292, 1987.