INVESTIGATING THE USAGE OF ENTERPRISE ARCHITECTURE ARTIFACTS

Research in Progress

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Abstract

Enterprise architecture (EA) is a description of an enterprise from an integrated business and IT perspective intended to improve business and IT alignment. EA literature describes many detailed EA methodologies, artifacts and frameworks to organize them. However, establishing EA practice still remains a challenging endeavor with a low success rate. On the other hand, this is not surprising since most organizations successfully practicing EA do not follow EA methodologies and frameworks strictly but adapt them to their own needs or even use them only as idea contributors. Therefore, in order to improve the success rate of EA initiatives, it is necessary to understand better how exactly successful companies adapt EA methodologies in practice. In particular, we argue that the most significant problems in EA practice arise because the usage of individual EA artifacts in practice is poorly understood. In this paper we describe how we are going to investigate the usage of EA artifacts to close this gap.

Keywords: Enterprise Architecture (EA), Problems, Artifacts, Stakeholders, Usage.

1 Introduction

The role of IT for modern companies is tremendous. Companies spend huge amounts of money investing in IT. However, in order to realize the full potential value of IT investments, IT strategy of a company should be aligned with its business strategy (Henderson and Venkatraman, 1993, Byrd et al., 2006). Achieving strategic business and IT alignment was long recognized as a desired goal or even an imperative for modern companies and is still acknowledged among the highest priorities of IT management allowing companies to use available resources in a more effective manner to improve their competitive advantages (Rackoff et al., 1985, Rockart et al., 1996, Luftman and Ben-Zvi, 2011, Luftman et al., 2006, Kappelman et al., 2013). Enterprise architecture (EA) is a description of an enterprise from an integrated business and IT perspective intended to improve business and IT alignment (Schmidt and Buxmann, 2010, Bradley et al., 2011, Tamm et al., 2011). Unsurprisingly, EA is practiced by the majority of large companies (Ambler, 2010, van der Raadt et al., 2007) and makes a significant contribution to their success (Ross et al., 2006).

EA literature describes many detailed EA methodologies, artifacts and frameworks to organize them (TOGAF, 2011, Bernard, 2012, van't Wout et al., 2010, Spewak and Hill, 1993, Boar, 1999, Niemann, 2006, Longépé, 2003). However, establishing EA practice still remains a challenging endeavor with a low success rate (Roeleven, 2010, Holst and Steensen, 2011, Zink, 2009, Löhe and Legner, 2014, Kemp and McManus, 2009, Bloomberg, 2014b). On the other hand, this is not surprising since most organizations successfully practicing EA do not follow EA methodologies and frameworks strictly but adapt them to their own needs or even use them only as idea contributors (Buckl et al., 2009, Winter et

al., 2010, Lange and Mendling, 2011, Aziz and Obitz, 2007, Obitz and Babu, 2009, Smith et al., 2012, Anderson et al., 2009, Bloomberg, 2014a). Therefore, in order to improve the success rate of EA initiatives, it is necessary to understand better how exactly successful companies adapt EA methodologies in practice. In particular, we argue that the most significant problems in EA practice arise because the usage of individual EA artifacts in practice is poorly understood.

In this paper we describe how we are going to address the following research question:
"Which EA artifacts are used by different EA stakeholders, how, when, for what purpose and what information do they contain?"

This paper continues as follows: (1) we describe EA practice and its essential elements, (2) we describe typical practical problems with EA, (3) we analyze the underlying reasons for these problems and formulate our research question, (4) we describe our research design and (5) we describe the potential contribution of this research.

2 Enterprise Architecture Practice

EA practice is a complex set of organizational processes aimed at improving business and IT alignment (Ahlemann et al., 2012, Simon et al., 2013). Now we will discuss the essential elements of EA practice described in EA literature.

2.1 EA methodologies

The seminal EA methodology was initially presented by Spewak and Hill (1993) and can be generally described as a four-step sequential process: (1) document the current (as-is, baseline) state of an organization, (2) develop the desired future (to-be, target) state of an organization, (3) analyze the gaps between the current and future states and develop a transition plan (roadmap) describing how to migrate from the current to the future state, (4) implement the transition plan. This step-wise EA methodology had a huge influence (Spewak and Tiemann, 2006) and was later supported by other authors (Bittler and Kreizman, 2005, Covington and Jahangir, 2009, Bernard, 2012, Theuerkorn, 2004, Niemann, 2006, Boar, 1999, TOGAF, 2011, van't Wout et al., 2010, FEAF, 1999, Schekkerman, 2008, Longépé, 2003, Armour et al., 1999b) who proposed its different variations. Some of these variations emphasize the importance of a formal EA development process (Spewak and Hill, 1993, TOGAF, 2011), extensive formal modeling (Boar, 1999, Longépé, 2003) or partitioning of enterprises into independent units (Bernard, 2012, FEAF, 1999), however all the variations support the original four-step logic of the seminal EA methodology. Therefore, most existing EA methodologies recommend documenting a current state, developing a future state, analyzing the gaps between them, developing transition plans and implementing them.

2.2 EA artifacts

EA artifact is a single document describing a particular aspect of EA (Abraham, 2013; Winter and Fischer, 2006). EA documentation is a collection of individual EA artifacts describing various aspects of EA (Abraham, 2013, Winter and Fischer, 2006). The incomplete list of proposed EA artifacts includes business strategy, business drivers, business risks, organization model, context diagram, principles, policies, standards, business process models, logical data models, data flow diagrams, network diagrams, transition plans, roadmaps as well as a multitude of other artifacts (van't Wout et al., 2010, Spewak and Hill, 1993, Bernard, 2012, TOGAF, 2011). Therefore, many different artifacts are recommended as a means to describe EA.

2.3 Organization of EA artifacts

EA documentation typically describes business, data, applications and technology architectures (or domains) and EA artifacts are usually organized accordingly (Spewak and Hill, 1993, TOGAF, 2011, Covington and Jahangir, 2009). However, a number of EA frameworks (Sowa and Zachman, 1992, Pulkkinen, 2006, Schekkerman, 2006, van't Wout et al., 2010, PRISM, 1986, Zachman, 1987) propose more detailed taxonomies for organizing and structuring EA artifacts according to their domains, perspectives, abstraction levels or interrogatives. Therefore, EA documentation and artifacts can be organized in many different ways.

2.4 EA stakeholders and usage

EA has a wide circle of the potential stakeholders (Niemi, 2007, van der Raadt et al., 2008, van der Raadt et al., 2010, Thornton, 2007, Verley, 2007, Perroud and Inversini, 2013, TOGAF, 2011, FEA, 2007). An incomplete list of EA stakeholders includes members of the board, executives, CIOs, middle managers, enterprise architects, software architects, project managers, developers, testers, IT operations and maintenance staff and other specialists (Niemi, 2007, van der Raadt et al., 2010, Thornton, 2007).

EA is used by IT staff since it provides an actionable guidance for implementing the necessary information systems and transforming an enterprise to the desired target state (Spewak and Hill, 1993, TOGAF, 2011, Bernard, 2012). However, EA is also used for communication, analysis and decision-making by executives, managers and many other stakeholders (Lankhorst, 2013, TOGAF, 2011, Bernard, 2012, Armour et al., 1999a). Therefore, EA is used for different purposes by different groups of stakeholders.

3 Problems in Enterprise Architecture Practice

Despite the abundance of advice on various aspects of EA practice in literature, EA is infamously known for a low success rate of its initiatives (Roeleven, 2010, Holst and Steensen, 2011, Zink, 2009, Löhe and Legner, 2014, Kemp and McManus, 2009, Bloomberg, 2014b). EA programs often face severe challenges and suffer from a number of typical problems (Kaisler et al., 2005, Lucke et al., 2010, Hauder et al., 2013, Chuang and van Loggerenberg, 2010, Seppanen et al., 2009, Levy, 2014, Kim and Everest, 1994, Ambler, 2010). These problems can arguably be summarized to three major issues (Löhe and Legner, 2014): (1) extraordinary efforts are needed to develop and maintain EA documentation, (2) low quality of EA documentation undermines its usability and (3) EA practice is not sufficiently integrated into an organization. Now we will discuss these problems in detail.

3.1 EA documentation is hard to develop and maintain

An investment of substantial financial, human and time resources is essential to develop EA (Seppanen et al., 2009). Huge effort required to collect data and develop EA documentation is recognized as one of the topmost challenges in EA practice (Roth et al., 2013, Kim and Everest, 1994). In order to develop a comprehensive EA documentation, organizations need to overcome the significant challenges caused by their large scope, high organizational complexity and a huge number of people involved in the process (Löhe and Legner, 2014). Unsurprisingly, EA is highly criticized by practitioners for its heaviness because it is associated with the development of an unreasonable number of descriptive models (Lagerstrom et al., 2011). Moreover, the external business environment and internal IS context are constantly changing (Beeson et al., 2002). This instability leads to the necessity of additional efforts to maintain a huge volume of EA documentation accurate and up-to-date (Kim and Everest, 1994, Löhe and Legner, 2014). Therefore, 71.4% of companies recognize a quickly changing environment as a challenge for EA practice (Hauder et al., 2013).

3.2 EA documentation is unusable

On the other hand, after being developed, a comprehensive EA documentation is often poorly used or even found to be a useless architecture created for its own sake (Kappelman, 2010, Carvalho and Sousa, 2014). Too conceptual nature, inflexibility, obsolescence, wrong level of detail and mismatch with the real information needs of EA stakeholders are recognized as the common problems with EA documentation that render it virtually useless (Löhe and Legner, 2014, Kim and Everest, 1994). The survey of 105 companies (Hauder et al., 2013) demonstrates that 67.7% of companies find EA documentation too technical and IT-specific, 37.6% of companies find it outdated, 33.7% of companies find it too complex and difficult and 27.1% of companies find it improperly detailed. Therefore, Ross et al. (2006) criticize EA efforts for "their remoteness from the reality of the business and their heavy reliance on mind-numbing detail represented in charts that look more like circuit diagrams than business descriptions and that are useful as little more than doorstops". Even award-winning detailed diagrams often turn out to be self-serving and do not deliver any expected business value if they are created without considering who is going to use them and for what purpose (Hobbs, 2012).

3.3 EA practice is isolated

Finally, EA practices often live in a separate reality from the rest of the organization and eventually ends up in "ivory towers" (Hauder et al., 2013, Burton, 2009, Levy, 2014, Hobbs, 2012, van der Raadt and van Vliet, 2008, van der Raadt et al., 2010, Ambler, 2010). EA practices often lead to creation of "paper tigers" instead of working architectures if they are not sufficiently integrated into organizations (Wagter et al., 2005). A lack of benefits for employees from using EA, unclear goals of EA initiatives, ambiguous EA vocabulary, perceived technical focus of EA, limited participation of enterprise architects in decision-making committees and boards, inability to promote and enforce EA standards and existence of a parallel EA management cycle are the major symptoms of a poor acceptance and isolation of EA practices (Löhe and Legner, 2014). Lack of interest in EA among non-IT stakeholders (Kim and Everest, 1994), disdain for legacy systems (Kemp and McManus, 2009), descriptive emphasis (Bloomberg, 2014b), unclearly defined roles and responsibilities (Lucke et al., 2010), poor EA governance structures (Seppanen et al., 2009), an absence of adequate EA compliance processes (Zink, 2009), a lack of integration into regular enterprise life cycle (Kaisler et al., 2005) all lead to the alienation of EA practices and, ultimately, confine them into their "ivory towers". "The paradox is that EA efforts are aimed at integrating the various organizational elements, whereas the architecture efforts are not integrated in the organization", comments this problem an e-government interviewee (Janssen, 2012). "Architectures, like fondue sets and sandwich makers, are rarely used. We occasionally dig them out and wonder why we ever spent the money on them. [Our] experience resonates with that of many other large corporations: architectures have emerged as erudite, elegant abstractions of the world, but they gain no momentum, unable to find traction in a world they profess to model", comments this problem a practicing chief enterprise architect of a large telecommunication company (Fonstad and Robertson, 2004). Unsurprisingly, an establishment of an adequate engagement between business activities and EA activities is found to be the critical success factor of EA initiatives able to turn an isolated EA practice into a profitable one (Levy, 2014).

3.4 Summary of the problems in EA practice

EA practice typically suffers from the three major problems: (1) extraordinary efforts are needed to develop and maintain EA documentation, (2) low quality of EA documentation undermines its usability and (3) EA practice is not sufficiently integrated into an organization. These problems are summarized in Table 1.

Practical problem	Explanation
EA documentation is hard to develop and maintain	Large scope, high complexity, huge number of involved people and vibrant organizational environment require enormous efforts to develop and maintain EA artifacts
EA documentation is unusable	Too conceptual nature, IT-orientation, wrong level of detail and mismatch with the real information needs of EA stakeholders make EA artifacts unusable
EA practice is isolated	Unclear goals, lack of benefits for employees from using EA, unclearly defined roles and responsibilities, lack of interest among non-IT stakeholders, descriptive emphasis, lack of integration into regular enterprise life cycle and other reasons all lead to isolation of EA practice

Table 1. The problems in EA practice

4 Research Question

EA literature describes many EA methodologies, frameworks and artifacts and gives plenty of detailed advice on other aspects of EA practice (TOGAF, 2011, Bernard, 2012, van't Wout et al., 2010, Spewak and Hill, 1993, Boar, 1999, Niemann, 2006, Longépé, 2003). However, establishing EA practice still remains a challenging endeavor with a low success rate (Roeleven, 2010, Holst and Steensen, 2011, Zink, 2009, Löhe and Legner, 2014, Kemp and McManus, 2009, Bloomberg, 2014b). On the other hand, this is not surprising since most organizations successfully practicing EA do not follow EA methodologies and frameworks strictly but adapt them to their own needs or even use them only as idea contributors (Buckl et al., 2009, Winter et al., 2010, Lange and Mendling, 2011, Aziz and Obitz, 2007, Obitz and Babu, 2009, Smith et al., 2012, Anderson et al., 2009, Bloomberg, 2014a). Therefore, in order to improve the success rate of EA initiatives, it is necessary to understand better how exactly successful companies adapt EA methodologies in practice. In particular, we argue that all the three aforementioned problems in EA practice arise because the usage of individual EA artifacts in practice is poorly understood. Our arguments are summarized in Table 2.

Practical problem	Explanation
EA documentation is hard to develop and maintain	EA literature recommends to develop many different EA artifacts (van't Wout et al., 2010, Spewak and Hill, 1993, Bernard, 2012, TOGAF, 2011), however, it is not clear which of these EA artifacts are really useful in practice and worth developing and maintaining (Bischoff et al., 2014)
EA documentation is unusable	EA literature lists many different EA artifacts (van't Wout et al., 2010, Spewak and Hill, 1993, Bernard, 2012, TOGAF, 2011) and many different EA stakeholders (Niemi, 2007, van der Raadt et al., 2010, Thornton, 2007), however, there are no empirically substantiated examples demonstrating which EA artifacts are intended for different EA stakeholders and what information they contain
EA practice is isolated	EA literature lists many different EA artifacts (van't Wout et al., 2010, Spewak and Hill, 1993, Bernard, 2012, TOGAF, 2011) and many different EA stakeholders (Niemi, 2007, van der Raadt et al., 2010, Thornton, 2007), however, there are no empirically substantiated examples demonstrating how and for what purpose different EA artifacts are used by different EA stakeholders

Table 2. Explanation of the problems in EA practice

Therefore, all the three practical problems with EA arise partially because the usage of individual EA artifacts is insufficiently understood and even not described realistically since EA literature does not provide any research-based examples demonstrating which particular artifacts are used in successful EA practices, which particular stakeholders use these artifacts and how, for what particular purposes

they are used and what information they contain. Consequently, our research question can be formulated as follows:

"Which EA artifacts are used by different EA stakeholders, how, when, for what purpose and what information do they contain?"

5 Research Design

The proposed research is inductive and exploratory in nature because the question under investigation is not described in EA literature well enough to support any deductive propositions or hypotheses (Saunders et al., 2009). Therefore, this research will be an interpretivist study to gain rich insights and deep qualitative descriptions of different actors' behavior and their underlying subjective motives and reasons for usage of EA artifacts (Orlikowski and Baroudi, 1991, Saunders et al., 2009, Walsham, 1995, Klein and Myers, 1999, Shanks, 1997).

Due to the qualitative and exploratory nature of the research question, the most appropriate research methodology is the case studies method (Yin, 2003, Benbasat et al., 1987, Eisenhardt, 1989, Lee, 1989). Case studies help investigate a contemporary less studied phenomenon within its real-life context (Yin, 2003, Walsham, 1995). Therefore, case studies will help study EA artifacts used in organizations, their content and stakeholders as well as the reasons and purposes of their usage (Benbasat et al., 1987, Eisenhardt, 1989). Multiple cases from different industry sectors will be carried out to address the research objectives and to prepare a strong base for theory building (Benbasat et al., 1987). Therefore, in line with other similar studies (Haki et al., 2012), four case studies will be undertaken to collect the required data for this research.

5.1 Cases selection

There are three important requirements to potential case companies relevant to our research question. Firstly, case organizations must successfully practice EA for a prolonged period of time. In line with the earlier studies (Pyburn, 1983), it is reasonable to select companies where EA is practiced for at least 5 years and perceived as important and successful by senior business and IT leaders.

Secondly, case organizations must be relatively large in order to be using complex information systems and have different EA stakeholder groups present (executives, middle managers, project managers, solution architects and software developers).

Thirdly, case organizations must be diverse to get richer insights from the research and for theory building. Therefore, it is desirable to select companies working in different industry sectors. Choosing diverse companies for the study will enrich the cross case analysis, help articulate the difference in EA artifacts usage between these companies, suggest what contingency factors might influence this difference and how.

5.2 Data collection and analysis

Data will be collected from the organizational EA documentation and face-to-face interviews in three phases: (1) EA documentation analysis, (2) semi-structured interviews with enterprise architects and (3) semi-structured interviews with EA users.

Firstly, EA documentation in each organization will be analyzed to establish the EA artifacts used to describe EA in each organization. This will help understand which EA artifacts are used in organizations and their informational content.

Secondly, we will conduct a semi-structured interview with the enterprise architects who developed the EA documentation in order to understand the major stakeholders of this documentation, the major

categories of EA artifacts these stakeholders use, underlying reasons for the development of EA and other relevant organizational details. All interviews will be recorded (with the permission of the interviewees) and later transcribed for interpretive analysis.

Thirdly, we will conduct semi-structured interviews with the representatives of different EA stakeholder groups (executives, middle managers, project managers, solution architects and software developers) in order to find out (1) when EA documentation is used by this group of EA stakeholders, (2) why and for what purpose EA documentation is used, (3) what particular EA information is typically used by this group of EA stakeholders, (4) how this information is used, (5) what other information might be desirable but absent in EA artifacts, (6) what information is present in EA artifacts but not necessary and (7) what can be improved in EA documentation to better satisfy the information needs of this group of EA users. Totally, after the documentation analysis, several semi-structured interviews will be conducted in each of the four case organizations to collect data.

All interview data will be analyzed using the grounded theory data analysis method (Strauss and Corbin, 2008, Glaser and Strauss, 2009). This analysis technique is the most appropriate method of analysis for building theories (Langley, 1999, Miles and Huberman, 1994) suitable for a new area that is not guided by an established theory, and for inductive research (Saunders et al., 2009). Interview transcripts will be coded and analyzed in order to identify major conceptual themes and to ground the findings into theory (Strauss and Corbin, 2008). After that, we will compare our grounded framework to different organizational and IS theories in order to relate our findings to the existing theoretical base (Glaser and Strauss, 2009).

5.3 Triangulation

Preliminary findings collected via the case studies will be triangulated with the focus groups method (Morgan, 1997), since it is a suitable research method for triangulating the qualitative research results. In order to increase validity of the research outcomes, we will conduct two online focus groups with different groups of EA stakeholders (executives, middle managers, project managers, solution architects and software developers) to confirm the EA artifacts usage established from the case studies. Online focus groups will allow participants from different EA stakeholder groups and some EA experts on an online platform. This will also help recruit focus group participants from different parts of the world and with different levels of experience with EA.

The responses from the focus groups participants will be analyzed using the grounded theory method (Strauss and Corbin, 2008, Glaser and Strauss, 2009) in a similar way to the interview transcripts analysis described above. Analysis of the focus group responses is intended to confirm the preliminary findings from the case studies and to highlight any additional issues on EA artifacts usage.

6 Contribution

Our research can make a significant contribution to both EA theory and practice. From the theoretical point of view, this research will address the questions on EA artifacts usage which are not addressed in the present EA literature. This research will describe: (1) EA artifacts which are typically used in practice, (2) typical stakeholders of these EA artifacts, (3) typical responsibilities of EA stakeholders which depend on EA artifacts, (4) EA information required to accomplish these responsibilities, (5) the reasons why this information is necessary for EA stakeholders, (6) better ways to represent and structure EA information for stakeholders and (7) the integration of EA practice into organizational processes.

From the practical point of view, the research will address all the aforementioned problems in EA practice and help ensure that (1) only useful EA artifacts are developed and maintained, (2) all EA stakeholders are able to get the information they need from EA artifacts in a convenient form, (3) EA

practice is integrated into organizations and supports the relevant responsibilities of its stakeholders and (4) typical problems of EA practice are overcome and EA initiative are successful.

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