Architectural Work Status: Challenges and Developmental Potential - A Case Study of Three Finnish Business Enterprises

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Abstract: - Recently, Enterprise Architecture (EA) has been considered significantly important by industry and academia alike. Still, the research on this area is currently fragmented and studies on the current status of EA work or maturity are rare. Therefore, this study pursues to chart the current status of EA work (EA planning, development and management), its challenges and needs for development in three Finnish business enterprises. A generic evaluation model for EA was used in charting the current status of EA work, and semi-structured focus group interviews were used to gather information. It was found that EA work in the case companies is currently incomplete or in initial state.

Key-Words: - Enterprise Architecture, architectural work, evaluation, maturity, quality, improvement

1 Introduction

During the recent years, Enterprise Architecture (EA) has gained considerable attention. According to the Open Group [1], a high-quality EA can bring important business benefits, such as making IT operations more efficient, increasing the returns on existing investments and reducing the risks on future investments, and making procurement faster, simpler and cheaper. Moreover, communication, decision-making and change management can be supported and improved by EA [see e.g. 2, 3]. However, investments on organizational, cultural and technical infrastructure are needed to support the architecting process and result in political, project management and organizational challenges [see e.g. 4].

EA takes a holistic view of an enterprise's structure, business processes, information systems, information and technological infrastructure [see e.g. 3-5] and defines their interoperability for achieving defined business objectives [see e.g. 4]. In brief, EA can be seen as a collection of all models needed in managing and developing an organization, such as business, information, systems, and technical architecture [see e.g. 1].

Despite its importance, the research on EA is currently fragmented. However, there are a great number of studies related to EA, particularly on EA frameworks [see e.g. 1, 6, 7], EA processes [see e.g. 8, 9], and to some extent, EA critical success and failure factors [see e.g. 10-13]. Generally, most of the studies have focused on EA planning and development methods, but the focus has been moving towards EA management and evaluation during the recent years.

Unfortunately, the number of studies on current EA work status or maturity in organizations is very low. The studies focus on describing and evaluating different aspects of EA in US public administration by NASCIO [14] and GAO [15], and worldwide in different areas of business by IFEAD [16], Infosys [17] and META Group [18]. Only GAO and META Group [15, 18] have clearly evaluated the maturity of EA. However, due to different evaluation methods and criteria used in these studies, generalization and comparison is difficult. Therefore, it seems that more research in this area is needed, especially on EA work status in European private sector organizations. This study aims to provide a contribution to this area of research.

The study has been conducted as a part of ongoing research project on EA quality management, and its objective is to chart the current status of EA work in three case companies. Moreover, the most significant challenges and needs for development in EA work are analyzed. In this study, EA work denotes all activities in EA planning, development and management.

This paper is organized as follows. In Section 2, we describe the research method used in this study. In Section 3, we briefly discuss the current status of EA work in each of the case companies. In Section 4, the most significant challenges for each area of EA work are presented. Section 5 concludes the

paper with suggestions for further development and research.

2   Research Method

Data-based case study was chosen as a research strategy, since it is perceived to be appropriate for developing theories, providing themes for further research and forming the boundaries of generalization [19]. Because the field of research is fragmented and lacks established theories and frameworks, strict hypotheses were not defined.

2.1   Generic Evaluation Model for EA

Since most of publicly available EA maturity models are domain-specific and designed for evaluating EA maturity in public sector US organizations, a generic evaluation model for EA introduced in detail by Ylimäki [20] was adopted in the study. The model consists of

1) Areas of EA work, adapted from EA critical success factors, discussed in Section 4
2) Key questions related to these areas [see 21]
3) Six maturity levels, presented in Section 5

2.2   Case Companies and Research Data

In this study, three companies were selected from different industries in Finland. These case companies are currently initiating EA work in collaboration with the research project. In the following, we call them Company 1, Company 2, and Company 3. Company 1 is an IT service provider, in which we studied its internal EA work status and the company's view of its customers' EA work. Company 2 and Company 3 are IT user organizations, in which we studied their internal EA work status. The information gained could be used to assess the differences between EA work carried out by an IT service provider and its customers.

Interviews of the companies' EA specialists were taken as the best method of information gathering. In the two IT user organizations, the view of architectures is more focused on system architecture levels. Therefore, the overall enterprise view of architectures is shared by few specialists in the companies. Semi-structured interview was chosen as the most appropriate, since the themes of the interview were clear and questions could be prepared forehand to make the interview easier to document and carry out. The interviews took place in February 2006. Each interview took 2-4 hours. In Company 1, the interview was complemented with an additional phone interview. The case companies and interviewees are displayed in Table 1.

Table 1. The case companies and interviewees

Case company	Industry	Number of interviewees	Viewpoints of interviewees
Company 1	Business & IT consulting and development	3	Business and system architecture
Company 2	Banking, finance and insurance	3	Enterprise and system architecture
Company 3	Telecomm	1	Enterprise architecture

The interviews were carried out by three researchers, from whom one acted as a moderator and the other two took notes. The interviews were also audio-recorded. After the interviews, the notes were checked against the recordings and in contrast to each other. Textual documents were written based on the confirmed interview data, describing how the work is each EA work area is carried out. Here, we focused especially on answering the key questions related to the areas and charting the challenges encountered therein. Documents received from the companies were used as supplement data sources where appropriate. Moreover, a subjective maturity evaluation was performed for each EA work area. For confidentiality, detailed reports were compiled for each case company individually.

3   EA Work Status

The main findings on the current status of EA work in the case companies are briefly presented in the following.

Company 1 has extensively developed EA work methods, models and tools, which can be used in EA consultation and system development projects with broad scope. Additionally, several EA evaluation methods, metrics and criteria have been developed. Moreover, the company has knowledge and skills needed in EA work and its project management practices are well established. However, it seems that some Finnish customer organizations of the company have lower maturity in EA work methods and processes, which challenges the utilization of the company's EA methods and practices in customer projects.

Company 2 has invested especially in planning and developing EA frameworks and work methods. EA is governed by policies and a number of groups and practices have been established for producing,

communicating and managing these policies. Furthermore, there are established procedures to plan and improve communication on EA with parties that implement the policies. Also, the relationship between EA planning and IT investments is planned and devised.

Company 3 has established a foundation for EA work by identifying and documenting the objectives and benefits of EA work as well as the objectives of EA. Moreover, the phases and schedule for EA development has been planned. Business-drivenness is accepted as an objective of EA work and taken into account in EA frameworks. The company has also documented previous experience from projects on lower level architectures. An independent architecture team has been established apart from IT management for the governance of enterprise-level ICT architecture, encompassing a number of architectures related to e.g. information, telecommunications, systems and technology. EA governance is done in cooperation between the team and business architecture governance, which is situated elsewhere. Communication with top management on EA is established, but resources for EA work are limited and schedules are strict.

4 EA Work Challenges

The most significant challenges in the EA work areas faced by the case companies are presented in the following, in alphabetical order. For confidentiality, the challenges are discussed only at a general level.

1. Assessment / Evaluation. The possibilities of EA evaluation have not been charted extensively or in detail. Nonetheless, evaluations are occasionally made in one or two case companies. A defined set of EA evaluation methods and metrics is rarely established.

2. Business-Drivenness. The EA work of the case companies is mostly driven by business needs and requirements. However, collecting the business requirements and verifying their traceability to e.g. EA decisions are a challenge.

3. Commitment. The management of the case companies is committed to the EA approach and is aware of the importance of EA. In practice however, gaining management support for EA work is challenging. In all cases, IT organizations are committed to EA work, but gaining the commitment of business end-users is evidently a challenge. Guidelines for IT developers for assuring EA compliance are under construction.

4. Communication & Common Language. All of the case companies have established communication between the EA team and the key stakeholders to some extent. Nonetheless, there is room for improvement in communication with management, IT developers and business end-users. A number of EA concepts are defined, and communication challenges have been discussed.

5. Development Methodology, Framework and Tool Support. There are no specific development methodologies for EA development defined in the case companies. However, methodologies for individual systems and software development projects are mostly well developed and a number of system architecture development methodologies are available. On the other hand, the framework for EA development is defined and documented in all cases. However, there are challenges either in communicating the framework to all relevant stakeholders or actively using it in EA development. Multiple tools, including modeling tools, are used in EA work. Nevertheless, defined and controlled use of the tools is not yet established. Also, the challenges in transferring architectural descriptions between tools are being considered. The use of UML has been discussed, but it is thought to have its limitations in intelligibility.

6. EA Models and Artefacts. There are a number of deficiencies in the descriptions of the state of EA, both current and objective, as well as in the transition plans. They are fragmented or based on incomplete information, or even non-existent. Plans for EA documentation have mostly been done, but the documentation process is typically not very systematic.

7. Governance. The organization, functions and processes of the EA governance have been partially defined and documented, but not implemented. Furthermore, the governance unit is mostly situated under IT management. Therefore, the connection between business and EA has not been fully established. In EA risk management and organizational change management, existing practices could be used.

8. IT Investment and Acquisition Strategies. It is perceived that investments should be driven by EA planning and development. A missing link between the investment process and EA planning is considered as a risk, and therefore the case companies either have connected or are currently establishing a connection between them.

9. Organizational Culture. The general commitment of either or both management and the IT organization already supports EA work to some degree. A number of organizational challenges for

EA work have been identified and preliminary solutions considered.

10. Project Management. The case companies have established project management practices. From EA point of view, the coordination between projects generally operates well. However, methods for collecting project management best practices are not established in all case companies.

11. Scoping and Purpose. The cases show that the benefits and objectives of EA work and architectural objectives are mostly identified on a general level. Yet, the identification is somewhat insufficient on occasion.

12. Skilled Team and Training / Education. Most of the case companies have defined roles and responsibilities for a full-time EA team. The roles of chief architect and business architect are mostly not named, but there is practically a certain person that works in the role of the chief architect. The training and education needs of the team or other stakeholders, such as management, are not yet thoroughly charted. Training and education is available and personal training and education plans are implemented but not actively used.

5 Conclusion

In this study, a generic evaluation model for EA [20] was used in analyzing the current status of EA work and its most significant challenges in three case companies. A summary of the current status of EA work in the companies is presented in Figure 1, which shows the average maturity levels of the EA work areas.

As can be seen in the figure, EA work in the case companies is currently incomplete or at the initial state. The more matured areas include especially

1. Development Methodology, Framework and Tool Support. The EA framework is defined and documented. Still, EA development methodology and tool usage need further definition, development and implementation.

2. Communication & Common Language. Communication on EA between the EA team and the key stakeholders is established to some extent. However, communication with management, IT organization and business end-users still need improvement. Communication should take into account the different information needs of the stakeholders, be understandable and reach the entire organization [see e.g. 5, 13, 22]. Moreover, a communication plan or strategy might be needed [see e.g. 13, 23].
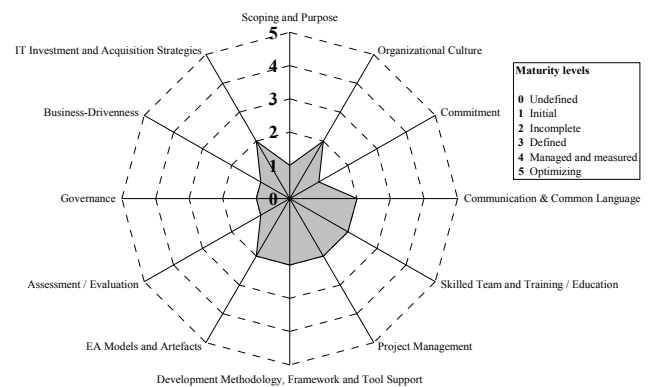

Fig. 1. The average maturity levels of the EA work areas in the three case companies

3. Skilled Team and Training / Education. The roles and responsibilities of the EA team have been defined and education and training is available.

4. Project Management. Established project management practices form a solid foundation for EA work. Still, companies should consider if EA evaluation milestones should be imported into project management methodology.

5. IT Investment and Acquisition Strategies. It is perceived that investments should be driven by EA planning. Moreover, methods for taking EA policies into account in investment planning have been developed.

The least matured areas of EA work are the following.

1. Scoping and Purpose. The benefits and objectives of EA work and the objectives of EA should be defined and documented to form a basis for EA work [see e.g. 24, 25].

2. Commitment. Gaining true commitment of management and business end-users is a challenge. Especially top management support is essential to any enterprise program, including EA. Presenting EA work benefits is important in gaining stakeholder support and rationalizing investments in EA work [see e.g. 26]. In addition, EA projects should be bound to business requirements with business cases [see e.g. 27], and potential project benefits should be displayed [see e.g. 23] using e.g. simulation or scenarios. Also, a consistent strategy for EA development could be made [see e.g. 25].

3. Assessment / Evaluation. The needs and possibilities for evaluation should be charted thoroughly in detail and evaluation methods, criteria and metrics should be developed [see e.g. 28].

4. Governance. EA governance should be fully defined, implemented and integrated into the management processes of the organization. A connection between business and EA should also be established [see e.g. 29]. Also, EA risk management

[see e.g. 29] and organizational change management [see e.g. 25] should be taken into account.

5. Business-Drivenness. To increase business and EA alignment, the business requirements of EA should be carefully charted [see e.g. 25]. Moreover, methods could be utilized in tracing the implementation of requirements in EA conformant systems and software, and the interaction between IT and the business organization increased.

These findings show a certain degree of similarity with other studies on EA maturity. According to GAO, NASCIO and IFEAD [14-16], EA has been widely adopted by organizations. However, the average EA maturity level of all organizations studied worldwide by META Group [18] is slightly above 2. In most US public sector organizations, EA maturity level is 1 or 2 according to GAO [15]. Nonetheless, the differences in the evaluation methods and criteria used in these studies make further comparison almost impossible.

A number of EA value-adding actions, which correspond to the findings of this study, have been emphasized by NASCIO [14]. *EA funding* can be gained by senior management commitment, and *EA value proposition*, on the other hand, can be used to gain commitment. Also, *EA marketing and communication* should be used to increase EA awareness. According to NASCIO [14], *EA performance metrics* should also be developed.

Moreover, the EA trends worldwide, studied by IFEAD [16], are parallel with the status of the case companies. All of the organizations studied have an EA framework, and virtually all use tools and modeling techniques. The majority of the organizations also employ architects of their own, but their education and training is most commonly their own responsibility. EA governance is usually located under IT management but there seems to be a shift to business management. Furthermore, according to Infosys [17], two-thirds of the organizations studied have a full-time EA team.

There are some limitations in this study. Firstly, direct generalizations cannot be made since only three Finnish business enterprises were studied. Secondly, due to confidentiality the findings had to be presented only at a general level. However, the findings are suggestive of the EA work status in Finnish business enterprises, which, supported by similar findings elsewhere, is also suggestive of the situation in European enterprises in general.

The results of this study can be used in organizations to identify areas of EA work that need improvement and how to improve them. However, the evaluation model should be further improved especially by prioritizing the areas of EA work and

charting for interrelations, contradictions and other links between them. Moreover, the EA work status should be studied more extensively in organizations worldwide for more generalizable results. To study the development of EA work status over time, the possibility of conducting a longitudinal research in the case companies is being considered. This kind of research could provide answers to a number of interesting questions, such as how fast the development is and whether all the EA work areas are improving, or if some of them have been omitted in the development.

6 Acknowledgements

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