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Enterprise Architecture management challenges in the Norwegian health sector

Dag H. Olsen*

University of Agder, Post box 422, NO-4604 Kristiansand, Norway

Abstract

Enterprise Architecture (EA) is instrumental to align ICT and business strategy, and many organizations carry out substantial efforts to implement EA. It is therefore seen as imperative to drive the digital strategy, identifying innovative new business models and technologies, and realizing more business value of technology investments. However, recent work suggest that it is a challenging task to implement enterprise architecture in an organization. This study explores the implementation of enterprise architecture (EA) in the Norwegian health sector. We found a number of challenges that impeded the process toward a common EA: unclear enterprise architecture roles, ineffective communication, low EA maturity and commitment, and complicated EA tools. These challenges were traced to three root causes: the ambiguity of the EA concept, difficult EA terminology and the complexity of EA frameworks.

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Keywords: Enterprise Architecture; health sector; Enterprise Architecture Managemenet

* Corresponding author. Tel.: +0-000-000-0000 ; fax: +0-000-000-0000 .
E-mail address: dag.h.olsen@uia.no

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1. Introduction

IT and Communications Technology (ICT) is a crucial technology in most organizations. Vast resources are invested in ICT to make organizations more effective and efficient, but realizing the full benefits of such investments is very challenging. It is generally believed that business strategy and ICT must be aligned. Enterprise Architecture (EA) is such an integrated perspective. Ross et al. stated that: "EA provides a long-term view of a company's processes, systems and technologies so that individual projects can build capabilities – not just fulfil immediate needs"[1]. This is also holds for the health sector, where innovative use of new ICT will have significant impact on the logistics and care of patients[2].

Norwegian health trusts had operated as separate enterprises until 2007. They acquired ICT systems without cooperation and coordination with other health trusts. In addition, the health trusts were not allowed to share information. This had led to a maze of different solutions, infrastructure and ways of doing things. The Norwegian health sector is now organized into four regional health authorities, and has started the process toward a mutual enterprise architecture for the health trusts.

Health enterprises are very complex organizations, and they have a high degree of specialization and a heterogeneous combination of actors and interests[3]. Health enterprises have very complex ICT infrastructures, and must cope with significant challenges in creating appropriate enterprise architectures that can accommodate agile changes in services, processes and systems. It can therefore serve as a good example of the increasing complexity related to ICT utilization in many sectors. The effort to create a common enterprise architecture in specialized health care services is very challenging. While the literature has documented an array of challenges related to EA management[4-6], little research has focused on the challenges related to the adoption of a common EA for an entire sector. This paper will present insights from the Norwegian specialized health care services. We have posed the following research question:

Which are the most important challenges related to enterprise architecture management in the specialized health care services, and what are the root causes?

The rest of this paper is organized as follows: The next sections present related work, the research method, the results and the discussion. Finally, we present the conclusion.

2. Related work

There are many definitions of EA and from a number of perspectives, and there is a lack of a universally accepted definition[1, 7, 8]. Gartner group has defined EA as: "The process of translating business vision and strategy into effective enterprise change by creating, communicating and improving the key principles and models that describe the enterprise's future state and enable its evolution"[9]. We can interpret EA as a holistic view of the organization, emphasizing the interaction between business and IT. We can also perceive it as the process of developing and transforming the organization. "Enterprise architecture (EA) implementation refers to a set of activities ultimately aiming to align business objectives with information technology infrastructure in an organization. EA implementation is a multidisciplinary, complicated and endless process"[10]. We should therefore also expect that large organizations, with complex IT environments, and with extensive standardization and integration, would benefit most from an EA[11].

The literature identifies a number of important potential benefits. Tamm, Seddon, Shanks, Reynolds [11] identified twelve high-level benefits: increased responsiveness and guidance to change, improved decision-making, improved communication and collaboration, reduced IT costs, business-IT alignment, improved business processes, improved IT systems, re-use of resources, improved integration, reduced risk, regulatory compliance and providing stability. However, empirical studies show that very few organizations are able to realize substantial benefits. The literature estimates that approximately five percent of EA efforts succeed [7]. Several authors have pointed out that EA must be liberated from the IT focus, and become better entrenched at the executive level to realize its potential as a facilitator of strategic planning and business transformation[8, 12-14].

Enterprise architecture management (EAM) has been defined as the management activities conducted to install, maintain and develop the EA in an organization[15]. Kotusev et al identified three approaches to EA Management[16]: the traditional approach, the MIT approach and the DYA approach. The traditional approach was introduced by Spewak, Steven [17] and can be described as a four-step sequential process[16]: document the current state, develop the desired

future state, develop the migration plan, and implement the plan and repeat the process all over again. The MIT approach was proposed by Ross, Weill, Robertson [1] and advocates the development of a long-term architecture vision at the enterprise level. The DYA approach was first published by Wagter, Van Den Berg, Luijpers, Van Steenbergen [18]. This approach views EAM as a reactive response to concrete business initiatives. EAM in practice rarely follows any one of these approaches, but combines various elements from each method[16].

Lucke, Krell, Lechner [6] found a number of challenges for EA management: missing management commitment, lack of experienced architects, difficulty for EA teams in understanding the requirements, insufficient tool support and rapidly changing environmental conditions. Scholars have also pointed to the lack of clearly defined EA roles and responsibilities[5, 6]. A large part of the obstruction seems to be the ambiguity of the EA concept, and that a common understanding and methodological consistency are still lacking [8]. Lemmetti, Pekkola [4] in a study of EA implementation in the Finnish public sector, found that EA concepts were vague and was not properly understood by the public sector authorities. EA was primarily seen as a tool. Lemmetti, Pekkola [4] also found that there were many comprehensions of the EA concept, and pointed out that it is imperative to make sure that all actors share the same perception of what EA really is.

3. Research setting and method

3.1. Research setting

There are four health regions in Norway. In each region, a regional health authority (RHF) is responsible for offering specialized healthcare to the population. The government owns the regional health authorities. Each health authority owns a number of health trusts (HF), which perform a geographic and/or specialist activities of operations. There are 43 health trusts in Norway. Helse Sør-Øst RHF (HSØ) is the largest RHF and offers specialist health care to approximately 2.85 million citizens, and has approximately 78,000 employees. HSØ consists of 15 HFs.

All ICT staff (approx. 400) in the HFs in HSØ were pooled into a new trust, Sykehuspartner HF in 2009. Sykehuspartner now has the whole responsibility for ICT, HR and procurement services to all hospitals in the region. It now has approximately 1,300 employees and is one of the largest enterprises in Scandinavia in this field. In 2014, Nasjonal IKT (NIKT) was established. It is a health trust responsible for promoting and coordinating common ICT-related initiatives in the specialized health care services.

Difi, The Agency for Public Management and eGovernment is a public agency that work to strengthen the government's effort in renewing the Norwegian public sector and improve the organization and efficiency of government administration. It is overseen by the Ministry of Local Government and Modernization (KMD). An important task is therefore also to endorse coordinated and cost-efficient use of ICT within the public sector.

Digital Renewal (Digital Fornying) is a regional program for renewal and standardization of work processes and technology within HSØ. The initiative aims to provide better quality and patient safety, increased efficiency and better coordination between agencies involved in patient care [19]. The initiative commenced in 2013 and HSØ led the implementation of the program. The present program consists of a number of larger and smaller projects, organized as follows: Regional clinical solution, Enterprise Management, Infrastructure Modernization, and ICT support for research [19].

3.2. Research Method

This was an exploratory case study, and has adhered to the interpretive case study approach[20]. Interpretive research focuses on the complexity of human sense as the situation emerges[21]. It is essential to understand the context of the IS in information systems (IS) research, and the interaction between the system and the context[21, 22]. Interpretive design offers a flexibility that permits discoveries of new and unexpected empirical results and for increasing sophistication. This provides the researcher with an iterative design and the option of improvisation and flexibility in the research process.

We conducted twelve open-ended and semi-structured interviews with informants involved in the EA projects at HSØ. We contacted NIKT to identify appropriate informants. People that had enterprise architect as their job title were contacted. Seven informants were recruited in this manner. The rest of the informants were recruited by the

snowballing method. The informants are either employed by HSØ or Sykehuspartner, or have broad knowledge of the EA efforts in the health region. Nine of the informants have positions that involved enterprise architecture, with roles such as enterprise architect, consultant or senior consultant. These informants were located at the health trusts. This made it possible to get perspectives on the implementation and management of EA from both the health trusts and Sykehuspartner. The last three informants have positions as senior managers at HSØ and Sykehuspartner.

The interviews were conducted over the phone. Different guidelines were applied to ensure the quality of the interviews. The guidelines was divided into three phases: before, during and after the interview[23]. The mainly focused on the use of enterprise architecture and related challenges. All interviews were recorded and lasted 20 to 50 minutes.

We used NVivo to organize the empirical data, transcribe interviews and identify patterns in the findings. NVivo has also made it easier to interpret the results by navigating across the data. The text transcripts were reduced and major themes were identified and categorized into main categories[24]. The analysis was performed in the following steps based on Oates [25]. First, the transcribed data was read to get an overall impression. The data was categorized into the following categories: Tools, Organizational challenges, Project challenges, Decision authority, Enterprise architecture, Communication, Governance.

4. Results

We will here present the results of the interviews. The informants held various consultant, architect and senior manager positions at HSØ and Sykehuspartner. Several important issues emerged from the data analysis, and we will here focus on the most pronounced ones. Some of these issues relate to several of the data categories in the data analysis.

4.1. Lack of management understanding and commitment

All informants conjectured that the senior management of HSØ had a limited knowledge and understanding of EA. One senior managers of HSØ (Informant 12) stated that: “I believe that the knowledge about enterprise architecture is way too low in the senior management” Informant 4 noted that this was a problem at all levels. “Competence and knowledge about architecture are very limited at all levels.” Informant 5 even stated that the senior management is critical to EA. A number of informants stressed that they need to gradually achieve a higher EA maturity: “Attitudes gradually improve over time.” (Informant 4)

The informants also conjectured that commitment from the top management was weak. Informant 4 noted that: “The biggest challenge is management buy-in, it is good in large projects but in small ones, it is limited”. This was a general attitude among the informants, and seven informants stated that they were not satisfied with the present top management commitment in minor projects. It was also an issue of management mind-set. Several informants noted that the senior management often are not able to see the usefulness and value of EA. They may see the value in large projects, but not in the line function. This quote from Informant 1 is illuminating: “[The management] does not completely see the value of having EA as a line function. [They] see the usefulness and value in projects and programs.” Five of the informants noted that the attitudes toward EA are not good enough, or have room for improvement.

4.2. Communication Challenges

Communication was also a major challenge. Eleven of the informants had experienced difficulties in communicating, particularly with senior management and ICT staff. The informants related the difficulty in communication with senior management to the difficulty in conveying the value and necessity of the EA project. Most enterprise architects observed that it was challenging to show the business value, and it was primarily seen as a result of their own inability to convey the business value, and to the difficulty in communicating with the (technical) EA concepts. One of the enterprise architects (informant 9) commented that: “It is a challenge to make this understood, and actually a challenge to communicate the business value of architecture, and why money should be put into this. It is difficult to explain to [business people], who are used to think in quarterly costs and investments. They look at the short term rather than the long term. But this is a fundamental crash of cultures.” Informant 13 supported this: “There

are challenges with mapping [EA descriptions] over to something that is understandable for the management. We must be better at keeping it simple."

The informants also stated that it was difficult to communicate with ICT staff. Eight of the informants noted that EA concepts are difficult and not manageable for other stakeholders. Dialogues would easily become very technical and too detailed. One of the enterprise architects noted that: "Enterprise architecture is a completely unknown concept to ICT staff. […] and the standard language that the enterprise architects use can create a distance between the customer or the organization - the ones you are to create value for, and yourself" (Informant 6).

4.3. Unclear enterprise architecture role

The informants conjectured that unclear enterprise architect role was a significant problem. Eight informants noted that this created substantial problems in the EA projects. They believed that clarifying the role of the EA architect is the most critical EA issue. This quote from Informant 2 is representative: "Clarified role is in a way the most important issue. [We need to] get a clarified role that would get us as architects more effective."

We found that the architects often do not comprehend precisely what they are expected to deliver in the EA projects. Several of the informants stated that this led to their competence not being utilized appropriately. They were even sometimes given roles where they did not contribute anything. One senior manager noted that "[Enterprise architects] get assignments that they should not have, and they get a somewhat different role than intended." This was corroborated by one of the other informants: "In projects and in the line [function], everyone asks themselves when they should involve the architect. Later they ask why they needed to involve the architect so early in the project because we are not in a technical phase yet. So, there is a misunderstanding about the enterprise architect role and a very limited knowledge of [EA] in its entirety" (Informant 4).

Several informants stated that the unclear roles could be caused by a lack of rules and policies. They also believed that there is too little focus on the mandate, and that it is not strong enough.

4.4. Organizational challenges

There were also challenges related to the relationship between the enterprise architecture project and the organization. Lack of trust was seen as one of the reasons for the slow EA progress. Many informants stated that he regional ICT service provider, Sykehuspartner, was poorly positioned in relation to HSØ. Several informants believed that Sykehuspartner had not been able to gain the appropriate level of trust as a service provider for HSØ, and that this was due to Sykehuspartner not having lived up to the expectations. When the results did not materialize, there was not a good foundation for trust. Informant 12 observed that: "We are not able to deliver good enough due to lacking trust from HSØ. Sykehuspartner only becomes an implementer, and we do not get to hear the needs". The informants conjectured that it was vital to attain the expectations. Informant 4 noted that: "It is important to manage the expectations to the present architecture function, so the various stakeholders don't get disappointed when they contact us, so that they will come back."

Several informants noted that it was very challenging to get priority for EA project issues. It was a process that was contingent on decision authority and various stakeholders. This is demonstrated in the following quote: "As an architect, one does not always have the influence one would like, and that depends on the management – business people. There is a conflict between the ones who manage and those who would like to work long term, the architects are sitting too far away from the ones who have decision authority." Informant 10 supported this: "… what enterprise architects may propose […] get overtaken by other matters or needs, and [the EA architects] sit too far away. I believe a clearer management based on architecture would make sense." Several informants also believed that there should be an architecture policy through the health regions. Four of the informants believed that an national architecture policy would improve the situation.

4.5. Challenging EA tools

The health region had adopted the Troux EA tool. The informants noted that this tool was very difficult and cumbersome to use. Informant 4 stated that: "With the more complicated tools, as with for example Troux, one needs

more training to actually get anything out of the tools. The biggest disadvantage with these tools is that they really are difficult to use." Informant 9 supported this: "[Troux] was chosen as the architecture tool. It was acquired ten years ago. I have been attending three courses with this tool, and I still cannot use it. […] It should be noted that none of the others are able to use it either."

5. Discussion

This study explores the management of enterprise architecture (EA) in the Norwegian specialized health care services. We found there were substantial challenges related to EA management. The EA role was not well defined, management understanding and commitment was weak, communication was challenging and the EA governance was weak. We found that all stakeholders had unclear conceptions of EA and the EA value propositions, even the enterprise architects had unclear conceptions of their roles. This is consistent with Lemmetti and Pekkola's [4] finding about varied and unclear EA perceptions in the Finnish public sector. This created confusion and made the EA efforts very challenging.

Role clarity is particularly important since the regional health administration is a very complicated organization. What is rather astounding in this study, is that even enterprise architects do not have clear conceptions of their role. A large number of actors and stakeholders need to communicate and interact with each other. This is consistent with Ylimäki [26]'s EA implementation success factor, *Skilled team, Training and Education.* This factor emphasizes that roles and responsibilities are clear, documented and that people are employed in proper roles. Gøtze [27] found that the complexity of the enterprise architect role makes it challenging to clarify it. Gøtze [27] found that the enterprise architects can have up to five possible roles. These roles may change over time or during projects. Such changes would create misunderstanding and confusion in HSØ, and lead to unclear role definition. We conjecture that this would go both for the architects as for other stakeholders who need to interact with the architects. We trace this problem to the lack of shared EA understanding. We argue that the lack of shared EA understanding is primarily due to ambiguity of the EA concept, but also to the difficult EA terminology and the complexity of EA frameworks.

Management understanding and commitment was an important challenge. The management had too little understanding of EA, and there was a lack of commitment to EA efforts. We contend that this problem is connected to the communication challenge. The informants related the lack of commitment to the inability to convey the value proposition of EA. Effective communication is essential for management commitment. Chuang, van Loggerenberg [28] found that living up to the expectations from the management was essential for commitment. This is a pervasive problem in EA implementation[6, 29-31]. Low commitment may lead to less effective communication[26, 32]. We conjecture that the EA mind-set is not fully adopted by the senior management. EA still need to move to a higher maturity level, and free itself from the IT focus[8]. The findings also illustrate that lack of understanding is a challenge. Lack of understanding reinforces the communication and commitment challenges. Ylimäki [26] identified knowledge as a critical success factor, and illustrates that managers should at least be competent at a general level about EA, EA frameworks and architecture goals and vision. Lack of understanding is then due to the ambiguity of the EA concept and the difficult EA terminology.

Communication was found to be quite challenging. The informants saw the ability to communicate as one of the most important capabilities of enterprise architects. The importance of communication is consistent with the EA literature[6, 26, 28, 30]. Communication is an essential success factor and a critical challenge related to EA and the enterprise architect role. Implementing EA involves many stakeholders in various parts of the enterprise. Communication is essential to achieve a common understanding, which is instrumental for obtaining an agreement about scope, goals and vision[26]. The communication challenges are also related to the lacking role clarity, and thus also to the ambiguity of the EA concept. The enterprise architects must communicate effectively to convey their role accurately to the other stakeholders. Three aspects of communication were challenging in this case, communication with decision makers, communicating the value of EA, and a complicated set of concepts. Enterprise architects and other stakeholders communicate in different ways[6]. Enterprise architects will communicate primarily at a technical level, while managers will focus on business aspects – and not be interested in the technical issues[28]. EA has a very different terminology from what is used by business managers[29]. We therefore also see the difficult (and unfamiliar) EA terminology as a root cause for the communication challenges.

Communicating the value of EA is also complicated by the fact that HSØ has not yet realized any significant benefits from the EA efforts. Gartner group [33] argues that you often don't realize EA benefits before you reach level 3 in their 5-point maturity scale. Based on the interviews we would place the HSØ somewhere between 1 and 2 on this scale.

The *weak EA governance* was also a perceived to be an impediment. The enterprise architects in HSØ advocated stronger EA governance. This is consistent with the finding in EA studies[6, 26, 30, 34, 35]. Lucke, Krell, Lechner [6] found that there is a lack of governance in many EA projects. The informants believed that Sykehuspartner had too little influence on HSØ, and that it requires a stronger governance to improve the EA efforts. The informants felt that they were too far away from decision makers, making it hard to get backing for the EA agenda. Lucke, Krell, Lechner [6] also found that coordination within an organization is a critical problem. This includes how various actors are positioned relative to each other. Seppänen, Heikkilä, Liimatainen [30] argues that establishing an architecture mandate is a key factor for succeeding with EA implementation in the public sector.

This case demonstrates that there must be a shared understanding that EA is not only about IT infrastructure, but also includes policy, project and organizational factors. The informants perceived a tension between the long term perspective of EA and the short term focus of managers. This is a result of the difficulty of conveying the value of EA – when the value of EA is not communicated effectively, it may be hard get the needed influence and long term commitment from top management. We conjecture that a lack of clear understanding of the EA concept was an important impediment to establishing a shared understanding.

We argue that the identified EA management challenges can be traced back to three root causes: the ambiguity of the EA concept, difficult EA terminology and the complexity of EA. These EA characteristics make it challenging to define benefits, roles, responsibilities, processes and procedures needed in the EA program. Without clear definitions of these crucial aspects, it will be difficult to create a common understanding of the EA efforts. It also will be very difficult to convey the value and need for EA efforts to the various stakeholders. The inability to convey the value proposition then will likely lead to little top management commitment and support. Top management commitment and support again are crucial for the success of the EA programs. Without a clear shared understanding of the EA concept it will be difficult to achieve a common EA vison and reach an agreement on EA policy and mandate. Thus, a stronger EA mandate is also contingent upon a strong shared understanding. We propose that one possible avenue would be to build the legitimacy and organizational support over time by cultivating the EA practice, as argued by Hope [7], thereby gradually and increasingly demonstrating benefits and usefulness.

6. Conclusion

This study addressed the management of Enterprise Architecture in the Norwegian specialized health care services. The implementation of EA faced some significant challenges. There were a number of EA management challenges: unclear EA architect roles, communication problems, management understanding and commitment and weak EA governance. We found that the ambiguity of the EA concept, the difficult EA terminology and the complexity of EA frameworks were root causes for the EA management problems.

The EA maturity is still quite low in HSØ, and the EA mind-set has not been sufficiently adopted in the organisation. The low maturity level is natural given that it is a complex topic that is difficult to comprehend and communicate. HSØ need to build the legitimacy and organisational support over time by cultivating the EA practice[7], and increasingly demonstrate benefits and usefulness.

This was an exploratory study in one sector, and has limited generalizability, providing a basis for future research. We hope that this research be useful for later studies of EA management in health enterprises as well as other enterprises. We cannot generalize the findings, but the study may serve to inform health enterprises about the challenges associated with the enterprise architecture management.

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