Institutional perspective on introducing enterprise architecture

The case of the Norwegian hospital sector

Anne Kristin Sortehaug Ajer

UiA University of Agder

Doctoral Dissertations at the University of Agder 272

Anne Kristin Sortehaug Ajer

Institutional perspective on introducing enterprise architecture

The case of the Norwegian hospital sector

Dissertation for the degree philosophiae doctor (PhD)

University of Agder
Faculty of Social Science
2020

Doctoral dissertations at the University of Agder 272
ISSN: 1504-9272
ISBN: 978-82-7117-973-1

Print: 07 Media
Kristiansand

Acknowledgements

I use this opportunity to thank the Department of Information Systems at the University of Agder (UiA) for making it possible for me to complete a doctoral degree in information systems.

The supervisors are crucial in the doctoral journey. Eli Hustad and Polyxeni Vassilakopoulou, the way you guided and supported me during the work was priceless. Many discussions made me refine my thoughts, reconfigure my mind and strive to deliver scientific work of good quality. It was a winding road to the final research direction, and you were of great help to me in finding relevant literature and finally settling on a focus that led to exactly this dissertation. Professor Dag H. Olsen deserves special thanks. We had many interesting and fruitful discussions, which contributed to parts of this thesis. Additionally, I am grateful to all the staff at the department for including the doctoral students as virtual members of the regular staff and to the faculty staff for supporting the process.

Three years seem like an eternity at the start of the PhD journey but like a flash of time in the end. Nonetheless, my PhD colleges whom I regularly encountered in the hallway made it a memorable time at UiA; thanks to Peter André Busch, Marilex Rea Llave, Geir Inge Hausvik, Kristi Askedal, Mohamed Tafiqur Rahman, Nhat Nam Bui, Jan Helge Viste, Frank Danielsen and Kristine Steen-Tveit.

Without the friendly and benevolent people who participated in the interviews, this thesis could not have been written. A warm thank you to those people who shared their experiences and enlightened me in the particularities of hospitals and enterprise architecture.

Finally, I express my appreciation to my friends and family for encouraging me in this work, listening to my 'ups and downs' and showing faith in me to accomplish this task. One thing is for sure; without the comfort, support and patience of my husband, Sjur Petter, I could never have fulfilled my dream of obtaining a PhD degree.

'Happiness lies in the joy of achievement and the thrill of creative effort.'
- Franklin D. Roosevelt

Abstract

Nations all over the world pay much attention to healthcare. With an increasing number of elderly citizens, higher demands for healthcare services in general, based on new medical insights and technological innovations, and national goals for equal access to pervasive healthcare, are major factors that have increased the total cost of healthcare in society. Information and communication technology (ICT) is perceived as a means to deliver better healthcare while contributing to cost reduction. Enterprise architecture (EA) is an approach used to develop and manage the ICT landscape in large and complex organisations. Over the last two decades, healthcare organisations have started introducing EA as a more systematic way of designing, planning and implementing process for technology changes. The complexity in healthcare is grounded in interdependencies among medical specialisations with their own processes and data requirements, the variety of decision makers at different levels of healthcare systems, the rapid technological advancements and the shifting regulative requirements. I have synthesised prior definitions of EA to be a hierarchical description of organisations' current and future states, represented by artefacts describing the business processes and information technology (IT) components, including information models, hardware and software to support the business processes. EA thus enables the transition towards the organisations' vision in a coherent and systematic way. Consequently, the organisations' capability to be agile and responsive to change is strengthened. The holistic perspective is what mainly differentiates EA management from traditional information system (IS) management.

The holistic EA view is criticised for its emphasis on standardisation that leads to suboptimal business solutions, which can endanger the organisations' competitiveness and trigger organisational resistance. The appropriateness of EA in certain settings is also questioned, such as in federated organisations, of which the hospital sector is an example, where the organisational structure can constrain the architecture development. The outset of this thesis was my observation that large public ICT initiatives continue to fail in deliveries in terms of time, budget or in functionality, notwithstanding decades of experience in system development, which I assumed was integrated in modern IT system governance and system development methodology. Since prior research had called for further understanding and theorising of EA institutionalisation in the public sectors' different domains, I found it

timely to study the challenges in the hospital sector, with the aim to gain an enhanced understanding of the phenomena and ultimately obtain an outcome that could help EA initiatives to navigate in the complex hospital domain.

The research approach used for this doctoral thesis was an interpretive case study. Subsequent research questions emerged from the findings regarding the prior research questions. After the initial interviews, the first research question (RQ1) was formulated, and two additional research questions (RQ2 and RQ3) emerged during the period of the study.

RQ1 aimed to identify and understand challenges by tracing the introduction of EA and the organisational reactions to the initiative. RQ1 was stated as follows: *What are the main challenges of EA institutionalisation in the hospital sector?*

The purpose of **RQ2** was to study in more depth the tensions revealed in the analysis of RQ1. Institutional logics can be the sources of underlying challenges in EA institutionalisation, and an enhanced understanding of the logics can improve an organisation's capability to address the challenges. Therefore, RQ2 was posited as follows: *What kinds of tensions emerge between different professional institutional logics and the EA institutional logic in the introduction of EA in the hospital sector?*

Finally, through the rich data that I had collected and the extensive literature review that I had conducted, I recognised the opportunity to use the insights gained from them in order to provide suggestions for dealing with the challenges and the tensions found in RQ1 and RQ2. This led to **RQ3**: *How can the challenges of EA institutionalisation in the hospital sector be addressed?*

To explore the answers to these research questions, I utilised analytical frameworks from institutional theories to study the creation of EA as an institution, as well as the theory on organisational response to analyse the answers to the initiative. Furthermore, I used the institutional logics perspective to study the tensions among the main actors in the design of hospital IS. The main actors are the IT professionals, the managers and the medical professionals. However, the logics of the enterprise architects and the logic of EA itself require attention to understand the whole picture in relation to everyday action taking. Finally, theories on institutionalisation and institutional work were used in the analysis of the empirical

data and in the discussion on how measures could contribute to creating and maintaining EA as an institution. Documents were collected from websites of the Norwegian parliament, ministries and agencies under them, as well as from the National ICT and the South Eastern Regional Health Authority. I conducted interviews in three phases in the latter two organisations. Insights from the documents and the interviews made it possible to connect the data with the theory so that the contributions to both research and practice could be trustworthy.

The empirical findings are presented in six articles; four are published in peer-reviewed conference proceedings, one is accepted for publication in an international journal, and one is currently under revision for resubmission to an international journal (after two review rounds). The results show many challenges to the EA initiative. The three major challenges involve the *autonomy* of the organisational units, the national objectives that are not followed up with *financial* initiatives, and the lack of *understanding of EA*. The challenges related to EA institutionalisation are highly intertwined. The units' autonomy allows them to dismiss or only partly participate in the EA initiative. When the EA projects are on track, the risks of their being deviated from the EA logic come from several sources.

The findings from this thesis also point to the incongruence between the characteristics of EA and the healthcare domain as specific tensions among the EA logic and different professional logics as a source of deviation. The incongruence comes from the long-term plan-driven EA approach versus healthcare traditions and needs for ad-hoc initiatives. Other themes stem from the EA logic of process standardisation, which poses challenges in gaining acceptance and trust that the processes inscribe appropriate clinical knowledge and provide support for local variations. Moreover, the EA vision of data integration across organisational units and across IS has implications for concerns about privacy and protection of sensitive data, but this can collide with the healthcare view on patient safety and the need for mission-critical data.

This dissertation makes several contributions to research and practice. First, it augments the EA research stream by offering rich insights and specific implications related to challenges of EA institutionalisation in healthcare. A description of the enterprise architects' logics and the EA logic supplements the EA knowledge base. Likewise, it presents a model of a predicted evolution of the EA initiatives through the phases of optimism, resistance, decline and finally, reconsolidation of the most

persistent ones, unless firm mandates are established from the start. Furthermore, the study provides a model that illustrates how coexisting institutional logics maintain their distinct character while allowing compromises that shape EA operationalisation. The model shows a set of scenarios for settling tensions in project decisions. In these scenarios, EA is foregrounded, blended with other available institutional logics or suppressed.

Second, this dissertation contributes to an enhanced theoretical and empirical understanding of EA institutionalisation, where regulative, normative and cultural-cognitive elements create and maintain EA as an institution, and unsurprisingly, the organisational response impedes the institutionalisation process. The organisational response can be explained by selective activated institutional logics among the actors. However, with targeted institutional work from the actors that want EA to be institutionalised, the process can be reinforced.

This thesis also offers some practical suggestions at the national policy level. First, financial arrangements should be assessed to encourage broader involvement from the sub-organisations. Second, through active ownership, they can address the need for enhanced EA understanding and should secure the education of the actors, not the least at the executive level, together with the targeted hires. Furthermore, the need for organisational changes related to EA is under-communicated. The thesis also makes practical suggestions to deal with the challenges, the incongruence and the consequent tensions, mainly by finding solutions that balance between the institutional logics of EA and of healthcare.

Contents

Acknowledgements v

Abstract vi

List of Tables xiv

List of Figures xv

List of Acronyms xvi

1 Introduction 1

1.1 Research Questions 6

1.2 Summary of findings and contributions 10

1.3 Structure of the dissertation 11

2 Healthcare and ICT coordination and collaboration 13

2.1 Overview of the Norwegian healthcare sector 13

2.1.1 Governance body for the hospitals 14

2.2 Short historical overview on coordination in the hospital sector 15

2.3 National visions for e-health services 18

2.4 Foundation of the EA approach 22

2.4.1 Documents from the government and their agency for ICT 22

2.4.2 Documents from the hospital sector 27

3 Conceptualisations and theoretical foundation 33

3.1 Enterprise architecture 33

3.1.1 EA frameworks and EA approaches 36

3.2 Prior relevant research on EA 39

3.2.1 EA challenges 40

3.2.2 EA in hospitals 42

3.3 Institutional theory 42

3.3.1 Emergence of EA as an institution 43
3.3.2 Institutional logics in health information systems 45
3.3.3 EA institutionalisation 48
3.3.4 Institutional work 50
3.4 Summary of the theoretical framework 52
4 Research approach 55
4.1 Research setting 55
4.1.1 National ICT 55
4.1.2 South Eastern Regional Health Authority 57
4.2 Research design 63
4.2.1 Interpretive case study 63
4.2.2 Quality assurance of the research 65
4.2.3 Selection of case 67
4.2.4 Data collection 68
4.2.5 Analysis 76
4.2.6 Limitation of the research design 77
5 Research articles 79
5.1 Enterprise architecture in healthcare and underlying institutional logics: a systematic literature review of IS research 80
5.1.1 Results 80
5.1.2 Relation to the whole 81
5.2 Enterprise architecture challenges: a case study of three Norwegian public sectors 82
5.2.1 Results 82
5.2.2 Relation to the whole 83

5.3 Enterprise architects' logics across organisational levels: a case study in the Norwegian hospital sector 84
5.3.1 Results 84
5.3.2 Relation to the whole 85
5.4 Enterprise architecture in hospitals: resolving incongruence issues 85
5.4.1 Results 86
5.4.2 Relation to the whole 87
5.5 Enterprise architecture implementation is a bumpy ride: a case study in the Norwegian public sector 87
5.5.1 Results 88
5.5.2 Relation to the whole 89
5.6 Enterprise architecture and institutional pluralism: the case of the Norwegian hospital sector 90
5.6.1 Results 90
5.6.2 Relation to the whole 92
5.7 Overview of the logical flow of the articles 92
6 Summary of the key findings 95
6.1 Main challenges of EA institutionalisation 96
6.2 Tensions between professional logics and the EA logic 99
6.3 Addressing challenges of EA institutionalisation 101
7 Contributions 107
7.1 Contributions to theory 107
7.2 Contributions to practice 109
8 Conclusions 111
8.1 Limitations and future research 112
List of references 115

Appendices 137
Appendix A. Interview guide – starting questions 137
Appendix B. Interview guide – initial phase 138
Appendix C. Interview guide – first phase of study 141
Appendix D. Interview guide – third phase 143
Appendix E. Interview guide – final section 148
Appendix F. Details from the data collection 149
Appendix G. Details from the analysis 152
Appendix H. Timeline for South Eastern Regional Health Authority 156
Appendix I. Analysis of institutional work 157
Appendix J. Thesis articles 159

List of Tables

Table 1. Articles in the thesis. 10
Table 2. The articles' relation to the research questions and the key findings. ... 11
Table 3. Timeline for development of architectural thinking in the Norwegian public sector.. 25
Table 4. Multiple institutional logics in healthcare information systems. 47
Table 5. Overview of activities when creating, maintaining and disrupting an institution. 51
Table 6. Health trusts in the South Eastern Regional Health Authority. 58
Table 7. Overview of the phases of data collection. 69
Table 8. Summary of interviews. 71
Table 9. Detailed overview of interviewees. 72
Table 10. Overview of articles. 79
Table 11. Main challenges of EA initiatives; origins and the problem owners ... 97
Table 12. Incongruence between EA and healthcare. 99
Table 13. Overview of tensions between the EA logic and the prevailing logics in hospitals..... 100
Table 14. Suggestions to deal with the major challenges..... 104

List of Figures

Figure 1. Overview of stakeholders related to ICT development in the Norwegian healthcare sector. 14
Figure 2. The total care process. 20
Figure 3. Interaction among enterprise architecture (EA), strategy and portfolio management. 31
Figure 4. Basic elements of EA analysis and design. 35
Figure 5. TOGAF-ADM. 37
Figure 6. Institutionalisation process. 49
Figure 7. Theoretical framework to explore EA institutionalisation. 54
Figure 8. Organisation chart for the NICT. 56
Figure 9. Organisation chart for the administration of the South Eastern Regional Health Authority. 58
Figure 10. Organisation of the regional clinical solution as of April 2017. 62
Figure 11. Overview of the articles in relation to the research questions. 94
Figure 12. Overview of the key findings. 96

List of Acronyms

Acronym	Meaning
ADM	Architecture Development Method
AR	Action research
CEO	Chief executive officer
CIO	Chief information officer
CSF	Critical success factor
DIFI	Agency for Public Management and eGovernment
DYA	Dynamic approach
EA	Enterprise architecture
EAM	Enterprise architecture management
EDP	Electronic data processing
EHR	Electronic health record
PACS	Picture archiving and communication system
PAS	Patient administrators' systems
GP	General practitioner
HCO	Healthcare organisation
HP	Hospital Partner
HT	Health Trust
IT	Information technology
ICT	Information and communication technology
IS	Information systems
KITH	Competence centre for IT in the health and social sector
MIT	Massachusetts Institute of Technology
MHCS	Ministry of Health and Care Services
MLGM	Ministry of Local Government and Modernisation
MRA	Ministry of Renewal and Administration
NICT	National ICT
NOU	Norwegian Official Report
RCS	Regional clinical solution
RHA	Regional Health Authorities
RQ	Research question
SERHA	South Eastern RHA
TOGAF	The Open Group Architecture Framework

1 Introduction

Over the last two decades, healthcare organisations (HCOs) have started introducing enterprise architecture (EA) as a systematic way of designing, planning and implementing process for technology changes (Venkatesh, et al., 2007; Bradley, Pratt, Byrd, et al., 2012). The EA approach has become an increasingly important subject in information system (IS) research; studies on EA implementation and adoption, EA management (EAM) and related topics comprise a growing field (Shanks, et al., 2018; Dale and Scheepers, 2019; Hylving and Bygstad, 2019). The main objective of this thesis is to increase the understanding of EA institutionalisation in healthcare.

Information systems are fundamental for revolutionising healthcare (Drucker, 2007; Kellermann and Jones, 2013) and meeting the triple aim of providing the citizens with improved care experiences and better healthcare and reducing society's total costs (Berwick, Nolan and Whittington, 2008). Hospitals typically employ a variety of information and communication technologies (ICTs) sourced from various vendors, including systems for patients' electronic health records (EHRs), laboratory systems, logistic systems, sensors, diagnostic facilities and medical automation. The complexity stems from the interdependencies among medical specialisations with their own processes and data requirements, the variety of decision makers at different levels of healthcare systems, the rapid technological advancements and the shifting regulative requirements (Gebre-Mariam and Bygstad, 2016; Aanestad, et al., 2017). Ensuring smooth information flows across the ICT landscape is not only pivotal for healthcare delivery but also quite challenging (Romanow, Cho and Straub, 2012; Gandhi, 2016).

EA is a method and a process used to holistically manage the complex ICT landscape in large organisations. The holistic perspective is what differs EA management from traditional IS management (Hjort-Madsen and Burkard, 2006), and since EA addresses how to operate the business it is far beyond the scope of information technology (IT) (Gardner, et al., 2012). Based on previous research and definitions, I define EA as a description of the organisations' current and future states represented by artefacts describing the business processes and IT components, including information models, hardware and software to support the business processes, thus enabling the transition towards the organisations vision in a

coherent way and enhancing the organisations' capability to be agile and responsive to change. EAM is the approach used to plan and control the transformation (Aier, Gleichauf and Winter, 2011).

The major drivers for EA initiatives are aspirations for business-IT alignment and cost reduction, as well as external demands related to legal requirements (Schöenherr, 2008). Other frequently mentioned benefits from EA are providing a holistic view of the enterprise, improved change management, improved risk management, improved interoperability and integration, and shortened cycle times (Niemi, 2006). However, 'most of the benefits are indirect or strategic – even if they can be clearly quantified, they are difficult to address to EA or EA work (planning, development and management)' (Niemi, 2006, p.5).

Several researchers have questioned the results and the contribution of EA to organisations. For example, if the strategy is to give the business units the responsibility for their own architecture, it will '[result] in slow, chunky, and potentially frustrating architecture development' (Martin, 2012, p.146). For the public sector, Hjort-Madsen and Burkard (2006) point to the fact that widespread EA frameworks are made for the private sector, thus missing the organisational perspective that is important because of the autonomy of public agencies.

Other intertwined issues that question the appropriateness of EA relate to its long-term perspective and value. A standardisation project can take two to six years (Ross, 2003). Given the time issue, combined with problems with clarifying the value from EA (Tamm, et al., 2011; Bygstad, Bendik and Pedersen, 2012; Dang and Pekkola, 2016), and the implicit uncertainty about when the EA benefits will be realised (Schmidt and Buxmann, 2011), questioning the feasibility of EA seems legitimate. The misalignment between the long-term EA approach and the necessity for rapid organisational development results in development projects that constantly change the current EA. Moreover, the role played by enterprise architects remains unclear (Bloomberg, 2014), with the limited research on them (Robertson, Peko and Sundaram, 2018), and in a recent article, Ylinen and Pekkola (2018) argue that finding the perfect enterprise architect is analogous to finding a five-foot sheep.

Despite an increasing interest in EA research, several areas within EA still need more understanding and theoretical explanations. For instance, there are reported

difficulties with EA implementation in general, and it is even more problematic in the public sector than in the private sector, but the reason is not clear (Mezzanotte and Dehlinger, 2014). Some case studies have covered EA challenges in the public sector in several countries (e.g., Janssen and Hjort-Madsen, 2007; Carota, Corradini and Re, 2010; Valtonen, et al., 2011; AlSoufi, 2014; Moreno, et al., 2014; Zadeh, et al., 2014; Bakar and Selamat, 2016). Nevertheless, there are calls for more research related to problems with EA implementation and adoption issues (Dang and Pekkola, 2017). Since research on EA methods is well covered, researchers should address establishing architectural thinking (Seppänen, Penttinen and Pulkkinen, 2018), something that I conjecture to be imperative for EA institutionalisation. Improving EA governance still requires in-depth knowledge on how EAM is integrated into the organisation, the characteristics of the enterprise architects and the factors that influence the evolution of EAM (Rahimi, Gøtze and Møller, 2017; Rouhani, et al., 2019), as well as the dynamic nature of EA (Schilling, Haki and Aier, 2018).

The selection of the hospital sector as the research context is appropriately related to EA because hospitals constitute one of the most complex sectors, and standardised EA guidelines for hospitals are missing (Purnawan and Surendro, 2016). Even if hospitals can be both public and private, the business processes tend to be similar, and the same EA approach is appropriate (Purnawan and Surendro, 2016). Research on EA within healthcare is scarce in the IS community. EA research often revolves around several issues in the same study, thus the need for addressing specific EA topics through in-depth research. Hence, empirical studies focusing on the introduction of EA in healthcare still comprise an area for researchers to explore.

In Norway, EA is perceived as an instrument for achieving national goals of ICT coordination and interoperability for the Norwegian healthcare sector (National ICT [NICT], 2008; Ministry of Health and Care Services [MHCS], 2009; Ministry of Local Government and Modernisation [MLGM], 2009a). The white paper, 'One citizen – one record' (MHCS, 2012), stands out as the bearer of the main message that identifies the objectives of eHealth in Norway, and the government clearly proclaims that the aim is to modernise the sector and work towards common ICT solutions. Importantly for this thesis' scope, one chapter describes the need for stronger national governance and coordination of the ICT development in the

healthcare sector. The challenges and the causes of the slow development of utilising ICT in the sector, as described in the white paper, are that the technological possibilities are not realised; there are many autonomous actors/stakeholders, many systems and little integration; and finally, the two laws regulating the use of and the access to health information are not adjusted (one of the laws is now changed to facilitate sharing of patients' health data across Health Trusts [HTs]). The Agency for Public Management and eGovernment (DIFI) points to the following problems: coordination issues are not clarified, there is a lack of common understanding, and little empirical data are available regarding the lack of coordination, as well as the costs and the benefits related to coordination (DIFI, 2017).

Notwithstanding the fact that Norway has one of the best healthcare systems in the world (Barber, et al., 2017), the Organisation for Economic Co-operation and Development (2017) has assessed the digitalisation of the healthcare sector in Norway as trailing behind other sectors yet having a significant potential for improved effectivity and efficiency. Furthermore, despite the clear statements on architectural principles and interaction, it seems that large regional health projects have not taken the national principles into account, and the Office of the Auditor General has questioned the regional practices (Riksrevisjonen, 2014). Several regional ICT projects in the South Eastern region have also struggled to reach their targets and to deliver the IS on time and within their budgets. Additionally, recent failures have stopped regional initiatives and have incurred financial losses; for example, the infrastructure modernisation programme was cancelled in 2018 with a termination payment of 211MNOK (SERHA, 2018a), and a radiology project was stopped the same year after 273 MNOK had been spent (SERHA, 2018b). This situation is my main motivation to embark on a PhD project; despite decades of experience in the development of large national information systems, Norwegian stakeholders are obviously still struggling, and I want to gain an enhanced understanding of this situation, especially related to the introduction of EA and its premise of being a 'silver bullet' for large and complex organisations.

My curiosity in examining this phenomenon is also grounded on my previous work as an IT professional since 1984. Among others, I worked for over 10 years as a system developer for a large national system with local installations in 258 municipalities. The work included software design, programming, test and release, and project management. Then, for a few years, I worked on the operations of a large

enterprise resource planning system (SAP), mainly with configuration and tuning. Subsequently, I served as a consultant for a company in selecting an IS for retail business and advising it on establishing new routines related to the new system. I helped the same company to improve its routines and use of an interorganisational system for retail in the franchise context. Additionally, I have experience in design, development and maintenance of web applications.

Researchers have called for further understanding of EA challenges in other countries (Dang and Pekkola, 2016), for more knowledge related to EA implementation in the public sector (Dang and Pekkola, 2017) and for the dynamic nature of EA (Schilling, Haki and Aier, 2018). Additionally, there is stated a need for further understanding of EA institutionalisation in their specific environments (Winter, 2016). Therefore, I have found it timely to study the challenges in the hospital sector, with the aim of acquiring an enhanced understanding of the phenomena and ultimately obtaining outcomes that can help EA initiatives to navigate in the complex hospital domain.

Among organisational theories, the institutional theory has the potential to help researchers understand interorganisational intricacies related to ICT (Orlikowski and Barley, 2001, p.153). Institutions are defined in several ways, and to encompass previous researchers' definitions, Greenwood, et al. (2008, pp.4–5) describe an institution as 'more-or-less taken for-granted repetitive social behaviour that is underpinned by normative systems and cognitive understandings that give meaning to social exchange and thus enable self-reproducing social order'. An institution can be perceived as a social arrangement and 'is said to be institutionalized when it is widely practiced, largely uncontested, and resistant to change' (Suddaby and Greenwood, 2009, p.176). The institutional perspective acknowledges that not everything that occurs in an organisation can be explained by rational actions of managers; social and cultural realities in the organisation's surroundings also play a major role in shaping the organisation's structure, not the least the organisational behaviour (Meyer, J.W. and Rowan, 1977). How to shape the organisation's structure, including its work processes, can diverge among different occupations and professions (Powell, 1991). Paying attention to the actors, as well as the actions of the different agents and their motives, can help form new institutions, such as EA (Meyer, R.E., 2008; Battilana, Leca and Boxenbaum, 2009).

To fulfil the aims of this PhD project, an interpretive case study (Walsham, 1995) as a methodological foundation is a natural choice for me since my ontological worldview is relativistic – the world is not predefined but a result of many conditions that change over time. The contributions of this thesis are formed by the findings presented in six peer-reviewed conference and journal articles, where four have been published in conference proceedings, one is accepted for publication in an international journal, and one is under revision for resubmission to an international journal. The research progressed through the analysis and the results reported in one article, which formed the subsequent research question for the next article. The findings discussed in the articles are intertwined; thus, for the final analysis, I have formulated three research questions. In the next three subsections, I provide the detailed research questions, a summary of the findings and contributions related to these questions and an overview of the structure of this dissertation.

1.1 Research Questions

The context of this study is the Norwegian hospital sector, which is organised into four independent enterprises, called regional health authorities (RHAs). The RHAs are publicly owned and governed by the MHCS. Each RHA has some authority over the HTs in its region, which is regulated by laws. Investments in ICT are made at both the regional and the trust levels. The NICT is a trust owned by the four RHAs, and the NICT's main work areas are strategic coordination, prioritisation and consolidation of a common approach to key ICT issues across the regions. The NICT and SERHA (which serves the largest region with 78,000 employees and 30 hospitals) are the organisations that are investigated in more depth.

The different public sectors in Norway are supposed to develop their own architecture principles and domain architectures, as well as take the national architecture into account. Establishing an EA strategy is one of the NICT goals (NICT, 2012). The NICT has been in charge of some national ICT projects. In 2015, SERHA started to use EA as an approach in a regional mega programme for clinical solutions, among other systems, for laboratories, medical cancer treatment and radiology.

As described in the first part of the introduction, the hospital sector has a technical complexity, and Norwegian hospitals started early with ICT support in their oper-

ations; thus, they must change and replace existing systems, which is more challenging than starting from scratch. Second, the Norwegian hospital context is also complex when it comes to organisational issues. There is a hierarchical owner structure with national, regional and local levels, notwithstanding that the units are in a position to exercise a degree of autonomy. The third form of complexity comes from the hospitals' many different production lines, with numerous professionals (healthcare managers, physicians, nurses, physiotherapists, etc.) involved in the caring process, some with stronger voices than others. Additionally, some hospitals are large and specialised; others are small and cover a diversity of treatments. Moreover, historically, the physicians have had the strongest voice in how hospitals should be operated, but this has dissipated in western society when politicians and market forces have challenged the physicians' power (Currie and Guah, 2007; Reay and Hinings, 2009).

The complexities outlined above make it challenging to implement EA in the hospital sector, considering its holistic view on an organisation, as well as its emphasis on standardisation of both work processes and technology. The first part of the introduction points to reports showing that the Norwegian EA initiative strives to gain a foothold in the hospital sector; thus, the main challenges are important to identify. Therefore, the first research question (RQ1) is as follows:

RQ1: *What are the main challenges of EA institutionalisation in the hospital sector?*

To comprehend the challenges and ultimately, how they can be addressed, I first had to understand the introduction of EA and how the organisations reacted to the initiative. I used an exploratory approach when interviewing and asked open-ended questions, so the interviewees could elaborate on the theme that we were discussing. The interview guides are provided in Appendices A–E.

The challenges were identified through an analytical process (Miles, Huberman and Saldaña, 2014). To study the introduction of EA, I was guided by Scott's (2014) framework for the creation of an institution and the theory on the organisational response to institutional pressure (Oliver, 1991). The study's findings have been reported in Articles #2 and #5 (see Table 1), and a summary is provided in Chapter 5.

The findings reveal diverging responses to the initiative that could be related to the different professions involved, in line with prior research that has reported that EA implementation is influenced by tensions and interactions among actors in its institutional context (Hjort-Madsen and Pries-Heje, 2009; Janssen and Klievink, 2012). Therefore, I conceptualise one of the underlying challenges as involving tensions among different institutional logics at play.

The institutional theory's concept of institutional logics (Friedland and Alford, 1991; Thornton and Ocasio, 2008) offers the possibility to understand the rationality behind the actors' actions, and the healthcare sector is a multifaceted organisational field where multiple competing institutional logics coexist (Currie and Guah, 2007; Reay and Hinings, 2009; van den Broek, Boselie and Paauwe, 2014). The research community uses institutional logic synonymous with logic (Thornton, Ocasio and Lounsbury, 2012; Reay and Jones, 2016; Boonstra, A., Eseryel and van Offenbeek, 2018).

EA operationalisation in the hospital context entails introducing principles and assumptions that may collide with existing institutional logics embedded in the different professions and in local practices, and these can be observed as tensions. Thus, institutional logics can be the sources of the underlying challenges of EA institutionalisation, and an enhanced understanding of the logics can improve an organisation's capability to address the challenges. Therefore, I investigated the tensions caused by the multiplicity of logics, and the second research question (RQ2) is as follows:

RQ2: *What kinds of tensions emerge between different professional institutional logics and the EA institutional logic in the introduction of EA in the hospital sector?*

To answer RQ2, I had to identify the enterprise architects' logics and the EA logic, which had not been described in previous research. The most influential rationalities in health IS are technical, managerial and medical (Heeks, 2006), and researchers have described the logics for IT professionals, managers and clinicians (Currie and Guah, 2007; Reay and Hinings, 2009; Boonstra, A., Eseryel and van Offenbeek, 2018). However, I conclude that to be able to influence EA institution-

alisation, the enterprise architect's logic and the EA logic itself need more exploration and improved understanding, especially in relation to the other influential professions.

To reveal the tensions, I first analysed the rich data from the first interviews, then I added more targeted interviews, also among managers and clinicians. I continued with an exploratory approach and used the institutional logics' perspective in the analysis. This study's findings are included in Articles #3, #4 and #6 (see Table 1), and a summary of the findings is provided in Chapter 5. Article #4 is not precise about logics, but it does point to the incongruencies in EA characteristics and healthcare characteristics that lead to tensions that have to be resolved, thus informing the total understanding of the phenomena under study.

EA usually entails organisational changes, including changes in work processes and power structures. Ross, Weill and Robertson (2006) emphasise the importance of the key stakeholders' engagement in the process to reach overall goals. Organisations and people involve more challenging issues than the technical aspect of a business transformation (Gardner, et al., 2012), and Denert-Stiftungslehrstuhl (2015) finds that people pose the greatest challenges in standardisation processes because they need to change. Thus, EA initiatives need to address the actors involved in the transformation processes. 'In order to move to the next level of EAM productivity, it appears necessary to shift the focus from an enforcement-centric view (i.e., enhancing EAM governance) towards an influence-centric view (i.e., improving the EAM influence on local stakeholder decisions)' (Winter, 2016, p.5). To move the EAM discipline forward, Winter (2016) calls for further studies to understand the institutionalisation's mechanisms in each specific environment to reveal the contingencies influencing the institutionalisation process. Thus, through the rich data that I had collected and the extensive literature review that I had conducted, I recognised the opportunity to use these insights to provide suggestions for how the challenges related to EA institutionalisation could be addressed. This leads to the third research question (RQ3):

RQ3: *How can the challenges of EA institutionalisation in the hospital sector be addressed?*

The answer to this research question is formed from four sources: the analysis of the interviewees, the organisations' documents and the institutional logics employed in ongoing regional projects, as well as from the research literature.

The answer to RQ3 is presented in two parts: first, how to address the general challenges mentioned in Subsection 6.1, and second, how to address the tensions noted in Subsection 6.2. In relation to the general challenges, I draw a timeline for SERHA regarding important events and descriptions of what have had an impact on EA institutionalisation (see Appendix H) and use the theory from institutional work (Lawrence and Suddaby, 2006) to analyse and discuss how different types of institutional work affect the institutionalisation.

1.2 Summary of findings and contributions

The six articles that build up to the answers to the research questions are listed in Table 1, and a brief overview of their contributions to the different questions is presented in Table 2. Each article's complete reference information is listed in Appendix J, and a summary of each article's findings is provided in Chapter 5.

Table 1. Articles in the thesis.

#	Article
1	Enterprise architecture in healthcare and underlying institutional logics: a systematic literature review of IS research. The *22nd Pacific Asia conference on information systems* (2018).
2	Enterprise architecture challenges: a case study of three Norwegian public sectors. The *26th European conference on information systems* (2018).
3	Enterprise architects' logics across organisational levels: a case study in the Norwegian hospital sector. The *12th Mediterranean conference on information systems* (2018).
4	Enterprise architecture in hospitals: resolving incongruence issues. The *17th World congress on medical and health informatics* (2019).
5	Enterprise architecture implementation is a bumpy ride: a case study in the Norwegian public sector (accepted for the Electronic Journal of e-Government).
6	Enterprise architecture and institutional pluralism: the case of the Norwegian hospital sector (revised version after 2nd review for the Information System Journal.).

Table 2. The articles' relation to the research questions (RQs) and the key findings.

#	Input to RQs	Key findings and contributions
1	RQ2	The selected studies mainly address the information technology (IT) professionals' logics, and the logic of medical professionalism is scantily addressed. Synthesis of prior findings and gap identification in prior research on enterprise architecture (EA) in healthcare and underlying institutional logics.
2	RQ1 and RQ3	The major challenges are related to autonomy, financial issues and the lack of understanding of enterprise architecture (EA) and holistic thinking. Implications: Improve EA competency, especially for the top management. Strengthen EA governance. Evaluate the financial model.
3	RQ2	There are no significant differences between the enterprise architects' and the managers' perspectives when considering the intended contributions of EA, but tensions exist among the professions. Most prominent tension: Demands for local flexibility and autonomy at the local level versus the predefined rules and standardisation of EA. Other contribution: Suggestion of a persona of the enterprise architect.
4	RQ2 and RQ3	Incongruences in healthcare versus EA, with suggestions on how to deal with them. The incongruences are bottom-up versus top-down planning, clinical versus system knowledge, local versus global arrangements and patient safety versus patient privacy.
5	RQ1 and RQ3	The significant obstacles are organisational and technical complexities, the limited understanding of EA and the lack of formal EA governance mechanisms. A common evolution pattern for EA initiatives goes through the phases of optimism, resistance, decline and finally, reconsolidation.
6	RQ2 and RQ3	The main tensions between the logic of EA and the logics of medical professionalism, managerialism and IT professionalism regarding EA operationalisation are fractional versus holistic orientation, bottom-up localisation versus top-down standardisation and short-/medium-term versus long-term outlook. Tensions are settled through a dialectic approach of dynamic balancing by trying to conciliate the conflicting institutional logics. A model is developed to show the different scenarios. Other contribution: Description of institutional logic for EA itself.

1.3 Structure of the dissertation

This doctoral work consists of six articles and this dissertation. The dissertation is divided into eight chapters.

In Chapter 1, I introduce the phenomena under study and present the study's aim, the research questions, the key findings and contributions and the structure of the dissertation.

In Chapter 2, I offer an overview of how healthcare is organised in Norway. The historical background and the governmental efforts to achieve ICT coordination and collaboration in the healthcare sector are presented in a condensed form. Likewise, I have drawn the line on the foundation of EA from the government down to the subordinate organisations.

Rooted in the IS literature, the conceptualisations of the themes and the theoretical background for the study are presented in Chapter 3. First, I explain the EA concept before discussing previous research on EA challenges and EA in the hospital setting. Furthermore, the different streams of institutional theory used in this dissertation are accounted for.

In Chapter 4, I describe the research setting, the philosophical underpinnings for the research approach and the research process. How the informants were selected and how the interviews were conducted are also explained, and details from the analysis are presented. A discussion of the limitations related to the research design concludes this chapter.

In Chapter 5, I summarise the results reported in each of the articles and their relation to the whole study.

In Chapter 6, the three research questions are answered.

In Chapter 7, the contributions of the thesis are discussed, first for theory and then for practice.

An overall conclusion is offered in Chapter 8. Finally, I summarise the limitations of the research and outline an agenda for future research topics related to the institutionalisation of EA in general and for hospitals in particular.

2 Healthcare and ICT coordination and collaboration

In this section, I aim to present a brief overview of the healthcare sector in Norway and to illuminate the complex organisation and governance structure in the hospital sector. Another purpose is to provide a foundation for understanding why ICT coordination and collaboration are viewed as imperative tasks for Norwegian society, as well as the strategies laid down by the Norwegian government and the healthcare sector throughout history.

A goal for many nations, Norway included, is pervasive healthcare. Pervasive healthcare is defined as 'healthcare to anyone, anytime, and anywhere by removing locational, time and other restraints while increasing both the coverage and the quality of healthcare' (Varshney, 2007, p.114). This implies integrating primary, secondary and home care services (Tan and Liu, 2013).

The Norwegian government has published several white papers describing how ICT can be used to achieve political objectives regarding healthcare and be a tool for more effective and efficient services, with emphasis on quality and patient security (Directorate of eHealth, 2018a). Additionally, the governance structure for ICT initiatives has changed over the years. In the first subsection, I present a brief overview of the Norwegian healthcare sector. In the second subsection, I present a short history of ICT initiatives from a coordination perspective. In the third subsection, I describe national visions for e-health services. Finally, I explain how the EA initiatives in the hospital sector have evolved in general and for the SERHA case in particular.

2.1 Overview of the Norwegian healthcare sector

The healthcare sector in Norway can be divided into primary and specialist HCOs. Primary HCOs are health service providers with agreements with the municipalities, for example, general practitioners (GPs), physiotherapists and nursing homes. The specialist HCOs are the hospitals. In Norway, the hospital sector is mostly public. The public hospitals are organised into four independent enterprises, called RHAs, which are in turn appointed by the MHCS. The hospitals are organised in small groups, depending on their geographical locations, and are named HTs. Each RHA and HT are separate legal entities with their own boards. Additional ministries and actors are involved in organising and developing the ICT structure and

systems. Figure 1 illustrates an overview of the main stakeholders and the governance structure of the work related to ICT in the healthcare sector.

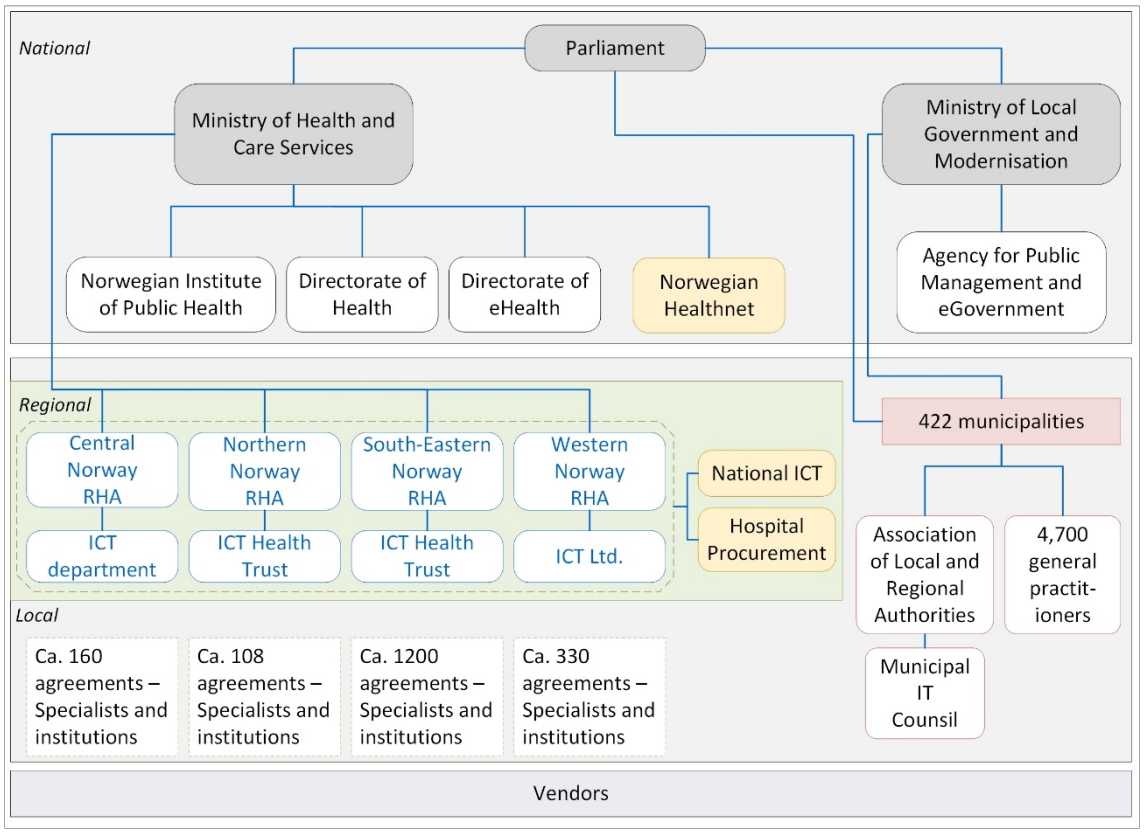


Figure 1. Overview of stakeholders related to ICT development in the Norwegian healthcare sector, based on Røren (2016) and Directorate of eHealth (2017a).

2.1.1 Governance body for the hospitals

In 2001, the government passed the Health Authorities and Health Trusts Act for health enterprises to reorganise the hospital sector. In 2002, the government took over the ownership of hospitals from the counties and other enterprises with special care services. The reform was about organisational changes, not health politics; however, it was perceived as a means for future improvement of the healthcare area (Norwegian Official Report [NOU], 2016). 'The goal of the hospital reform is more equal hospital services across the country, greater effectiveness, clear and uniform responsibility and better utilization of capital and labour. Common IT solutions and purchasing systems can also make significant savings' (Ministry of Finance, 2001, p.57). In the beginning, there were five RHAs, but in 2007, two of the regions were merged into SERHA. Each RHA owns the hospitals in its region.

In total, there are 20 hospital HTs, which are their own jurisdictional units. One HT can consist of several local hospitals.

In conjunction with the evaluation of the national hospital reform in 2002, a national official report was prepared in 2016 (NOU, 2016). The report states that since the enterprises are organised as legal units, the hospital services do not constitute an integrated part of the national governance. However, with stronger national governance through the reform, it was assessed as appropriate to let the hospitals exercise greater authority over their operations. Organising them into enterprises was meant to be an initiative for decentralisation. For the reform to be a success, the need for both local freedom and national governance was emphasised. The Health Authorities and Health Trusts Act determines which governing and decision-making bodies the health enterprises should have and which authority is assigned to the individual body. Figure 1 shows the actual governance structure, with lines from one organisation to another. Each RHA and each HT have a board and a chief executive officer (CEO). The upper body of governance for the RHAs is the MHCS, and the board of each RHA is superior to the HT.

The overall governance is exercised by the parliament through plans, such as those outlined in the white papers, 'The coordination reform, proper treatment – at the right place and right time' (2009), 'One citizen – one record' (2012) and 'National health and hospital plan' (2015). The health policy order and the allocation of funds are mainly due to the annual assignment documents from the MHCS. Corporate governance in the RHAs and HTs is exercised through the appointment of boards, the adoption of statutes and resolutions. Formally, there are no limitations in the owners' right to govern; however, to what extent the MHCS will govern the RHAs is actually a political question. Likewise, the boards of the RHAs decide on the degree of freedom that they leave to the HTs. Overall, each RHA is responsible for implementing the national health policy in its region and is the level that initiates and carries out many of the necessary changes to the healthcare services. The HTs are their own legal entities and are responsible for ensuring that their actual services meet the requirements for safety, patients' and users' rights and so on.

2.2 Short historical overview on coordination in the hospital sector

In 1965, the Directorate of Health established a committee for computing, and it delivered a national report in 1973, stating that the development of electronic data

processing (EDP) projects within the healthcare sector is random and not as coordinated as needed in order to utilise the possibilities of EDP (NOU, 1973). Furthermore, the report indicates that in 1966, 10 hospitals used EDP for their daily operations, and in 1971, there were 200 EDP projects in 70 health institutions where 68% of the projects were operative, but only 6 institutions had their own computers. Building on the 1973 report, a white paper published in 1978 (Ministry of Social Affairs, 1978) noted that the healthcare sector so far had simple administrative or medical-administrative systems, and the initiatives were random and uncoordinated. The main objective of the white paper was to illuminate the need for coordination, as well as examine the organisational structures and the resources needed to develop a long-term plan for the sector. Even if ICT issues were the responsibilities of each hospital owner, at that time, the counties and the state had the overall responsibility for the purposeful development of healthcare in general. Therefore, the report recommended establishing a national coordination group for future system development projects. The 'general management group for EDP in the health service' was established in 1981 and remained active until 1988. In 1990, two ministries and the central organisation for municipalities established an enterprise named 'Competence centre for IT in the health and social sector' (KITH), with the aim of contributing to coordinated IT development in the health and social sector. The KITH worked on several standardisation and coordination issues, among others, for enhanced interoperability, IT security, the EHR system, and the picture archiving and communication system (PACS). In 2012, the KITH was incorporated into the Directorate of Health, and their work has been continued by the Directorate of eHealth that was established in 2016. For the specialist healthcare, the NICT was established at the initiative of the MHCS in 2003. The NICT's main work areas focus on strategic coordination, prioritisation and consolidation of a common approach to key ICT issues across the health regions (NICT, 2012). In 2014, the NICT continued as a separate enterprise owned by the four RHAs.

In the 1990s, the larger hospitals started to implement radiology, laboratory and other specialised solutions; some of them had some form of integration with patient administrators' systems (PAS) and/or an EHR system (Den-Norske-Legeforeningen, 2015). In the late 1990s, some hospitals collaborated on specific systems, such as the EHR (Ellingsen, 2003) and the radiology systems. Among

others, the Medakis project was started in 1996, where five regional hospitals collaborated on an EHR system but did not succeed, and the project was dissolved in 2004, four years after it was planned to be completed (Brevig, 2006). A report of the Directorate of Health (2014) described four eras in the development of ICT for the sector, measured by the spread of the EHR system. First, until 1996, the focus was directed to single units; 80% of the GPs had the EHR system compared to just above 30% of the hospitals. Coordination among the units received little attention. The second era spanned the 1996–2002 period, when 95% of the GPs had the EHR system compared to only 50% of the hospitals. The focus on coordination had increased, and message-based interaction was developed based on the five hospital regions. The third era, covering the 2002–2008 period, was influenced by the reorganisation of the hospitals into RHAs instead of being owned by the counties. Internal consolidation of the RHAs was therefore a key phrase for this period. To ensure uniform development and a stronger implementation ability related to interaction, the Norwegian Healthnet was established in 2004. At the end of the period, 95% of the GPs and 75% of the hospitals had an EHR system. The final era in the report spanned the 2008–2013 period, which focused on solving the lack of interaction between and among the primary and the specialist health services. A programme audited by the Directorate of Health was run to increase message-based interaction. The two important governance documents, 'The coordination reform' and 'One citizen – one record' were published in this period.

Notwithstanding regional differences in EHR/PAS and the chart and medication system, there was improved collaboration in recent years, and 'in the period 2014–2017, the specialist health service's goal fulfilment within ICT has been high' (Directorate of eHealth, 2018b, p.22). For the hospital EHR system, three of the four health regions currently have a system from one vendor, Dips, and in 2018, SERHA had consolidated its EHR system, but access for health personnel across the HTs is planned to be ready in 2020 (SERHA, 2019a). In 2019, the fourth health region signed an agreement with the vendor Epic to deliver a solution for both the primary and the specialist services. Altogether, how to arrive at the last milestone to fulfil the vision described in 'One citizen – one record', with a common solution for all healthcare institutions, is not reasonable to assess since it will take so many years before the RHAs' and the primary HCOs' solutions will be ready; within that

time, several conditions (e.g., technology) will probably have changed (Directorate of eHealth, 2018b).

Since 2013, there has been a huge development related to the interaction between and among the primary and the specialist healthcare services. In recent years, the patients have also been invited to be participants in the interaction chain to some degree (e.g., with the introduction of a nationwide web application named helsenorge.no). However, this issue is beyond the scope of this dissertation, as I delve more into the EA methodology used in the hospital sector. Nevertheless, in understanding the challenges in utilising EA as a method, the history of the organisations and previous efforts related to ICT development in the healthcare domain offer valuable insights.

2.3 National visions for e-health services

The term *national health plan* has been used in Norway since 1980 in both formal and informal documents, but it was revitalised after the new government in 2006 presented a long-term plan for 2007–2010 (Store Norske Leksikon, 2009). The plan states, 'We want the [health] services to be of a high quality, to be available within acceptable waiting times and distances, and the provision to reach out to everyone regardless of their financial situation, social status, age, gender and ethnic background. These high ambitions have to a great extent been realized and we have a health service that is among the best in the world' (Regjeringen.no, 2006, p.1).

To meet the challenges related to more senior citizens, changes in the disease picture, and treatment methods, the government mentioned six foundations for all types of health services: 1) cohesion and interaction, 2) democracy and legitimacy, 3) proximity and security, 4) stronger user role, 5) professionalism and quality, and 6) work and health (Regjeringen.no, 2006). With the national health plan as a background, the MHCS developed a national strategy for electronic interaction in the healthcare sector for 2008–2013. The report (MHCS, 2008) stated that even if the healthcare sector had three prior strategy plans for ICT, the first in 1997, there was still work left. The new strategy emphasised realising and consolidating the current goals before creating new visions. There should be stronger governance and commitment to participation, as well as firm local anchoring. Addressing the six foundations from the national health plan, the report emphasised that interaction among

the actors in the sector could be improved, and ICT could be instrumental in achieving improved interaction and providing continuity in the services to patients, especially for those who would have to move between institutions (MHCS, 2008). The strategy continued the vision from the 2004–2007 strategy – comprehensive patient and user pathways through electronic interaction.

Two of the most important governmental white papers that have formed and guided the development of eHealth services today are 'The Coordination Reform' (MHCS, 2009) and 'One citizen – one record' (MHCS, 2012). The former was the first paper that addressed the coordination and collaboration issue, and the targets described in the latter remain valid, and it is an important document for the evolution of current health services (Directorate of eHealth, 2017a; Bergland, 2018).

The first paper, 'The Coordination Reform' (MHCS, 2009), anchor the ICT part in the strategy report for 2008–2013. The white paper states that despite 10 years of initiatives related to the national ICT strategy, the benefits are not yet obtained, and the objectives are not yet met; however, some achievements have been fulfilled. For example, EHRs are acquired, but paper is still in use, the communications among the systems are limited, too few organisations are connected to the Norwegian Healthnet, and the law partly hinders information sharing or access.

The second white paper, 'One citizen – one record' (MHCS, 2012), conveys the main message about the objectives of eHealth. The paper also describes the current status, challenges, perceived benefits, new services and the fulfilment of existing initiatives. Moreover, one chapter describes the need for stronger national governance and coordination of the ICT development in the healthcare sector.

'One citizen – one record' states that the overall goal is that necessary health information shall be available electronically through the entire care process (thus the title 'One citizen – one record'). However, the paper points out that this is far from reality. Figure 2 describes the care process. Three more specific goals are outlined: 1) To provide improved healthcare, the health personnel shall have easy but secure access to patient and user information. 2) The patient should be more engaged in the care process and experience it as 'streamlined'. 3) The data should be accessible for quality improvement, health surveillance, management and research.

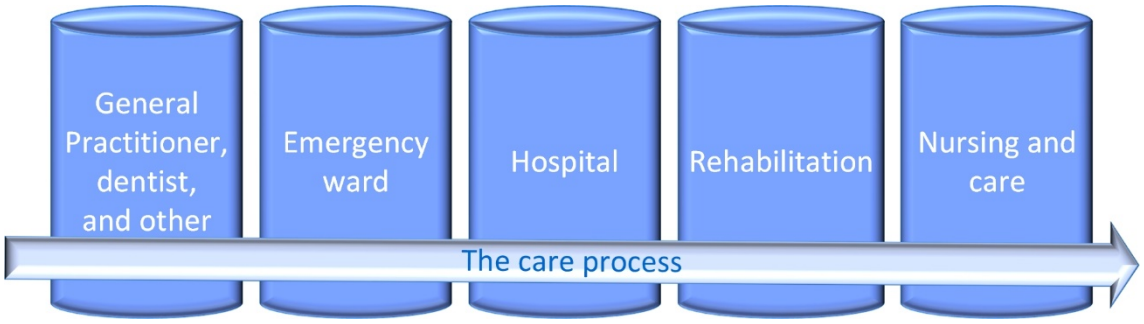


Figure 2. The total care process (MHCS, 2012, p.9).

The white paper further describes that one of the main causes of the lack of information flow through the total healthcare process is related to the fragmented system landscape of the healthcare sector, where many autonomous organisations are responsible for their own IS in terms of prioritising, procurement and operations. The government clearly proclaims that the aim is to modernise the sector and work towards common ICT solutions.

The challenges and the causes of the slow development in utilising ICT in the sector, as described by the MHCS (2012), are as follows:

- *The technological possibilities are not utilised* to the full extent; sometimes, the IS are just partly used.
- Due to *many autonomous actors/stakeholders,* individual actors bear the responsibility for implementation. Hence, it is demanding to achieve national governance and coordination of the ICT development. Furthermore, the vendors struggle with uncoordinated procurements.
- *There are many systems with little integration.* Systems for specialised use with their own databases (silos) are widespread. Information can be difficult to access due to little integration among the different systems.
- *The two laws* regulating the use of and access to health information, health personnel law and health register law are not adjusted to the objectives stated in the Coordination Reform.

Two main initiatives are described in the white paper ‘One citizen – one record’. The first is to work towards an integrated patient record for the whole healthcare

sector. The options in how to achieve this shall be evaluated, and the Central Norway RHA is suggested as a test site since it has already coordinated the IS for clinical information for all the hospitals in the region.

The second initiative is to adjust the laws, adapted to the intention stated in the Coordination Reform, so the information can follow the patient and not be stopped due to jurisdictional issues. Other laws are continuously evolving to support the need for coordination and collaboration towards information sharing. The 'soft way' of voluntary participation and economic incentives has not been a success; hence, a new law, the Health Services Supervision Act, was passed in 2011. The law stipulates several demands for the use of ICT. Among others, for ICT investments, hospitals and municipalities are required to emphasise the society's need for information sharing.

On behalf of the MHCS, the Directorate of eHealth has suggested an action plan for implementing the expected outcomes described in 'One citizen – one record' and following the national strategies, among others, those described in white paper #27, 'Digital agenda for Norway' (2016), and the parliament's 2016 decision, where the target for healthcare services shall be a common national solution. The directorate first had to discuss strategic choices before drafting the action plan (Directorate of eHealth, 2017b). From this work, three reports have been published. The Directorate of eHealth (2017c) describes the overall strategy and means but not the goals and the initiatives. The Directorate of eHealth (2017b) describes the strategy and the goals, while the Directorate of eHealth (2017d) describes the initiatives and the action plan.

Six main strategy areas are suggested and elaborated by the Directorate of eHealth (2017b), as follows: 1) digitisation of work processes, 2) better coordination of the patients' healthcare process, 3) better use of health data, 4) new ways of providing healthcare, 5) a common foundation for digital services and 6) national e-health management and increased implementation capacity.

To sum up the status for the national vision, I conclude this subsection with an excerpt from a report published by the Directorate of eHealth: 'The national target for a common national solution for clinical documentation and patient / user administration should still be valid. The goal is ambitious, and the realization will

take place over several years, raising demands for national governance, co-financing and close cooperation and coordination between enterprises and national authorities. […] With the knowledge we have today, it will probably be demanding to fully realize the goals in Meld. St. 9 (2012–2013) One citizen – one record' (2018b, pp.6, 53). In the next subsection, I present the background on introducing EA in the effort to achieve the national goals.

2.4 Foundation of the EA approach

In this chapter, I describe the emergence of using EA as a strategy in the Norwegian public sector in general and for the hospital sector in particular. Important documents and guidelines in this process are accounted for. First, the regulative elements from the government and the DIFI are presented (the DIFI is representative of the public sector in general). The regulative elements comprise laws, regulations and directives that are supposed to be mandatory for every organisation in the public sector. Then, the documents from the NICT are presented, which are specific for the hospital sector.

2.4.1 Documents from the government and their agency for ICT

During the 1990s, the need for national ICT coordination became clear, and in 2000, the parliament established a department that would be in charge of ICT policies (Ministry of Renewal and Administration [MRA], 2006). Based on the government's strategy for ICT in the public sector for 2003–2005, a workgroup presented the report 'Architecture for electronic interaction in the public sector' (Ministry of Labor and Administration, 2004). For the services to be cost-effective and perceived as seamless by the business community and the citizens, superior coordination was regarded as necessary, and the workgroup recommended, among others, that common principles, methods and requirements should be developed for collaborating on solutions (Ministry of Labor and Administration, 2004).

White paper #17 MRA (2006, p.12) states that 'the establishment of a common architecture principle for the public sector is itself the framework for building up public ICT systems'. Furthermore, for an initiative, the government intended to develop 'a more detailed description of the architectural principle with the associated strategy, target image and guidelines. The ICT strategies and large public ICT projects of the sector and the industry must build on and support these' (MRA,

2006, p.122). The workgroup set to address the initiative, delivered its report (MRA, 2007a) and recognised three levels involved in applying the principles: national, sector specific and enterprise. Furthermore, it specified eight architectural principles: service orientation, interoperability, accessibility, security, openness, flexibility, scalability and unified user front. The terms were elaborated with definitions, principles and consequences. The emphasis on the prerequisite for success is noteworthy: 'it is extremely important to succeed in the more ICT-focused architectures such as information architecture, solution architecture, technical architecture being closely linked to the company's visions and goals and business architecture' (MRA, 2007a, p.15).

White paper #17 also points out some governance challenges related to collaboration among sectors, and one of the initiatives was to assess how the governance of shared components should be organised to enable their reuse, how common architectural principles should be governed and so on. In response to the paper's call for stronger coordination of ICT in the public sector, the DIFI was established in 2008, following a merger of previous public agencies (MRA, 2007b). Among the main responsibilities of the DIFI were 'to prepare proposals for, anchor and secure a breakthrough for common governance standards, ICT architecture and guidelines for ICT in the public sector' (MRA, 2007b, p.42).

White paper #19, 'A government for democracy and community', emphasises the importance of having a common ICT architecture in Norway (MLGM, 2009a). This is the first government-issued paper that elaborates what forced coordination means for both how ICT can be used for coordination and how coordination of ICT can be achieved (originally, *samording* is used, a Norwegian term that is best defined as forced coordination). Regarding forced coordination, 'Organisation, division of labour, management system, and work methods must facilitate the coordination of the policy areas and methods that must be dealt with in context – also if they lie with different ministries or various underlying enterprises' (MLGM, 2009a, p.78). The paper also lists the architectural principles that all governmental organisations shall follow when new ICT solutions are planned or existing ones are renewed; the same principles are cited in a previous paragraph (MRA, 2007a), but unified user front is removed. Furthermore, the paper mentions the following benefits from ICT coordination and collaboration: 'reuse of solutions, need for less

changes in ICT-systems when there are organisational changes, making the administration more ready for changes, easier to integrate systems between organisations, [and] lower cost in a long term view' (MLGM, 2009a, p.117). However, the government understands that there can be problems related to benefits and costs, where parties other than those who gain the benefits cover the costs. There are also risks since the journey to conformity depends on the coordination of efforts by players with different management lines, legal requirements, funding models and not the least, diverse views on what is needed.

The report, 'National common components in public sector' (DIFI, 2010), clarifies the concepts related to national common ICT components. Furthermore, it explains EA, building on ISO/IEC 42010:2007, The Open Group Architecture Framework (TOGAF) 9, and Lankhorst's (2009) definitions. The national common components are defined as technical components, such as software, hardware and databases, that can be used by several organisations or reused in ICT solutions for the public sector. The report states that the tasks to be performed in the different organisations in the public sector have many similarities; therefore, it concludes that it should be possible to define an EA for the whole or parts of the public sector. 'This common enterprise architecture is called common architecture in [the] public sector' (DIFI, 2010, p.20). The preceding quote illustrates that the terms architecture and EA are used interchangeably.

In the report, 'Superior IT-architecture principles for public sector' (DIFI, 2012), the seven architectural principles (MRA, 2007a; MLGM, 2009a) are repeated and refined. Furthermore, the report pinpoints that the single sectors and the organisations themselves are responsible for implementing the principles in their own architecture. The report's target group comprises enterprise architects and IT architects. Since these principles are becoming outdated, the DIFI has started to revitalise and evaluate them and has recently (May 2019) invited the sectors to provide inputs for the process (DIFI, 2019).

A strong regulative element is the government's 'Digitization Circular', which is a 'compilation of orders and recommendations for digitization in the public sector. The circular applies to the ministries, the state's governing bodies, and executive agencies with separate proxies and management companies' (MLGM, 2017). The first circular (2009) stipulates the mandatory use of common architectural principles for public organisations. The 'Digitization Circular' is updated regularly with

decisions made by the parliament and the ministry; the current version (released in 2017) is #9 in the series.

Table 3 presents an overview of seminal documents, with selected quotes from them. These documents show that the government recommends EA as the method and the tool for achieving national goals for coordination and interoperability. Hence, EA can be an organisation-wide institution over time.

Table 3. Timeline for development of architectural thinking in the Norwegian public sector (the ministries mentioned are practically the same, but the names have changed).

Organisational unit	Document type and title	Important goal, and selected text
Ministry of Labour and Administration	*Report* Architecture for electronic interaction in the public sector	*Cost-effective and holistic/seamless services.* 'It should be developed common principles, methods and requirements for collaborating solutions' (Ministry of Labor and Administration, 2004, p.4).
Ministry of Renewal and Administration (MRA)	*White paper #17* An information society for everyone	*Initiative to develop architectural principles* with the associated strategy, target image and guidelines (MRA, 2006).
MRA	*Report* Common ICT architecture in the public sector	*Development of common architectural principles.* Specifies eight architectural principles: service orientation, interoperability, accessibility, security, openness, flexibility, scalability and unified user front. The terms were elaborated with definitions, principles and consequences (MRA, 2007a).

Table 3. Continued.

Organisational unit	Document type and title	Important goal, and selected text
Ministry of Local Government and Modernisation (MLGM)	*White paper #19* A government for democracy and community	*Formal introduction of common architectural principles.* Seven principles are listed: service orientation, interoperability, availability, security, openness, flexibility and scalability. 'Common architectural principles are going to assure the ICT-solutions every public agency or sector purchases, develops or uses, are aligned with central demands for improved user orientation and coordination across organisations' (MLGM, 2009a, p.117).
MLGM	*Directive* Digitization Circular	*Directive to use architectural principles, including reference to agency for managing them.* '[…] when new ICT systems are developed or are substantial[ly] changed [,] they are to be developed in line with some common architecture principles [hyperlink]. The principles are mandatory for public ICT investments. The Agency for Public Management and eGovernment (DIFI) [has] the authority to manage and develop the principles' (MLGM, 2009b).
Agency for Public Management and eGovernment (DIFI)	*Report* National common components in public sector	*Definitions and clarifying concepts.* The report's subtitle is 'Suggestion on how national common components should be managed, governed, financed and developed'. Before it describes what should be national concerns, it defines the terms that apply in general to all public activities. It adopts the definition of architecture from ISO/IEC 42010:2007 and explains that the definition of TOGAF 9 is built on this. However, DIFI (2010, p.19) emphasises Lankhorst's (2009) view that a coherent perspective on the organisation is needed: *'[…] a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise's organisational structure, business process, information systems, and infrastructure […]'.*

Table 3. Continued.

Organisational unit	Document type and title	Important goal, and selected text
		The report further elaborates on the term enterprise architecture: 'In an enterprise architecture, IT architecture is seen as a part of the enterprise's overall architecture. An enterprise architecture therefore includes what kinds of principles, methods, and models used for organizing the enterprise, how business processes are designed and how information systems and infrastructure are to be realized as a coherent whole. This means that the enterprise architecture tries to establish a clear connection between how an enterprise is organized, processes its task, and how information systems and infrastructure are to support them in the best possible way' (DIFI, 2010, p.19).
DIFI	*Report* General IT architectural principles for the public sector	*The responsible agency elaborates on the architectural principles from MLGM (2009a) and their implications.* '[…] An enterprise architecture consists of principles, methods and models […]. The purpose is […] [for] solutions [to be] realized in a holistic and coherent way. The aim is to secure the alignment between work processes and IT, and avoid […] silos' (DIFI, 2012, p.3). 'Enterprise- and IT-architects must make sure that the architectural principles become concrete and incorporated into the enterprise's own policies and principles and become part of the enterprise's architecture. […] The principles are also relevant to know by the responsible for the subject/domain areas (DIFI, 2012, p.4).

2.4.2 Documents from the hospital sector

As previously mentioned, the RHAs have the authority to make their own decisions on ICT investment. The four RHAs owe the NICT; nevertheless, the NICT's recommendations can be overruled by the RHAs. Nevertheless, the documents from the NICT are considered normative. In the following paragraphs, some of the architectural works led by the NICT are described. These works have engaged representatives from all the RHAs. They have started a joint undertaking on the journey to conformity to the national vision; thus, the initiatives can be regarded as

arenas for building a common understanding, a culture of collaboration and holistic thinking.

Initiative 12

Initiative 12, 'Service oriented architecture in the specialists' healthcare', is a comprehensive report consisting of 206 pages (NICT, 2008). It is the first edition of a management document for architecture in the specialist health service and serves as a foundation for further management of the architecture and for setting the guidelines for ICT work in the hospital sector. The project started in 2007 and was led by a forum of architects in the NICT. Enterprise architects from all the RHAs participated. The workgroups developed architectural principles and guidelines that would be valid for the entire organisation that is part of the architecture. They suggest that the principles be actively applied. They also recommend that changes in the IS portfolio be validated according to the principles to ensure that the goals for the architecture are met, and deviations should explicitly be approved.

The following architectural principles are listed and explained in more detail, with their background, architectural approach and implications for practice:

1. Holistic thinking rather than sub-optimisation
2. Interoperability (organisational and semantic)
3. Proper and secure access to information
4. Changeability and flexibility
5. Vendor independence
6. Reuse of information through services
7. Control of variation in technology
8. Control of functional redundancy
9. Horizontal and vertical consolidation of processes
10. Modern standards and technology
11. Reliability, scalability and robustness
12. Change processes driven by functionality
13. Effective change management

Organisational implications and management of the architecture are discussed. The report emphasises that processes for managing the architecture at various organisational levels must be established, and a framework for governance should be introduced. They mention TOGAF as an internationally recognised framework and

methodology that shall govern the new architecture, and tool support should be assessed and be made available at all organisational levels.

Initiative 42

Initiative 42 is a development of the work from Initiative 12, described in the preceding paragraphs. Entitled 'Further development of specialist health services' business architecture', this 181-page report describes the specialist healthcare's overall services and processes in *research, healthcare education, and training of patients and relatives* (NICT, 2011). These overall tasks are three of the four statutory tasks of the hospitals. The fourth one is patient treatment.

The report states that the NICT uses TOGAF and the TOGAF Architecture Development Method (ADM) for EA governance and development. The services and the processes are presented in model diagrams. The tool *Sparx enterprise architecture*, which supports TOGAF and modelling with the Business Process Model and Notation and Unified Model Language, was selected. The work in 2011 is compared to the work described for TOGAF phase B, and the 'as is' situation is described.

Furthermore, the report describes EA in general and elaborates on what is needed to succeed with the approach. Among others, anchoring, roles and governance are pointed out as important. Several recommendations for further work are also offered. There is a need to further develop the capability in relation to EA work. The organisation needs practical experience with TOGAF and service-oriented architecture, preferably in internal EA teams with participants from the various RHAs. The models from Initiatives 12 and 42 should be aligned and further developed in accordance with TOGAF phases C–H, which include acquisition of suitable solutions for the work process, implementation of the solutions and maintenance of the solutions. To achieve the common strategic goals (standardisation, economies of scale, shared processes, reconciled canonical data model, etc.), 'the EA-team should be given authority to overrule regional decisions' (NICT, 2011, p.10). The report stresses that the 'responsibility for enterprise architecture requires first and foremost good communication skills, ability to think strategically and see "the big picture" in a business perspective, rather than going into detail and creating concrete (technical) solutions' (NICT, 2011, p.10).

Initiative 48 and 50

Some of the other initial works conducted by the NICT on EA are those documented in 'Initiative 48, Clinical documentation for overview and learning' (NICT, 2014a) and 'Initiative 50, Knowledge based patient planning' (NICT, 2014b). These two reports should be read together. These works are aligned with the goals described in 'One citizen – one record'. The investigation presents an EA for the area, pointing to the need for future functionality in EHR systems.

Initiative 42.2

The report, 'Practice of Enterprise Architecture in National ICT, Initiative 42.2', describes the vision and the goals for architectural practices in the specialist health service and suggests several measures to reach the target images (NICT, 2014c). 'The enterprise architecture's contribution is to ensure that the healthcare and healthcare sector's strategies, tools and change processes are viewed in conjunction to achieve desired results' (NICT, 2014c, p.5).

Some initiatives to realise the national vision are suggested, architectural principles are presented, and the governance methodology is discussed. The report describes the relationship among different architectural levels, the perceived benefits from EA, and important stakeholders. Further interaction with strategy and portfolio management is discussed, and the necessity of collaboration among the national, regional and local levels is pinpointed. It uses a translation of Figure 3 to illustrate the interaction.

The method used in the NICT projects shall be based on TOGAF ADM but customised to its purpose. 'The methodological descriptions shall be regulatory for the NICT's architecture function and projects, and guide the regional architecture function and projects' (NICT, 2014c, p.41). Other architectural tools are discussed; finally, a schedule for the implementation of the initiatives is presented.

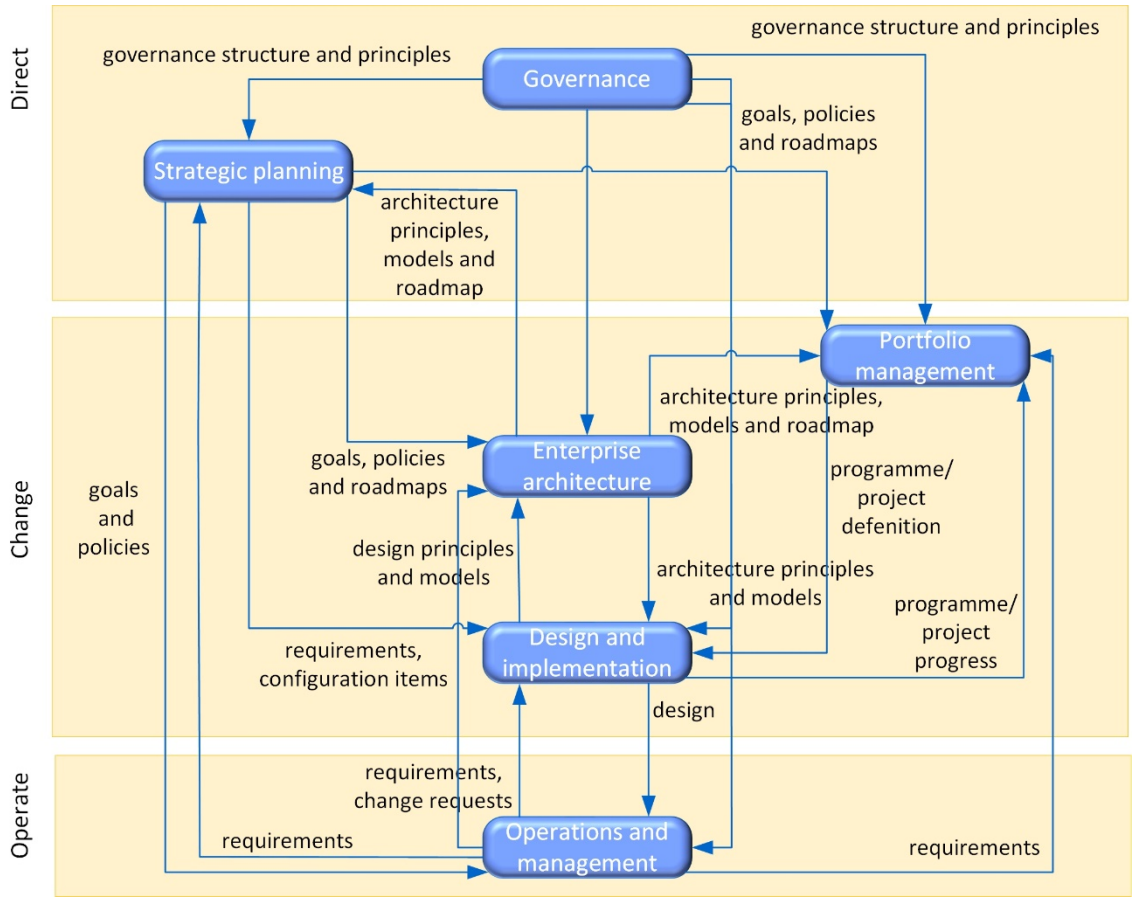


Figure 3. Interaction among enterprise architecture, strategy and portfolio management (Greefhorst, 2014, p.10).

Current enterprise architectural principles for the Norwegian specialist healthcare

The NICT has worked well with its website (kilden.sykehusene.no) to make recommendations and guidelines available for whom these may concern. The library contains the latest and current architectural principles, methodology, standards and reference models. Some templates and checklists for the architectural work are also offered on the website. The current architectural principles that are contained in version 2.1 (2018), replacing version 2.0 (2014, which replaced version 1.0 in 2010), are as follows:

1. Holistic approach 2. Process orientation 3. Service orientation 4. Interoperability (capability to interact; organisational, semantic and technical)	5. Information security 6. Availability 7. Quality of use 8. Adaptability 9. Information management

3 Conceptualisations and theoretical foundation

In this chapter, I aim to illuminate the existing knowledge and theory that have guided and supported the study. First, EA is described to bring out the meaning of the concept. Issues around IS are complex, and it is natural for several subject areas to be involved in the explanation of the research questions (Benbasat and Zmud, 2003). Second, I present selected EA literature, focusing on the challenges related to implementation reported by the public sector and the hospital sector. In addition to the IS field, this study includes elements from the field of organisational studies, specifically the institutional theory. The rationale behind the selection of the institutional theory is provided in Subsection 3.3, along with the elements of the institutional theory that are used as theoretical lenses in this thesis. Finally, there is a subsection with a summary of the integrated theoretical framework guiding the research in this dissertation.

3.1 Enterprise architecture

Since the 1990s, EA has been used as a strategy, a method or a process in large organisations to manage complex IT landscapes (Ross, Weill and Robertson, 2006; Bernard, 2012). There is no common definition of EA (Sidorova and Kappelman, 2011; Rahimi, Gøtze and Møller, 2017), but it is perceived as the recognition of an organisation's need for ICT solutions from a holistic perspective (Jonkers, et al., 2006; Bernard, 2012; Gartner, 2019). Importantly, the scope of EA has expanded from a technical approach (via integrating business) to include organisational strategy and business development (Rahimi, Gøtze and Møller, 2017).

The following are commonly used definitions:

- '*Enterprise architecture* is the organizing logic for business processes and IT infrastructure, reflecting the integration and standardization requirements of the company's operating model' (Ross, Weill and Robertson, 2006, p.9). '*The operating model* is the necessary level of business process integration and standardization for delivering goods and services to customers' (Ross, Weill and Robertson, 2006, p.8).

- ‘*EA* is a strategy and business-driven activity that supports management planning and decision-making by providing coordinated views of an entire enterprise. These views encompass strategy, business, and technology, which is different from technology-driven, system-level, or process centric approaches. […] Enterprise architecture is the analysis and documentation of an enterprise in its current and future states from an integrated strategy, business and technology perspective’ (Bernard, 2012, p.31). Hence, ‘EA is both a management process and an analysis and design method that helps enterprises with business and technology planning resource development’ (Bernard, 2012, p.49).
- EA ‘is a coherent whole of principles, methods, and models that are used in the design and realization of the enterprise's organizational structure, business processes, information systems, and infrastructure. EA captures the essentials of the business, IT and its evolution’ (Jonkers, et al., 2006, p.64).
- ‘We consider EA as the fundamental conception of an enterprise in its environment embodied in its elements, these elements’ relationships to each other and to the enterprise’s environment, and the principles guiding the enterprise’s design and evolution’ (Rahimi, Gøtze and Møller, 2017, p.125).

The last definition (Rahimi, Gøtze and Møller, 2017, p.125) is based on an analysis of 17 different definitions of EA, where the central points constitute a description of the enterprise and its inherent structure, including business processes, IT infrastructure, information and IT systems, in addition to being a management approach and a principle for guiding the enterprise design. However, Rahimi, Gøtze and Møller (2017) conclude that management is separated from EA and is a management approach to realise EA, described as EAM in the literature.

Moreover, several researchers compare or discuss the general definition of architecture in conjunction with EA (Jonkers, et al., 2006; Lucke, Krell and Lechner, 2010; Drews and Schirmer, 2014). The ISO/IEC/IEEE 42010 definition of archi-

tecture refers to the 'fundamental concepts or properties of a system in its environment embodied in its elements, relationships, and in the principles of its design and evolution' (iso-architecture.org, 2011).

A holistic perspective on EA provides the architecture to support the organisation as a whole. However, this approach can conflict with optimal solutions for sub-organisations (Jonkers, et al., 2006). An organisation's EA describes, in a hierarchical way, the business, its processes, the data and the applications to support these processes, and the technology to apply the solutions (Bernard, 2012). EA is viewed as the enabler for making the transition from lower to higher maturity states. For example, this would aid an organisation in progressing from isolated silos to integrated solutions across the organisation, making the IT landscape efficient, robust and flexible (Ross, Weill and Robertson, 2006). EA implies several architectural descriptions and diagrams of the business processes, for the underlying data structures, and for the application and the technology design.

To support the EA strategy, several frameworks have been developed, with stepwise phases. In this situation, EA is both a process and a methodology. Figure 4 shows the basic elements of EA and the common goals for the future architecture in the EA3 Cube model (Bernard, 2012).

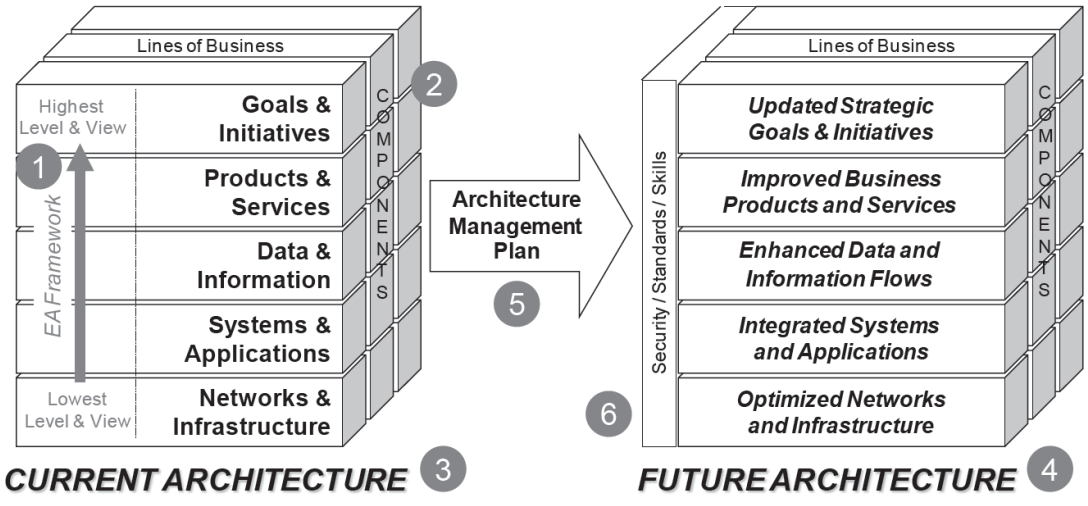


Figure 4. Basic elements of EA analysis and design (Bernard, 2012, p.40).

Based on several definitions (Jonkers, et al., 2006; Ross, Weill and Robertson, 2006; Bernard, 2012), this is my synthesis of EA:

> *Enterprise architecture (EA) is a hierarchical description of organisations' current and future states, represented by artefacts describing the business processes and IT components, including information models, hardware and software to support the business processes. EA thus enables the transition towards the organisations' vision in a coherent and systematic way. Consequently, the organisations' capability to be agile and responsive to change is strengthened.*

One important critique against EA is that standardisation offers suboptimal business solutions which can endanger the organisations' competitiveness and cause organisational resistance. Moreover, Bloomberg (2014) reports that practitioners discuss the usefulness of EA since they experience in practice that EA is narrowed down to documentation rather than a means for business change. Thus, he calls for a renewal of EA to be more agile in order to be able to support the executives in their effort to solve business problems. Practitioners and scholars find the architecture representing the current and the future states too simplistic, and a point of departure can be the improvement of the current state and the creation of an architecture that can evolve over time (Bloomberg, 2016). In line with this criticism, Kotusev (2018, p.25) finds that the 'current concept of EA explaining what exactly EA is and how exactly EA is used barely correlates with the practical realities' and calls for empirical studies to develop a revitalised EA concept.

3.1.1 EA frameworks and EA approaches

In an effort to arrive at the problematic transition between strategy and implementation of complex systems, Zachman (1987) prepared a framework to improve this conversion. The framework describes how an IS developed from its planning stage to an operational system. Today, there are several EA frameworks, and one of the most popular is TOGAF (Simon, Fischbach and Schoder, 2013; Denert-Stiftungslehrstuhl, 2015). However, the frameworks need adjustment for specific organisations (Buckl, et al., 2009) or can be used as conceptual models for new frameworks, as Armour, Kaisler and Liu (1999) did for the US Department of the

Treasury, where they used concepts from three frameworks, namely Zachman's, TOGAF and the Technical Architecture Framework for Information Management. Additionally, there are frameworks for specific industries (Gong and Janssen, 2019). However, frameworks can be difficult to use and understand. For example, in an attempt to solve practical problems with the national EA framework for Finland, an alternative concept called Lean EA development was formulated (Hosiaisluoma, et al., 2018). EAM is a common term for the processes of planning, executing, controlling and maintaining the organisations' EA (Buckl, et al., 2009; Weiß, 2015), and TOGAF ADM is an EA tool for managing these processes. Figure 5 shows a model of TOGAF ADM. The figure illustrates the modules or phases with important objectives that constitute an iterative process with a shared repository for documentation.

Figure 5. TOGAF-ADM (NICT, 2011).

Although frameworks are widely used, some organisations do not use them at all or only use elements from a framework (Fallmyr and Bygstad, 2014; Denert-Stiftungslehrstuhl, 2015). Furthermore, the value of utilising a framework is debated; one reason is that 'you'll need to customize it to suit your organizational culture and vocabulary' (Armour, Kaisler and Liu, 1999, p.37). Kotusev (2016) argues that EA frameworks do not work, but EA as a concept does. Even if organisations do not use EA as a specific tool in successful transformation processes, they use best practices that are similar to those of EA (Gardner, et al., 2012). Some researchers have also questioned the feasibility of EA in large federated organisations (Hjort-Madsen and Burkard, 2006; Martin, 2012).

An EA approach is about how an organisation plans and develops its EA. Kotusev, Singh and Storey (2015) compare the different approaches to EA identified in the literature and suggest three approaches, as follows: traditional, Massachusetts Institute of Technology (MIT) and dynamic. The characteristics of the different approaches are as follows:

1. '*The traditional approach* to EAM can be generally described as a four-step sequential process: (1) document the current (as-is, baseline) state, (2) develop the desired future (to-be, target) state, (3) develop the transition plan (roadmap) to migrate from the current to the future state, (4) implement the plan and then repeat the whole process all over again' (Kotusev, Singh and Storey, 2015, p.4071). This approach was described in Speawak and Hill's (1993) seminal book.
2. *'The MIT approach* advocates the development of a core diagram reflecting a long-term enterprise-level architectural vision. […] The MIT approach to EAM was developed in Massachusetts Institute of Technology (MIT) by Ross et al. [in 2006]' (Kotusev, Singh and Storey, 2015, p.4072).
3. *The dynamic approach (DYA)* 'advocates "just enough, just in time" architecture, no EA is designed until there is a need for it. EAM activities in the DYA approach are triggered by concrete business initiatives appearing in the process of a strategic dialogue' (Kotusev, Singh and Storey, 2015, p.4072). The DYA approach was presented by Wagter, et al. in 2005.

Kotusev, Singh and Storey (2015) compare the approaches. Briefly, achieving business strategy alignment with IT is important for all approaches; however, the roadmaps are different. The traditional approach depends heavily on frameworks, such as TOGAF, and has detailed maps on where to go and how to do so. In the MIT approach, EA has no detailed description but emphasises where to end. In its 'ad hoc' evolution, the DYA approach relies on architectural principles and sufficient documentation to maintain architectural consistency. However, no research suggests when one or the other approach is suitable for different contexts.

Interestingly, Finland has developed its own government's EA, which should be applied situationally, either as a system-driven or as a process-driven approach (Valtonen, Seppanen and Leppanen, 2009), respectively the traditional approach and the MIT approach.

3.2 Prior relevant research on EA

Research on EA has been limited before the current millennium. Since 2000, there has been an increasing interest and maturity in the field (Simon, Fischbach and Schoder, 2013; Winter, Legner and Fischbach, 2014). The different research streams on EA are based on various IS research streams, such as IT governance, IT management, IT architecture and IS strategy. However, to advance beyond the mere technical focus and single organisational focus, EA and EAM studies have emerged as their own fields to be explored (Löhe and Legner, 2012; Winter, Legner and Fischbach, 2014). Theoretically grounded research and contributions to theory in the field are nonetheless limited (Tamm, et al., 2011; Winter, Legner and Fischbach, 2014; Kudlawicz, et al., 2015).

Previous literature reviews have categorised EA research (Langenberg and Wegmann, 2004; Simon, Fischbach and Schoder, 2013; Löhe and Legner, 2014; Rasti, et al., 2015). Simon, Fischbach and Schoder (2013) find three main structural patterns: EA frameworks, design and operations of EA management, and EA conception and modelling. In their EAM literature review, Löhe and Legner (2014) identify four research streams with different conceptualisations of EAM implementation: EAM initiatives, EAM processes, EAM application scenario and EAM governance. Rasti, et al. (2015) extend the framework to categorise EA research developed by Langenberg and Wegmann (2004), resulting in the following categories: usage, framework, modelling, overview, design principles, other, security,

management, evaluation and service-oriented architecture. Researchers often narrow down broader categories to specific purposes; for example, Dang and Pekkola (2017) use EA development, EA implementation, EA adoption and overlapping as topics. Overall, the research scope of EA has expanded over the years, from applying a technical approach (via integrating the business) to including organisational strategy and business development (Rahimi, Gøtze and Møller, 2017).

IT governance is important for guiding the adoption of a nationwide EA. However, it is known that a controversy can occur between local IT departments and central IT management regarding IT decision making (van Veenstra, et al., 2012). Additionally, since EA governance has more of a strategic nature compared to the more operational concerns of IT governance, it is known that tensions will arise between long-term goals and short-term needs (Bygstad, Bendik and Pedersen, 2012; Martin, 2012; Günther and Heijstek, 2015). Since my thesis is specifically concerned about the challenges related to the introduction of EA in hospitals, and since hospitals are often part of the public sector (most of the Norwegian hospitals are public), the research on the EA challenges in the public sector and on generic critical success factors (CSFs) for EA is briefly described in Subsection 3.2.1, followed by a description of EA research in the hospital context (Subsection 3.2.2).

3.2.1 EA challenges

Some empirical case studies report EA challenges in the public sector in several countries (e.g., Janssen and Hjort-Madsen, 2007; Carota, Corradini and Re, 2010; Valtonen, et al., 2011; AlSoufi, 2014; Moreno, et al., 2014; Zadeh, et al., 2014; Bakar and Selamat, 2016). A recurring problem pertains to organisational issues, such as inadequate support, involvement and understanding from management and business units (Hjort-Madsen and Pries-Heje, 2009; Banaeianjahromi and Smolander, 2016; Dang and Pekkola, 2016; Banaeianjahromi, 2018; Seppänen, Penttinen and Pulkkinen, 2018). Furthermore, socio-technical issues related to the many different actors involved, who come from different autonomous organisational units, pose problems with authority, prioritising of projects and agreement on standards (Boh and Yellin, 2006; Hjort-Madsen, 2006; Saarelainen and Hotti, 2011; Drews and Schirmer, 2014; Bakar and Selamat, 2016; Dang and Pekkola, 2016).

Another theme is EA governance and management, where the lack of guidelines and appropriate frameworks causes challenges (AlSoufi, 2014; Drews and Schirmer, 2014; Bakar and Selamat, 2016; Hosiaisluoma, et al., 2018). Likewise, insufficient tool support is problematic (e.g., the absence of a shared repository and inadequate modelling tools for interorganisational settings) (AlSoufi, 2014; Drews and Schirmer, 2014; Bakar and Selamat, 2016; Banaeianjahromi and Smolander, 2016). The last recurring theme that I pinpoint is the need for stable and knowledgeable EA and IT personnel (Bakar and Selamat, 2016; Banaeianjahromi and Smolander, 2016; Dang and Pekkola, 2016; Seppänen, Penttinen and Pulkkinen, 2018).

An insight into CSFs is helpful in addressing the challenges. Governance, management, planning, and communication and support are the common CSFs in five EA implementation success models (Nikpay, et al., 2013). In a recent study, Rouhani, et al. (2019) not only verify the top CSFs in the literature – *governance, management, support (top management commitment) and communication* – but also identify two additional CSFs as *the readiness of technology and infrastructure* and *EA team capability*. Lange, Mendling and Recker (2016) and Löhe and Legner (2014) describe several challenges for EAM; EA requires a lot of effort, which leads to problems with measuring the benefits, and delays are common. The lack of governance, insufficient support for EA development from the business and IT management, as well as inadequate resources and skills, are central issues discussed in their articles. The reason why top management commitment is so critical is summed up as follows: '[…] indeed, without management's commitment, the EA project is doomed to failure' (Banaeianjahromi, 2018, p.102).

Nevertheless, Dang and Pekkola (2016) call for more research related to problems with EA in the public sector, for example, using case studies from other countries. Moreover, Dang and Pekkola (2017) find that research in the public sector is immature, and they call for further studies on implementation and adoption issues. I find this call appropriate because many of the identified challenges of EA come from studies in the private sector or in a mix of private and public sectors, and the public sector has institutional constraints that influence interorganisational collaboration in ways other than those in the private sector (Fountain, 2004). Improving EA governance still requires in-depth knowledge on how EAM is integrated into the organisation, the characteristics of the enterprise architects and the factors that

influence the evolution of EAM (Rahimi, Gøtze and Møller, 2017; Rouhani, et al., 2019), as well as the dynamic nature of EA (Schilling, Haki and Aier, 2018).

3.2.2 EA in hospitals

HCOs face significant technological and processual complexity, and research has shown that EA has contributed to the beneficial digital transformation of HCOs (Venkatesh, et al., 2007; Bradley, et al., 2011; Bui, 2015; Kaushik and Raman, 2015; Gebre-Mariam and Bygstad, 2016). Complexity in the domain stems from a variety of interdependencies, with many specialisations with their own processes, technologies and data requirements (Gebre-Mariam and Bygstad, 2016). Furthermore, new clinical methods are continuously arriving (Bygstad, B., Hanseth and Le, 2015). Notwithstanding some successful EA initiatives, coping with the mentioned issues has been difficult: reportedly, healthcare lags behind other organisational domains in utilising IT (Romanow, Cho and Straub, 2012; Gandhi, 2016).

However, EA in healthcare can contribute to a more efficient use of IT and a better assimilation of digital capabilities for process support and service delivery. Furthermore, EA aims to provide support for addressing long-standing healthcare problems related to fragmented IT portfolios, immature IT infrastructures and silo-structured organising (Ross, Weill and Robertson, 2006). Since hospitals have many specialised systems (e.g., for radiology, laboratories and EHRs), a common EA goal is to make these systems interoperable, which means providing access to their resources in a reciprocal way (Chen, Doumeingts and Vernadat, 2008). Interoperability is achieved through integration, either a ‘tightly coupled’ indication that the different systems are strongly coordinated and cannot operate alone or a ‘loosely coupled’ one, where they can interact but can operate locally with their own logic of operation (Chen, Doumeingts and Vernadat, 2008).

3.3 Institutional theory

The introduction of new, deeply invasive concepts, such as EA, challenges the established structures and business processes. EA is a deeply invasive concept since it often entails large organisational changes that significantly affect the work life of many employees. First, if EA is used as a strategic means, it is a party involved in deciding how the organisations will operate their business (Ross, Weill and Robertson, 2006), how to organise the work process (Venkatesh, et al., 2007)

and how IT is governed and prioritised. Second, the methodology for developing the ICT landscape can change (e.g., the project methodologies must adhere to the holistic EA perspective), and new specialised tools for developing and managing the EA can be introduced. Such organisational changes are often met with resistance (Meyer, J.W. and Rowan, 1977), and organisational resistance is one of the known EA challenges.

The institutional theory has the potential to help researchers understand 'how institutions influence the design, use and consequences of technologies, either within or across organizations' (Orlikowski and Barley, 2001, p.153). EA is an approach to arranging technology within organisations, and institutional perspectives are thus relevant. According to Mignerat and Rivard (2009), several IS studies adopt the view that managerial decisions and actions are based on analyses of the best alternative to maximise efficiency and effectiveness. An alternative perspective, the institutional one, acknowledges that not everything that occurs in an organisation can be explained by the rational actions of managers, but social and cultural realities in the organisation's surroundings also play a major role in shaping the organisational structure and not the least, the organisational behaviour (Meyer, J.W. and Rowan, 1977). How to shape the organisational structure, including the work processes, can diverge among different occupations and professions (Powell, 1991). R.E. Meyer convincingly discusses the institutional theory's potential to 'address all faces of power and domination' (2008, p.524). Paying attention to the actors, and the actions of different agents and their motives has strengthened the institutional theory, and this insight can help institutional entrepreneurs to form and maintain new institutions (Meyer, R.E., 2008; Battilana, Leca and Boxenbaum, 2009).

3.3.1 Emergence of EA as an institution

Institutions can be rules (e.g., a person needs a passport to enter a foreign country) or normative behaviours (e.g., a handshake) that the actors must take into account (Meyer, J.W. and Rowan, 1977). Other examples are contracts, formal organisations and corporations. Institutions are defined in several ways, and to encompass previous researchers' meaning, Greenwood, et al. (2008, pp.4–5) describe an institution as 'more-or-less taken for-granted repetitive social behaviour that is underpinned by normative systems and cognitive understandings that give meaning

to social exchange and thus enable self-reproducing social order'. An institution can be perceived as a social arrangement and 'is said to be institutionalized when it is widely practiced, largely uncontested, and resistant to change' (Suddaby and Greenwood, 2009, p.176). The actors in the institutional lifecycle can be organisations, groups of organisations, individuals, or groups of individuals (Battilana, Leca and Boxenbaum, 2009). Achieving the legitimacy of institutions is important for organisations in order to attain success and survive in the long term (Meyer, J.W. and Rowan, 1977). Additionally, institutions can operate as control mechanisms and set constraints on an organisation's behaviour (DiMaggio and Powell, 1983).

EA is an encompassing method, and it is recommended as the method and the tool for achieving the national goals of coordination and interoperability. Hence, over time, EA can be an organisation-wide institution. Therefore, I want to *understand the antecedents and the status of EA use.* For this purpose, the mechanism driving institutional change and Oliver's (1991) framework for a strategic response are suitable tools for this type of analysis (Suddaby and Greenwood, 2009). The combination of understanding the antecedents and the status of EA use, will enable me to better interpret the challenges encountered by the EA initiative.

Building on the work of institutional scholars, Scott (2014) has developed an analytical framework, consisting of three pillars of institutions, with logics, agency, carriers and levels to provide an understanding about the rise of institutions and how they are sustained. Scott's (2014) three pillars of institutions comprise the *regulative*, the *normative* and the *cultural-cognitive* types. The *regulative pillar* has the possibility to force actors to abide by decisions, through laws and rules. 'The regulatory process involves the capacity to establish rules, inspect others' conformity to them, and, as necessary, manipulate sanctions – rewards or punishment – in an attempt to influence future behaviour' (Scott, 2014, p.59). Therefore, I regard white papers, from the government to the parliament, as regulative carriers in the institutional change process, since these documents can subsequently lead to formal propositions. Coercive power comes from the legal environment and from standards related to the context. The rules and the laws are characterised as indicators. The *normative pillar* is built on normative power, where morals and expectations from networks and from people with the same education are important forces. The indicators are certifications and accreditation. The *cultural-*

cognitive pillar emphasises the single actor's interpretation of the situation. Cultural beliefs, cultural support and taken-for-granted assumptions make the mimetic mechanism a characteristic of this pillar. Common beliefs, shared logic for action and isomorphism are the indicators. Different pressures can be exerted at the same time, such as those from technology and from society (Boxenbaum and Jonsson, 2008).

The levels in Scott's framework are important since the organisations in bureaucratic structures are influenced by the individuals and internal and external expectations (Friedland and Alford, 1991). Additionally, the different levels and 'government agencies compete for control and provide dissimilar kinds of regulation as well as inducements' (Powell, 1991, p.196). Furthermore, agents comprise the actors' contributions to institutionalisation, which can range from individual actors to a nation, and the pillars are utilised in various ways by the different actors (Scott, 2014). Practices stemming from governmental laws and regulations can be weakly institutionalised if the implementation of the policy is unclear (Powell, 1991).

It is also interesting to analyse how the various rules, guidelines, and architectural decisions made by others are followed at the sub-organisational level. By bringing institutional and resource dependence theories together, Oliver (1991) presents a typology of strategic and tactical responses that organisations enact to enforce institutional pressure for conformity. Oliver's proposed agency strategies are acquiescence, compromise, avoidance, defiance and manipulation. She also categorises the nature of institutional pressures (cause, constituents, content, control, and context) and discusses how these influence strategic choices. When analysing the selected strategies, it is important to understand that the organisations' willingness and ability to implement changes are reflected in their decisions.

3.3.2 Institutional logics in health information systems

The study of institutional logics is a research stream with 'primary attention on the effects of cultural belief systems operating in the environments of organizations rather than on intraorganizational processes' (Scott, 2014, p.53). The works of Friedland and Alford (1991), Jackall (1988) and Thornton and Ocasio (1999) are central in the development of theory on institutional logics. Thornton and Ocasio's (1999) comprehensive definition of institutional logics that incorporates structure and symbols from Friedland and Alford (1991) and the normative approach from

Jackall (1988), is 'the socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality' (p.804).

Importantly, one institutional logic is associated with one institutional order, and this institutional logic will guide this order, and vice versa (Johansen and Waldorff, 2017). Institutions are seen as stable patterns describing the social structures; polity, family, economy, religion, culture (Alford and Friedland, 1985). These fundamental social structures are named institutional orders. Seven high-level orders: family, community, religion, state, market, profession, and corporation, are described across nine categories in a framework developed by Thornton, Ocasio and Lounsbury (2012). The institutions shape an interinstitutional system which all together provide multiple institutional logics that influence the actors' behaviour (Thornton, Ocasio and Lounsbury, 2012).

Prior research shows that multiple institutional logics exist in HCOs; furthermore, the professional healthcare logic of clinicians can conflict with the business logic of managers (Currie and Guah, 2007; van den Broek, Boselie and Paauwe, 2014). The concept of institutional logics is instrumental for understanding the behaviours of different players in the healthcare context (Currie and Guah, 2007), and one of the strengths of institutional logics is that they facilitate the possibility to explain institutional change and agency (Reay and Hinings, 2009; Johansen and Waldorff, 2017).

To gain advantages from EA, it is important to understand the sociocultural identities of different professional communities co-existing in a work context (Boland and Tenkasi, 1995; Brown and Duguid, 2001). In a healthcare setting, stakeholders come from different institutional backgrounds and may have distinct perceptions about EA and its implementation. The multiple (and sometimes competing) institutional logics need to be taken into account (Currie and Guah, 2007; Reay and Hinings, 2009; van den Broek, Boselie and Paauwe, 2014). If the dominant logic for a profession is not supported when a new IS is introduced, the system can be ignored (Jensen, Kjærgaard and Svejvig, 2009; Boonstra, A., Eseryel and van Offenbeek, 2018), used in suboptimal ways (Vassilakopoulou and Marmaras, 2015; Plumb, et al., 2017) or re-designed to support the old logic (Sahay, et al., 2010; Latifov and Sahay, 2012), and workarounds emerge (Jensen, Kjærgaard and

Svejvig, 2009). Heeks (2006) identifies the different rationalities that shape health IS as technical, managerial, and medical rationalities. Based on Heeks (2006) study, Boonstra, A., Eseryel and van Offenbeek (2018) suggest exploring the IT professionals' logic as a third type that is important for IT governance in the hospital context.

Table 4 provides an overview of the healthcare institutional logics identified in prior research. The logics are described along three dimensions (assumptions, principles and sources of legitimacy) that are adapted from the works of Hansen and Baroody (2019) and Berente, et al. (2019). Assumptions are established beliefs about the nature of reality and means-ends relationships. Principles are the foundations for action taking related to goals and values. Sources of legitimacy are bases on which actions are deemed desirable and appropriate.

Table 4. Multiple institutional logics in healthcare information systems.

Actor	Medical Professionalism	Health Managerialism	IT Professionalism
Institutional logic	Healthcare provision for helping people	Hospital management to ensure efficiency	Hospital support with technical excellence
Assumptions	The best decisions are made closest to the point of care (Hansen and Baroody, 2019)	Health information systems improve efficiency and reduce costs (Hansen and Baroody, 2019)	Health information systems improve medical care (Hansen and Baroody, 2019)
Principles	Medical autonomy, patient focus and quality of healthcare (Boonstra, Eseryel, et al., 2018; Hansen and Baroody, 2019)	Efficiency, cost control and work optimisation, including quality (Jensen, et al., 2009; Boonstra, Eseryel, et al., 2018; Hansen and Baroody, 2019)	IT quality, such as technical excellence, security, data quality and maintainability (Boonstra, Eseryel, et al., 2018; Hansen and Baroody, 2019)
Sources of legitimacy	Expert knowledge, evidence-based knowledge and professional experience (Currie and Guah, 2007; Plumb, et al., 2017; Boonstra, Eseryel, et al., 2018; Hansen and Baroody, 2019)	Financial outcomes, policy and span of control (Reay and Hinings, 2009; Boonstra, Eseryel, et al., 2018; Hansen and Baroody, 2019)	IT goals determined by strategy, standards and expert knowledge, and professional experience (Boonstra, Eseryel, et al., 2018; Hansen and Baroody, 2019)

Prior research has pointed out the importance of different institutional logics, but neither the logic of enterprise architects nor the logic of EA itself has been explicitly explored. To gain insights about EA introduction, it is important to make sense of the worldviews of enterprise architects and the logic of EA and the tensions that arise when they encounter the established logics. Therefore, these institutional logics are described in this thesis to be able to understand the tensions that arise during EA implementation. Previous information systems research has established enterprise system implementation as a new institutional order and has described its logic (Berente, et al., 2019). Similarly (or in the same vein), I put forward in this thesis that an EA implementation makes an institutional order and logic on its own.

3.3.3 EA institutionalisation

In Subsection 3.3.1, I have defined an institution and explained how it can rise and what response an organisation might apply to the institutional pressure. Organisational elements, such as EA, are institutionalised 'when they are widely understood to be appropriate and necessary components of efficient, rational organizations, organizations are under considerable pressure to incorporate these elements into their formal structure in order to maintain their legitimacy' (Tolbert and Zucker, 1983, p.26). In their study of the Civil Service Reform in the US, Tolbert and Zucker find that formally legitimising the elements shortens the time for them to be institutionalised in the organisation, but it is important to note that 'legal requirements do not always ensure adoption' (1983, p.27).

Based on prior research, Mignerat and Rivard (2009) have illustrated the process of institutionalisation (see Figure 6). The process describes the different stages (levels of adoption) undergone by an innovation (e.g., new IS development practices) – innovation, theorisation, diffusion, full institutionalisation and deinstitutionalisation.

In the innovation stage, the actual practices are questioned, and there is room for new ideas to emerge. For a complex organisation, the EA approach gradually increased in popularity at the end of the previous millennium and had become an approach that a large complex organisation had to assess, which exerted a mimetic pressure on other organisations. When an organisation decides to adopt EA, it has taken the innovation step.

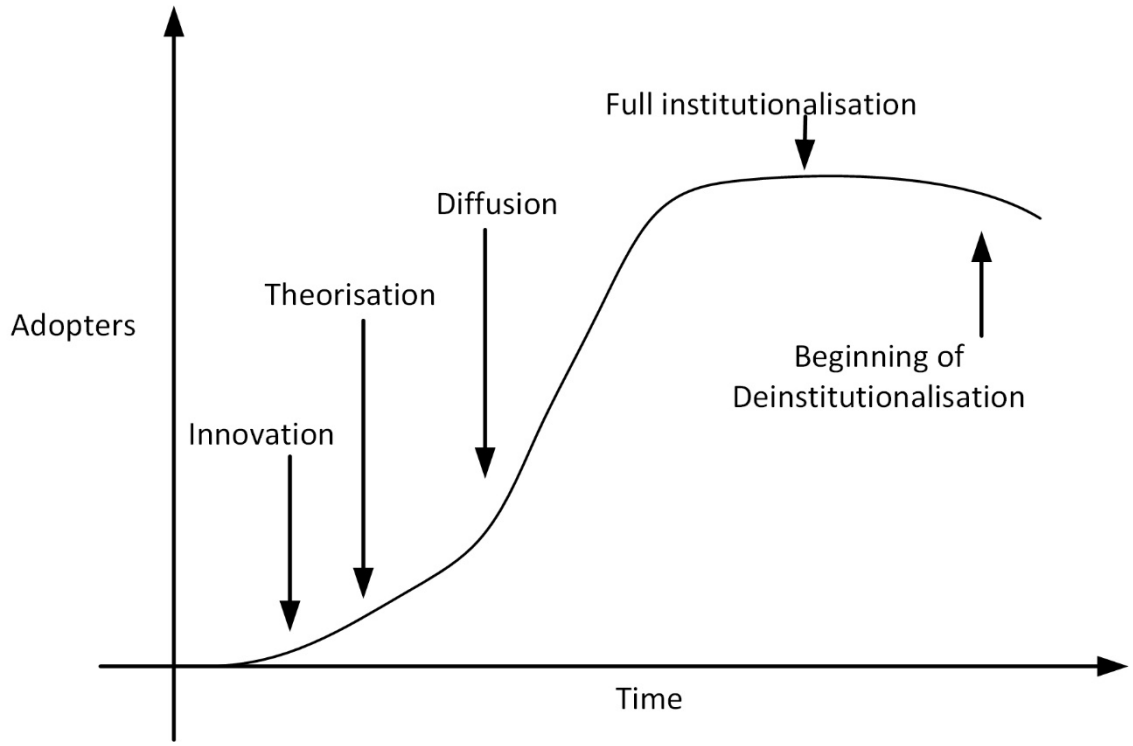


Figure 6. Institutionalisation process (based on Tolbert and Zucker, 1996; Greenwood, et al., 2002; Devereaux Jennings and Greenwood, 2003) (Mignerat and Rivard, 2009, p. 372).

The theorisation stage implies activities to legitimise the new structures (Mignerat and Rivard, 2009). For EA, this implies customised education and training of stakeholders, anchoring the vision and holistic thinking in an organisation, creating new guidelines and requirements, building formal structures for governance and adapting a development and project methodology. Mignerat and Rivard (2009, p.371) state, 'New ideas are aligned with existing norm[s]'; however, the work also changes the existing norm to align with the new idea.

In the diffusion stage, structures, now legitimised, are diffused (Mignerat and Rivard, 2009). For EA, this can imply that the organisation has experienced the EA approach as beneficial (e.g., in a project or for a sub-organisation), which is thus diffused to extend its use.

In the full institutionalisation stage, 'structures are said to be fully institutionalized when they are considered taken for granted' (Mignerat and Rivard, 2009, p.372). In the EA context, this will enable the organisations to increase their maturity and realise their visions.

In the deinstitutionalisation stage, the existing structures are challenged by new ideas and might be replaced with new innovations.

There is still a need for in-depth knowledge on how EA is integrated in an organisation, the characteristics of enterprise architects and the factors that influence the evolution of EA (Rahimi, Gøtze and Møller, 2017). Additionally, since national initiatives on EA entail long-term work (Lee, Y.-J., et al., 2013; Kaushik and Raman, 2015; Dang and Pekkola, 2016), this raises some questions about how the EA institutionalisation process can be addressed to speed it up.

3.3.4 Institutional work

The institutionalisation processes are described by other researchers (e.g. Tolbert and Zucker, 1996), but there is a lack of elaboration on the necessary practical work that is involved in the processes (Lawrence and Suddaby, 2006). Based on their review of prior research (especially from DiMaggio (1988) and Oliver (1991;1992)), Lawrence and Suddaby (2006) have categorised the types of institutional work that cover the lifecycle of an institution and encompass 'the sets of practices through which individual and collective actors create, maintain and disrupt the institutions of organizational fields' (p.220). The authors outline nine ways of creating an institution, organised into three categories. The first category addresses the activity to obtain legal approval for the institutionalisation process. Coercive pressure is used as an enabler for the new institution. The second activity addresses the change in the actors' institutional logics (belief systems); thus, the activity emphasises normative work. The third category of action implies the work involved to manifest the term of the institution and the positive outcome of the institution; it further implies cognitive work, so new practices can emerge.

Relatively few institutions have the power to reproduce themselves without maintenance. 'In general, institutional work aimed at maintaining institutions involves supporting, repairing or recreating the social mechanisms that ensure compliance' (Lawrence and Suddaby, 2006, p.230). Disrupting the old institutions is a consequence of the emergence of new ones; for example, when organisations have decided to use a shared repository, it is no longer legitimate to organise the files in other ways. Table 5 presents an overview of the different activities of institutional work described by Lawrence and Suddaby (2006).

Table 5. Overview of activities when creating, maintaining and disrupting an institution, as described by Lawrence and Suddaby (2006)

Aim	Activity
Creating a new institution	
Reconstructing rules, property rights and boundaries that define access to material resources	Advocating
	Defining
	Vesting
Performing actions in which actors' belief systems are reconfigured	Constructing identities
	Changing normative associations
	Constructing normative networks
Performing actions designed to alter abstract categorisations in which the boundaries of meaning systems are changed	Mimicking
	Theorizing
	Educating
Maintaining the new institution	
Ensuring adherence to rule systems	Enabling work
	Policing
	Deterring
Reproducing existing norms and belief systems	Valorising and demonising
	Mythologising
	Embedding and routinising
Disrupting the old institution	
Attacking or undermining the mechanisms that lead members to comply with the institution	Disconnecting sanctions/rewards
	Disassociating moral foundation
	Undermining assumptions and beliefs

Importantly, 'all the categories of institutional work regarding rules, norms, and meaning play complementary roles, and that all appear to be necessary, at different periods during the transformation process' (Guillemette, Mignerat and Paré, 2017, p.359).

The participants in creating new institutions at the expense of existing ways of pursuing goals are named institutional entrepreneurs. They can be organisations or individuals and are defined as 'agents who initiate, and actively participate in the implementation of, changes that diverge from existing institutions, independent of whether the initial intent was to change the institutional environment and whether the changes were successfully implemented' (Battilana, Leca and Boxenbaum, 2009, p.72).

3.4 Summary of the theoretical framework

EA involves new and changed IS, new ways of working and organisational changes. In the socio-technological world of EA, it is imperative to understand the challenges that such initiatives meet to be able to address the causes of the challenges in a constructive way.

The theoretical framework (Figure 7) shows a synthesis of theoretical concepts from the extant literature guiding the research. I use Scott's (2014) framework to analyse the antecedents of the introduction of EA in order to understand the rise of EA as an institution. *Institutional elements* formed by regulative, normative and cultural-cognitive systems direct how to *create and maintain an institution* in an interdependent and mutually reinforcing way (Scott, 2014). The institutional elements are *influenced* by changes in the field, e.g. that pervasive healthcare and 'One citizen – one record' are the ultimate goals.

The role of *institutional logic* as a concept in the framework is based on the assumption that regulative and normative elements can be regarded as substitutes or complements of institutional logics because the elements can 'explain individual adherence to the goals [culturally] embedded in institutional logics' (Thornton, Ocasio and Lounsbury, 2012, p.87); thus, institutional logics *influence* the institutional elements. Following Thornton and colleagues' (1999) definition, institutional logics can also be *influenced by* the institutional elements, similar to regulative rules and normative values, since changes in institutional elements can alter the actors' meaning of social reality.

The emergence of new institutions leads to new practices. The types of *organisational responses* to the new institutions can vary, from acquiescence to different forms of protests against institutionalisation (Oliver, 1991). I use Oliver's (1991) framework to analyse the organisations' strategic and tactical responses to the EA initiatives. When an institution encounters resistance, this will *cause institutional impediments*, which can then be perceived as challenges to EA institutionalisation, some of which can be observed as tensions. This provides the second reason why institutional logics constitute a useful concept in the framework, since 'many of the most important tensions and change dynamics observed in contemporary organizations and organization fields can be fruitfully examined by considering the

competition and struggle among various categories of actors committed to contrasting institutional logics' (Scott, 2014, p.91). Furthermore, the model shows that the organisational response, similar to work practices, are *shaped* by the institutional logics of the actors (Goodrick and Reay, 2011). For instance, a clinician can react differently to a request in order to comply with the professional logic of the quality of care compared to a healthcare manager whose behaviour can be guided by the logic of work optimisation.

Importantly, 'actors are part of other institutions that are apart from, though not independent of the institution in question' (Sahay, et al., 2010, p.21), and the situation and the individual commitment to a specific institution will influence which institutional logic the actor adheres to (Thornton, Ocasio and Lounsbury, 2012). To address the individual needs, institutional logic is a theoretical lens that is found appropriate (Hultin and Mähring, 2013; Mannion and Exworthy, 2017; Berente, et al., 2019). Thus, to be able to suggest remedies for challenges and tensions, the institutional logics of the involved parties have to be understood. In this thesis, the suggestions to influence EA institutionalisation are based on the assumption that if the organisations analyse the institutionalisation impediment, this can *trigger the reinforcement* of institutional elements. The actors can reinforce institutional elements through deliberate institutional work (Lawrence and Suddaby, 2006) to strengthen and maintain the institution (e.g., by creating formal architectural boards, conducting anchoring meetings, etc.). Importantly, I use the words *can reinforce*; thus, the model does not predict that the institutionalisation impediment will always be addressed if the tactics of bargaining lead to compromises that satisfy the actors, for example. For an organisation's EA, it can entail the modification of the intended future architecture, but the practices of using an EA approach can continue.

In the figure, I have used squares for what is observable, while the ovals indicate concepts that are intangible and have an interpretative nature. The start point in the framework is with field-level changes.

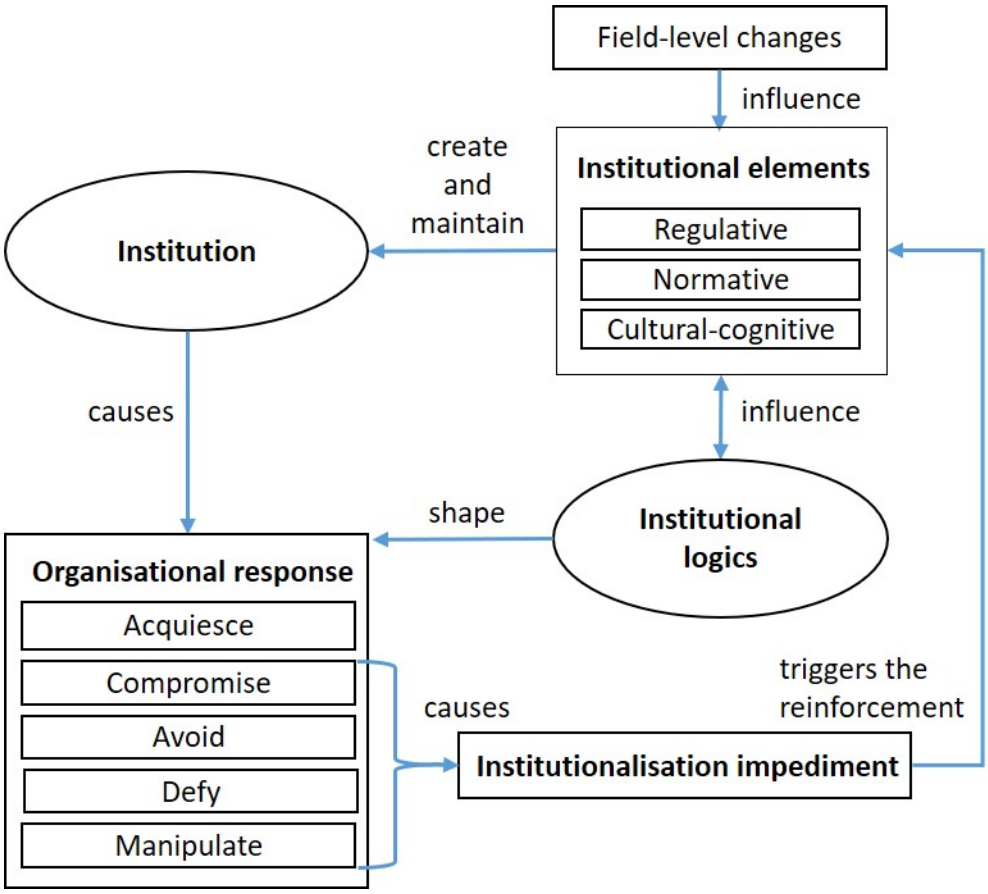


Figure 7. Theoretical framework to explore EA institutionalisation.

4 Research approach

My aim in this chapter is to illuminate the research process and describe how the research has been designed and planned. The philosophical underpinnings, with the ontological and the epistemological bases of the research, are explained. The research has followed an interpretive philosophical research tradition. This chapter is structured as follows. In Section 4.1, the research setting is described. In Section 4.2, the research design is explained, including an outline of the philosophy and the assumptions underlying this research, what data have been collected, how they are analysed and finally, the limitations in the research design.

4.1 Research setting

The research setting is the Norwegian public sector in general but with a special focus on specialist HCOs – the hospitals. I further limit the focus to two organisations – the NICT and SERHA; however, documents from the parliament, the MHCS with its directorates, and the Ministry of Local Government and Modernisation and its agency DIFI have been included as inputs to the study. Figure 1 presents an overview of the structure of the organisation of the Norwegian healthcare sector. In Subsections 4.1.1 and 4.1.2, the NICT and SERHA, where the interviews were conducted, are respectively described.

4.1.1 National ICT

As mentioned in previous sections, the NICT was established at the initiative of the MHCS in 2003. The NICT's main work areas focus on strategic coordination, prioritisation and consolidation of a common approach to key ICT issues across the health regions (NICT, 2012). In 2014, the NICT continued as a separate enterprise owned by the four RHAs. The NICT has been engaged in developing strategy plans and has contributed in the work to make the EA approach normative. It has also performed a coordination function, as intended, in national healthcare projects. By the end of 2014, the NICT only had two employees. However, the forums for the subject matters are important for the NICT's work, and the forums have representatives from the four RHAs (NICT, 2015). By the end of 2015, the number of employees increased to 13, and the project portfolio consisted of 13 projects (NICT, 2016a). At the time of the first interviews in 2016, there were 18 employees, and by the end of 2018, the number slightly decreased to 16. In addition to

participating in national projects, the employees join the national eHealth forums audited by the Directorate of eHealth. On the NICT website, 42 projects were listed as finished, and five were ongoing, as of July 2019. The projects are staffed with representatives of the different RHAs and other relevant organisations. In 2014, the operation cost was approximately 50 MNOK, and from 2015 to 2018, it amounted to approximately 100 MNOK, and the cost was largely covered by the four RHAs.

The professionals' forums are the arenas where the four RHAs regularly meet and discuss matters. Figure 8 shows the five forums in the NICT.

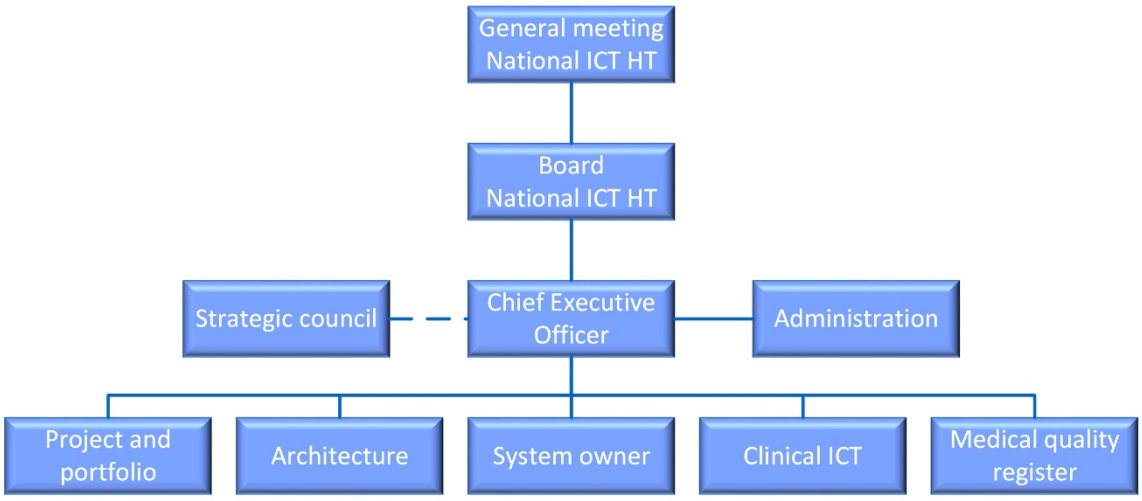


Figure 8. Organisation chart for the NICT (NICT, 2019).

The aims of the different forums are as follows:

- The *project and portfolio* forum 'shall follow up and contribute to the implementation of portfolio measures in common ICT strategy, treat and recommend in areas related to method, tools and practices within portfolio management, programme management and project management, facilitate the good portfolio management processes, as well as sharing good practice, developing expertise and facilitating experiences' (NICT, 2017).

- The *architecture* forum aims to 'achieve more coordinated interregional EA. The forum will contribute to the re-use of good practice in interregional business architecture by the health regions' (NICT, 2016b).
- The *system owner* forum (named the forum for EHR until 2016, and the forum for specialist systems in 2017–2018), 'is a management forum and whose main task is to coordinate good practice for the implementation, use and management of today's clinical information systems' (NICT, 2016c).
- The *clinical ICT* forum 'is an advisory forum and will contribute to NICTs long-term strategy for development and adaptation of functionality and information structure in clinical ICT systems. [The] Clinical ICT forum should be a professional partner for management, and build a long-term target from a clinical perspective' (NICT, 2016d).
- The *medical quality register* forum 'is an advisory forum and aims to ensure that all national medical quality registries have, or as quickly as possible, developed a well-functioning and quality-assured technological solution, which is operated through a common national operating environment' (NICT, 2016e).

The enterprise architects in the NICT have usually worked for many years in the context of healthcare and are experienced professionals through their work with the different RHAs. Therefore, they have first-hand information on how the work is associated with EA methodology, as well as the challenges in establishing a holistic view on national ICT development.

4.1.2 South Eastern Regional Health Authority

The RHAs are part of the Norwegian public sector and hence have some constraints due to ICT. Each RHA has authority over the hospitals in its region; for example, it can decide to a certain degree what IS shall be used by single hospitals, but the economic aspect is the HTs' responsibility. Importantly, investments in ICT are made at both the regional and the trust levels. SERHA serves the largest region, with 30 hospitals organised in nine HTs (see Table 6).

Table 6. Health trusts in the South Eastern Regional Health Authority.

Health Trusts (HTs)	Somatic hospitals
Oslo University Hospital	Aker, Gaustad, Radiumhospitalet, Rikshospitalet, Ullevål and specialist hospital for epilepsy
Akershus University Hospital	Ahus (Nordbyhagen), and Ski
Hospital Innlandet	Elverum, Hamar, Gjøvik, Kongsvinger, Lillehammer, and Tynset
Hospital in Vestfold	Larvik, Stavern, and Tønsberg
Hospital in Østfold	Kalnes, and Moss
Vestre Viken	Drammen, Bærum, Kongsberg, and Ringerike
Sørlandet Hospital	Arendal, Flekkefjord, and Kristiansand
Hospital Telemark	Notodden, Porsgrunn, and Skien
Sunnaas Hospital	Sunnaas
9 HT	***30 hospitals***

In 2018, SERHA had 78,500 employees, with an annual turnover of 82 billion NOK. Approximately three million citizens belong to the region. In addition to the Department of Technology and eHealth, SERHA has organised its ICT operations as its own HT, Hospital Partner (HP). The Hospital Pharmacies are also organised as an HT. For comparison, Northern Norway RHA has four HTs and 12 somatic hospitals and supports 0.5 million citizens. Central Norway RHA has three HTs and nine somatic hospitals and supports 0.7 million citizens. Western Norway RHA has four HTs and nine somatic hospitals and supports 1.1 million citizens.

The structure of SERHA's main organisation at the time of the investigation is shown in Figure 9.

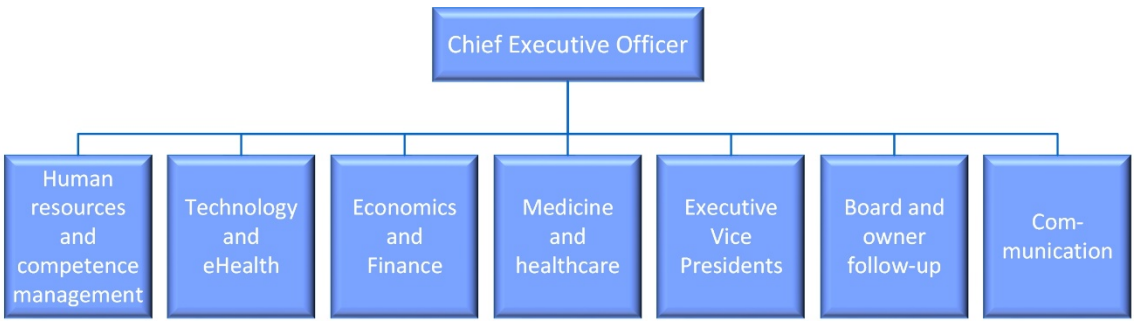


Figure 9. Organisation chart for the administration of the South Eastern Regional Health Authority (SERHA, 2019b).

The Department of Technology and eHealth 'is responsible for realizing SERHA's ICT strategy, and to coordinate and align investments in technology to support as much as possible the desired development in the enterprise group' (SERHA, 2018c). The department has around 15 special advisors. The projects managed by SERHA engage people from the ICT operational partner HP, the hospitals and external consultants.

Version 2 of the ICT strategy for SERHA was approved by the board in December 2015. It replaced version 1.0 (2012), and the new strategy supports 'One citizen – one record'. Therefore, one of the five main goals is to 'support interaction between all stakeholders involved in the delivery of healthcare services' (SERHA, 2015a, p.3). The strategy report describes the goals and the vision for ICT in SERHA, and it supports the long-term strategy for SERHA for 2012–2020 and the Directorate of Health's long-term strategy on improved healthcare services for 2005–2015.

The portfolio programme – Digital Renewal

One of the main initiatives to improve the healthcare services started in 2013 and was called Digital Renewal. The goals of 'Digital Renewal [are to] enable SERHA to achieve benefits of ICT to improve the everyday lives of patients and health professionals by improving support for patient safety and interaction, providing quality and efficiency improvements in core business, and meeting society's expectations for ICT solutions'(SERHA, 2015a, p.11). The means are to standardise work processes and technical solutions through six programmes, three for clinical matters (radiology, laboratory and clinical documentations), one related to national digital coordination with an emphasis on the exchange of messages among the actors, one for enterprise management and finally, infrastructure modernisation to create a shared platform for the regional solutions.

SERHA's annual report for 2014, related to the progress of the initiative, concludes that the region is still immature for a quick implementation of standardised processes and technology. Furthermore, the report discusses the instruments for achieving the strategic goals. To work towards common services and a common infrastructure, the report explains the current demanding and complex situation. Each HT has its own ICT infrastructure and system portfolio. In the 40 data rooms of varying degrees of quality, some systems are outdated, and there is a total of approximately 1250 ICT solutions for clinical and medical services. This complex

situation makes interaction difficult and is an obstacle to the use of regional ICT services. However, 'Digital Renewal has been mandated to consolidate and standardize parts of the system portfolio within the infrastructure, the administrative and the clinical area' (SERHA, 2015a, p.14). Additionally, the HTs and the HP will continue the work towards standardisation. One major obstacle to the programme was the limited ability to share patient data across the HTs. In 2015, changes were made in the health register law and in the law for patient records to make information sharing across jurisdictional boards possible. These changes enable SERHA to implement common solutions and seamless access to information for the benefit of the patients.

In 2014, the CEO took the initiative to have a more efficient organisation, and the programmes for clinical solutions were organised as one programme, called regional clinical solutions (RCS). In subsequent years, other services have been added under the umbrella of Digital Renewal, such as ICT services for research (in 2016). In 2017, the infrastructure modernisation programme of Digital Renewal underwent a crisis, and in 2018, a large radiology project of the RCS programme was terminated after several years of work. In 2018, Digital Renewal was renamed 'ICT project portfolio'; the name Digital Renewal was not considered appropriate since changing the ICT portfolio is an ongoing effort (SERHA, 2018d, 2018e). Despite some successful projects, the Office of the Auditor General assessed SERHA as not fulfilling its strategic goals, and in 2018, SERHA strengthened its governance of the ICT portfolio (SERHA, 2018d).

The annual report for 2014 stated that the budget for Digital Renewal was 6585 MNOK for the 2013–2020 period (SERHA, 2015b). The budget frame was included in the subsequent annual reports until 2017, then an accumulated value of 4521 MNOK was posted, and the budget frame was removed (SERHA, 2018f). The annual report for 2018 started to use the new name ICT project portfolio and noted the 2185-MNOK budget for 2018–2021 (SERHA, 2019a).

The programme – Regional Clinical Solutions

In the beginning of Digital Renewal, each project managed the architecture. In conjunction with the reorganisation of Digital Renewal leading to the RCS programme, it was agreed that two architectural functions would be established to handle issues across the projects under the programme in a better way. One was

the architecture and design group as an operational function and the other an architectural board as an interdisciplinary body that could make architectural choices, which could guide the programme. This agreement was formalised with the architecture and design group, and the architectural board was included in the organisation chart of RCS. This board's role is explained in its own mandate and in the programme directive for RCS (SERHA, 2015c). Hence, since 2015, SERHA has developed its EA methodology, with templates that are well connected with other issues, such as project portfolio management, benefit realisation and change management. Furthermore, it has explored different EA tools and gained valuable experiences using the EA approach. Nevertheless, EA has only been partly used in a couple of ways; first, it has only been applied in one programme, and second, the methodology has not been fully implemented. However, since the 2017 crisis, there has been an enhanced architectural focus, along with the ongoing work to strengthen the governance processes.

The RCS programme owner is represented by the head of the programme board. The board is responsible for ensuring that the programme is expediently and efficiently managed, organised and staffed, including assuring anchoring and change management in the RHAs' HTs. The programme management is responsible for overseeing and carrying out the daily operations in following up the programme's projects.

The programme has established professional networks to ensure the academic communities' broad involvement in the HTs during the establishment and the development of standardised work processes and solutions. Furthermore, the programme has developed buy-out routines for the programme participants to encourage the HTs to support the initiative with human resources. The programme management wants to assure that the work processes are professionally recognised and justified; thus, the projects have a large proportion of doctors, nurses and mercantile personnel. As of June 2017, the projects under RCS had approximately 400 participants, with 200 of them coming from the hospitals.

The RCS programme organisation, including the different projects (as of April 2017), is illustrated in Figure 10. As shown in the figure, some projects have two or three project managers, that is, one main project manager from an HT (preferably a clinician with knowledge of hospital operations), an assistant project manager from HP (with formal knowledge in project administration) and an assistant project

manager from the vendor. This structure is related to change management because based on the RCS management experience, it is important to have a clinician who provides information about the changes, thus establishing completely different trustworthiness and credibility when handled by a medical professional rather than a professional project manager.

Under the RCS programme, I interviewed representatives of the Department of Technology and eHealth, representatives of the RCS programme management, members of the architectural board, members of the architecture and design group, project managers and project participants. Most of the interviewees were enterprise architects, but there were other professionals, including business managers and clinicians. For more information on the interviewees, see Subsection 4.2.4.

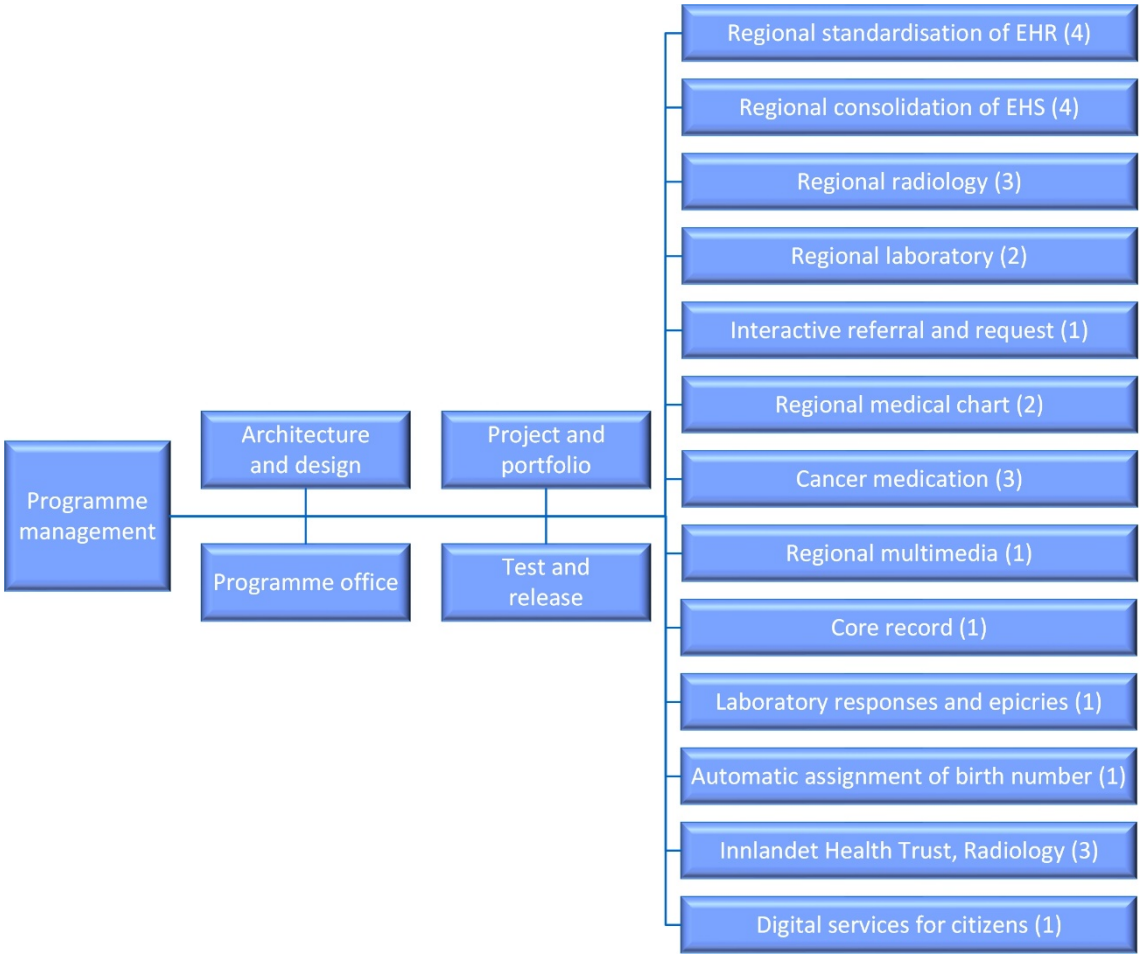


Figure 10. Organisation of the regional clinical solution as of April 2017 (each number in parentheses is the number in the project management) (SERHA, 2017).

4.2 Research design

The research was conducted as an interpretive case study (Walsham, 1995), and the principle of the hermeneutic circle (Klein and Myers, 1999) was important in the research design of this thesis.

4.2.1 Interpretive case study

Why are the species of the world acting as they do? How can researchers acquire valid knowledge of the phenomena? These are two fundamental philosophical questions for researchers. The first question is explained with *ontology,* the philosophical study of the nature of being. How a theory can be formulated is an issue for the second philosophical question and is explained with epistemology. *Epistemology*, the theory of knowledge, is 'philosophy that investigates the possibility, limits, origin, structure, methods and validity (or truth) of knowledge' (Delanty and Strydom, 2003, p.5). Epistemology is strongly related to ontology; therefore, the choice of ontology comes first. Then, practical issues have to be considered. How can someone find out what one wants to know? This is a *methodological* question (Guba and Lincoln, 1994).

Guba and Lincoln (1994) outline four major paradigms: *positivism, post-positivism, critical theory* and *constructivism.* Three philosophical views used by researchers in the IS field are described and discussed by Orlikowski and Barley (2001). Myers, M.D. (1997) adopts and explains these views:

1. *Positivistic* – This is a realistic view of the world as predefined, where knowledge of reality can be explained through causality and reduction. Separation between the subject and the object is important. Testing theories and making predictions are common aims.
2. *Interpretive* – In this relativistic view of the world, the world in social science is not predefined but is a result of several conditions that change over time. Its contribution to knowledge is understanding through cognitive processes and a hermeneutic approach.
3. *Critical* – This view believes that social reality is constructed by people over time. The aim is to improve people's lives. In the critical tradition, two recent paradigms are applied in IS: critical realism and agential realism.

The approaches of realism and positivism are strongly objectivist. The main methods of these traditions are quantitative for the former and qualitative for the latter. In critical realism, both quantitative and qualitative methods are accepted (Van de Ven, 2007).

Regarding the methods of interpretive research, the options are action research (AR), ethnography, grounded theory and case study (Myers, M.D., 1997). The selection of the method has to consider the research question and the researcher's opportunities for data collection. AR methods are suitable for acquiring knowledge of organisational practices and further developing such practices to improve performance (Susman and Evered, 1978). AR implies approval and cooperation with all parties (Vidgen and Braa, 1997). AR is irrelevant to my research questions since I would not collaborate with people in the research setting to solve any practical problem. In ethnography, participant observation is the primary source of data, and the researcher is involved in the social group under study and observes what is really done; for example, power structures can be disclosed (Myers, M., 1999). Ethnographic data can contribute with its aims 'to discover what is happening in a given place and time and to pass this discovery on to readers who are presumably unaware of such matters' (Van Maanen and Kolb, 1982, p.5). Even if I had the chance to attend meetings, I would not be sufficiently immersed in the actors' everyday context for a longer period to call the methodology ethnography (Myers, M., 1999). It would be practically difficult for me to be a visitor of the organisation under study, but in a case study, the researcher is less involved, and for my study, interviews are the primary sources of data (Myers, M., 1999). Nevertheless, participant observation can be powerful even if it is used on a limited basis (Guest, Namey and Mitchell, 2012).

In my PhD project, not only technical but also human-related issues are involved. My research seeks to understand how actors in a multilevel organisation use EA as a methodology and a process, as well as to describe the challenges faced by the organisation on this occasion. To be able to understand and report the organisation's approaches to EA, the challenges and how to address them, I need to reveal what the different actors' approaches to EA are, how they work and how they experience the process. Hope (2015) argues in his thesis that architecture is too complex for positivistic research; an interpretive approach is better. I believe that this

inquiry can best be undertaken with open-ended interviews and thereby 'obtain knowledge of the subjects' world' (Kvale, 1996, p.21).

Especially important for the interpretive choice is the fact that the stakeholders have different backgrounds and levels and fields of education and their own jargon, thus increasing the likelihood of misunderstanding. For me, the philosophical learning from Wittgenstein's language games was important in designing the research and arguing for the research quality (Wittgenstein, 1968 cited in Delanty and Strydom, 2003). My ontology is clearly relativistic, and I choose an interpretivist direction for my epistemology.

I find support for my choice from well-known IS researchers. An interpretive case study (Walsham, 1995) is appropriate for gaining in-depth knowledge and a solid understanding of the context (Orlikowski and Baroudi, 1991; Fitzgerald and Howcroft, 1998; Klein and Myers, 1999). Interviews and dialogs with the informants are valuable because they are reflective persons who can contribute to the interpretation of the phenomena under study (Bygstad and Munkvold, 2011). Organisations often have a historical basis, whose importance is understood only by long-time employees, and paradigms other than positivism are more appropriate in such research settings (Susman and Evered, 1978; Vidgen and Braa, 1997). A case study is an empirical inquiry and a research method that is suitable when the researcher wants to understand a real-world case; both qualitative and quantitative methods can be applied (Galliers, 1992; Walsham, 2006; Yin, 2013). Case studies conducted under the positivistic principles are common and recognised by IS researchers, but these principles do not fit the interpretivist paradigm (Walsham, 1995; Klein and Myers, 1999). Hence, my research design and selected methods comply with the interpretivist tradition.

4.2.2 Quality assurance of the research

An epistemological issue is the judgment of the quality of the research (Delanty and Strydom, 2003). To assess quality or 'trustworthiness' in qualitative research in the relativistic paradigm Guba and Lincoln (2001) have suggested to apply credibility, transferability, dependability and confirmability. These criteria can be compared to the traditional positivistic criteria in terms of validity, reliability and objectivity.

Trustworthiness is in the following shortly described based on explanation from Guba and Lincoln (2001) and Oates (2006).

- *Credibility* is questioning if the reality of the informant is presented in a way that really shows this reality. The quality assurance is done by discussing your findings with the informant and others. The credibility can be increased by investigating data from several sources, e.g. interviews and from documents.
- *Transferability* is whether your findings are relevant to others. The readers must be able to assess if the finding can be relevant in other contexts. This is enabled by first a rich description and then by a detailed description of the data collection and the analysis, so it shows that the data is clearly connected to the theory.
- *Dependability is* concerning to which degree the findings are related to the researcher's interest, theoretical knowledge and research experience. A clear and obvious research process and a good description of the process can illuminate this.
- *Conformability* implies that the findings must be based on real data and not the researcher's assumptions. To prove this, the researcher can make data available and describe the logic for connecting data and results is important.

Klein and Myers (1999) have also addressed quality of interpretive research. I think Guba and Lincoln (2001) and Klein and Myers (1999) complement each other, thus I decided to take both into account. To obtain quality Klein and Myers (1999) suggest seven principles. (1) The first and most fundamental principle is the principle of the hermeneutic circle; the iterative process of understanding the whole from understanding their parts. (2) The principle of contextualization; critical reflection of the research setting. (3) The principle of interaction between the researchers and the subjects; how research data can be socially constructed. (4) The principle of abstraction and generalization; relate ideographic details to principle one and two to concepts for understand human behaviour. (5) The principle of dialogical reasoning; awareness of contradictions between research design and

findings. (6) The principle of multiple interpretations; sensitivity to different interpretations of the same event. (7) The principle of suspicion; biases and distortions can occur.

Examples of how I have addressed the principles are: Principle 1: Doing interviews in several phases. Combining interview and documents. Review and analyse the data in steps, going from broad categories, to narrow categories, and then grouping categories. The use of open-ended interviews, or mere a conversation, doubles the relevance of hermeneutic, first by the interpretation during the conversation and second interpret the transcribed text (Kvale, 1996). Principle 3, 5, 6 and 7: Some interviews were retrospective to unveil how the organisation, and the management of the IT architecture, had developed over time. In order to address the possible shortcomings of examining the cases through retrospective interviews, multiple perspectives were sought through comparison with internal documents and by contrasting information with other informants. This enabled cross-checking and triangulation of the retrospective data in order to achieve a clear and enhanced understanding by using several sources (Flick, 2009), and to ensure credibility of the studies (Guba, 1981).

My supervisors and co-writers have long experience in interpretative research. Discussions of the research setting and findings with them throughout the project was paramount for the quality assurance.

4.2.3 Selection of case

Silverman (2013) fleshes out the practices in how to design case studies in order to secure generalisability. In purposive sampling, the researcher selects a case for practical reasons or because it illustrates his/her research interest. In theoretical sampling, the selections are based on the research questions; examining events and processes implies that the researcher is guided by some theory.

The selection of the case and the units of analysis in my thesis can be regarded as purposive because the hospital sector actually uses EA. As previously mentioned, this choice enables me to eventually enhance the knowledge base on the introduction of EA in specific contexts (Weiß, 2015). At the regional level, out of four options, I have selected the largest RHA, SERHA, because it is reasonable to think

that its experience and knowledge facilitate an in-depth examination of the phenomena. This is in line with Mason's (1996) recommendation to select meaningful cases that can represent a wider population and contribute to theory development (Mason, 1996 cited in Silverman, 2013). SERHA is also convenient since it is located in the region where I live. Additionally, I know people in the region who could introduce me to stakeholders. It is practical to 'choose any setting which, while demonstrating the phenomenon in which you are interested, is accessible and will provide appropriate data reasonable readily and quickly' (Silverman, 2013, p.152).

4.2.4 Data collection

There are several ways to collect data and obtain case evidence, for example, from texts and documents, interviews and observations (Silverman, 2013; Yin, 2013). I have used the principles from Klein and Myers (1999) work to gain an in-depth understanding about the phenomena. The main data collection method consists of semi-structured interviews and documents obtained from the Internet. To increase my understanding of the context, I participated as an observer in four eHealth conferences. Table 7 presents an overview of the data collected in the different phases of the PhD project.

Table 7. Overview of the phases of data collection.

Phase and time period	Data	Explanation
All phases August 2016–August 2019	Online documents and websites 4 conferences	Overview of the research setting, including organisational structures, strategies and project reports Documents from the government and the agencies, including public reports and white papers The organisations' reports and other documents on historical events and decisions Documents from the different projects at the National ICT and from Regional Clinical Solutions; minutes and reports from the organisations Attended national eHealth conferences where IT in the healthcare sector was a subject
Initial phase November 2016–February 2017	4 focus interviews	Gain an initial understanding of EA use and EA approach in the research setting
First phase May–August 2017	12 interviews	Interviewed personnel about their understanding and experiences with EA, projects and portfolio management, and the challenges of the holistic EA approach
Second phase November 2018–January 2019	15 interviews	Interviewed personnel about their views on the history of EA in South Eastern RHA (SERHA) and about the experiences with EA, use and value of artefacts, and the updated project roadmap for SERHA

4.2.4.1 Interviews

A research interview is a professional conversation whose 'purpose is to obtain descriptions of the life world of the interviewee with respect to interpreting the meaning of the described phenomena' (Kvale, 1996, pp.5–6). Qualitative interviews can take several forms, and a semi-structured interview is the most used interview technique in IS research (Myers, M.D. and Newman, 2007). 'However, interviewing does not automatically guarantee the production of rich data and meaningful insights' (Schultze and Avital, 2011, p.1); therefore, Schultze and Avital offer guidance on conducting qualitative interviews, so the potential for data generation through interviewing can be realised, and the formulation of theories can be improved. The researcher must prepare for the interview with the support

of his/her entire arsenal of knowledge, among them, philosophical reflection, whom to select as informants, and designing and conducting the interview. In the following paragraphs, I describe my approach to each of these issues.

Philosophical underpinnings of the interview approach

In unstructured and semi-structured interviews, some questions are prepared but with the advantages of offering the researcher the possibility to add questions and the interviewee the freedom to add important information (Myers, M.D. and Newman, 2007). Importantly, the interview is an essential key to obtaining information (Walsham, 2006).

However, interviewing is a demanding technique. The researcher has to balance between the effort of obtaining answers based on the predefined interview guide and being careful to avoid asking leading questions. Nevertheless, in my interpretive ontology, I am comfortable with the reflexive approach, where things other than just the interview are relevant (Alvesson and Ashcraft, 2012). The management of ICT in the case study has a political aspect and probably some power issues. The researcher must be aware of political agendas from the subject that can actually distort reality; further social and linguistic complexity challenges the researcher (Alvesson and Ashcraft, 2012). This problem can be addressed by means of interview techniques that generate rich data 'that facilitate thick descriptions [and] enhances interviewers' capacity for reflexivity and criticality' (Schultze and Avital, 2011, p.13).

Selecting informants

To be able to answer my research questions I needed to interview people with experience from the field. These persons are *informants*; they are experts in their field and know how EA is used in their organisation (Alvesson and Ashcraft, 2012). Alvesson and Ashcraft (2012) offer two guidelines for selecting interviewees: representativeness, and quality. Nevertheless, representativeness should include 'some breadth and variation among interviewees such that they allow coverage of the social category one seeks to explore' (Alvesson and Ashcraft, 2012, p.247). Quality can have different meanings, such as how much rich data the informant gives; an outspoken person can be more interesting for the researcher than one who hardly speaks. The researcher must balance representativeness and quality.

Gaining access to upper levels of the organisation could be difficult. Thus, I conducted four interviews at the initial stage to obtain empirical information, helping me, *inter alia*, to understand the problem, choose a theoretical foundation and ease the way to further access (Pettigrew, 1990). Interviewees can also mention other persons (snowballing) who can provide information about the inquiry (Yin, 2013). I found the 'snowballing' technique fruitful. Additionally, I identified potential interviewees via the organisations' websites and from relevant reports. If they had participated in national or regional projects, I considered the informants representative; nevertheless, I checked their LinkedIn profiles for further assessment. I also used LinkedIn to identify enterprise architects and project managers in HP. I contacted potential informants via e-mail or LinkedIn. In total, I had 33 informants and held 34 interviews. Two persons were interviewed twice, and in two of the interviews, two persons were interviewed at the same time. Table 8 provides an overview of the interviews, and Table 9 offers a detailed overview of the interviewees.

Table 8. Summary of interviews.

No. of interviews/ No. of informants	Type of informants	Average length (minutes)	Method
34/ 33	1 chief executive officer in a Hospital Health Trust, has clinical background 1 IT manager in a Hospital Health Trust 4 IT managers in Hospital Partner, one with clinical background 2 former IT managers at South Eastern RHA (SERHA) 17 enterprise architects from National ICT, SERHA (one former), Hospital Health Trust, and Hospital Partner, 3 with clinical background 8 programme and project managers from SERHA and Hospital Partner, 5 with clinical background	Interviews: 68 Recording: 56	18 by phone 2 video conference 12 face-to-face

Table 9. Detailed overview of interviewees (South Eastern Regional Health Trust = SERHA, P/P = programme/project)

Phase	Interview #	Interviewee #	Position	Organisation
Initial	1	1	Enterprise architect	National ICT
	2	2	Chief executive of-ficer	Hospital
	3	3	Enterprise architect	Hospital Partner
	4	4	Enterprise architect	Hospital
First	5	5	P/P manager	SERHA
	6	6	Enterprise architect	Hospital
	6	7	IT manager	Hospital
	7	8	Enterprise architect	National ICT
	8	9	P/P manager	Hospital Partner
	9	10	Enterprise architect	Hospital Partner
	10	11	Enterprise architect	Hospital Partner
	11	12	P/P manager	SERHA
	12	13	Enterprise architect	National ICT
	13	14	Enterprise architect	National ICT
	13	15	Enterprise architect	National ICT
	14	1	Enterprise architect	National ICT
	15	16	Enterprise architect	SERHA
Second	16	16	Enterprise architect	SERHA
	17	17	Enterprise architect	Hospital Partner
	18	18	P/P manager	SERHA and hospital
	19	13	Enterprise architect	National ICT
	20	19	Enterprise architect	SERHA (former)
	21	20	Enterprise architect	Hospital
	22	21	IT manager	Hospital Partner
	23	22	IT manager	Hospital Partner
	24	23	Enterprise architect	Hospital Partner
	25	24	Enterprise architect	Hospital Partner
	26	25	P/P manager	SERHA and hospital
	27	26	Enterprise architect	Hospital Partner
	28	27	P/P manager	SERHA
	29	28	P/P manager	SERHA and hospital
	30	29	IT manager	SERHA (former)
	31	30	P/P manager	SERHA and hospital
	32	31	IT manager	Hospital Partner
	33	32	IT manager	Hospital Partner
	34	33	IT manager	SERHA (former)

Interviews

I started with four unstructured interviews at high levels in the organisation to narrow down and decide on the focus of the study (Alvesson and Ashcraft, 2012). The interviews with architects had more preparation with specific questions, while those held with managers were more thematic. Based on the insights from the document reviews and the introductory interviews, I changed the type from open-ended to more structured interviews later in the process (Alvesson and Ashcraft, 2012). As Table 7 shows, the interviews were held in different phases. In the first and the second phases, I continued the interviews until the interviewees had no more information to add, referred to as the 'point of saturation' (Kvale, 1996, p.102).

All the interviewees agreed to have the interview recorded. This gave me the opportunity to focus on details in the interview instead of having to keep notes of the entire interview (Walsham, 2006; Silverman, 2013). One major disadvantage of recording is that the interviewee can omit sensitive issues (Walsham, 2006). During the interview, I took short notes to highlight the main findings and made notes of topics that I wanted to resume (Silverman, 2013). The interviewees were informed that their answers would be treated confidentially to make them feel comfortable. Each interview was transcribed as soon as possible afterwards. Both to make the informants comfortable and to address quality assurance (Klein and Myers, 1999), the informants were given the opportunity to read and comment on the article before its final submission when their direct quotes were used in the article.

All interviews followed an interview template with three sections, in line with Brinkman and Kvale's (2015) method. The first section provided an introduction of the purpose of the study and the structure of the interview, as well as explained practical and ethical issues (Silverman, 2013), see the interview guide in Appendix A). However, the main research question should not be revealed because this could affect the answers and the subsequent data analysis (Silverman, 2013). The second section comprised the interview itself (see the interview guides in Appendices B–E). The interview approach (Schultze and Avital, 2011) and the questions varied, depending on who was being interviewed. I started with simple questions, mostly how and what questions, and followed up on their answers with more in-depth questions and questions to clarify their meaning (Kvale, 1996). The interviewees

could then reflect on and tell their personal experiences, what worked well and what could be done to improve the situation (Schultze and Avital, 2011). Finally, I asked if they wanted to add something, and we discussed several issues, such as their approval of what to publish, further contact and other potential informants. When using this approach, it is important to let the informants speak as much as possible and not interrupt them, other than confirming gestures and short words (Silverman, 2013). Table 8 shows the average length of the interviews; the first section of each interview was not recorded.

The initial and the first phase of the interviews (see Table 7) were explorative in nature, whose main aim was to study how EA was implemented in the hospital sector and the challenges encountered by the initiative. Following the interpretive and hermeneutic approach (Klein and Myers, 1999), the interview guide was modified, and the questions were revised after new insights emerged in order to gain a comprehensive understanding of the challenges faced by the initiative. In the last phase of the interviews, the questions remained explorative, but there was less need to revise the interview guide.

4.2.4.2 Documents

The documents from a large distributed organisation can offer valuable qualitative insights (Geiger and Ribes, 2011). Documents can be of various types, from websites, handbooks, e-mail to open-source code and much more (Geiger and Ribes, 2011; Silverman, 2013).

Several web pages and reports available online have been used to gain a contextual understanding of the organisations and their practices related to the use of ICT and EA. Some reports from the government, its agencies and directorates describe the national visions for healthcare and the ICT strategy to achieve these goals. Other reports and minutes explain the status and the challenges of the visions, as well for single projects. Several documents discuss the organisational structure and the strategy of the NICT and SERHA, while annual and triannual reports provide information on focus areas, status information on the ICT portfolio and an economic overview. Finally, texts from professional associations and articles from professional journals and newspapers have also informed me about the context.

I have used the documents as background information about the identities of the important stakeholders, the projects' participants, the methodology used in the projects, and as sources to get an impression of the challenges in the EA initiative and how these can be addressed. I have also used the documents to analyse the antecedents to why and how EA and holistic thinking are introduced.

An extensive number of documents have been collected and reviewed; 548 files with a total size of 809 MB are organised in 67 folders. The majority comes from SERHA (187 files), followed by files from NICT (115) and the Directorate of eHealth (82). Figure 1 in Appendix F provides an overview of the folders, and Table 1 in Appendix F cites some examples of the documents.

4.2.4.3 Conferences

Participating in meetings or events can be data sources (Guest, Namey and Mitchell, 2012). I attended four two-day health conferences and one other event, where central persons from the organisation under study presented and discussed issues related to this research. The presenters were representatives of governmental agencies, project leaders (with a clinical background) from RHAs and vendors. Taking field notes is an important data collection technique in ethnography (Wolfinger, 2002; Geiger and Ribes, 2011; Guest, Namey and Mitchell, 2012). Field notes were extended and transferred to text documents immediately after the conferences to minimise the loss of data (Guest, Namey and Mitchell, 2012). I also downloaded the presentations, which were available on the conferences' websites. In one of the conferences, I recorded and transcribed a panel debate, as well as a presentation of the national initiative for a foundation for shared information.

Despite being just a passive observer of the conferences, I believe that I gained some of the benefits received by a participant observer (Bernard, H.R., 2006 cited in Guest, Namey and Mitchell, 2012), especially in identifying behaviour, acquiring a deeper understanding of the social reality and observing how people from the different organisations and professions interacted. Observational data did explain the findings from my other data sources (Guest, Namey and Mitchell, 2012). Table 2 in Appendix F presents an overview of the events with selected themes.

4.2.5 Analysis

Analysing the data and linking them to theory probably constitute the most difficult part of the research process. However, some techniques are described in textbooks (e.g., Miles, Huberman and Saldaña, 2014). The interpretation process entails connecting the data to the constructs and the processes in the theory to which a researcher wants to contribute (Orlikowski and Baroudi, 1991; Walsham, 2006). Thus, coding the data is a vital step in the process towards a new theory.

For the interviews, I followed Miles, Huberman and Saldaña (2014) recommendation to start the analysis and the coding concurrently with the data collection. This allowed me to ask questions to fill the gaps found in the analysis. This approach is the same as that used in grounded theory, where data collection and analysis are conducted simultaneously (Urquhart, Lehmann and Myers, 2010). The coding technique used in grounded theory can be fruitful for other methods as well (Urquhart, 2007). However, as the analysis progressed, I also coded the data under predefined categories based on the applied theory.

Because of the interview technique, where I avoided leading questions or questions that might yield stylised answers, the interview transcripts became rich with lengthy statements, amenable to a variety of analyses (e.g., of the informants' perspectives). The transcribing technique, true verbatim, enhanced the analysis possibilities. True verbatim implies transcribing all words and sounds during the interview, such as mmm, (laugh) and pauses. I used the symbols recommended by Social_Sciences_Research (2017). However, in the last phase of the interviews, I did not use signs for the volume of the tone (stronger or weaker) and the pace.

I utilised first- and second-cycle coding (Miles, Huberman and Saldaña, 2014). In the first cycle, the researcher connects chunks of text to one or several codes or themes. The codes can be predefined (e.g., related to the research question) or created on the fly. Furthermore, there are many approaches to the coding; I have used different approaches, depending on the research question. To identify the challenges for Article #2 (see Table 1), I used descriptive coding, where the code described the content of a text (see Table 1 in Appendix G). When identifying the rationale for EA, I used value coding, where the worldview of the interviewee was captured per profession. In the latter case, second cycle analysis was done in Excel (see Figure 3 in Appendix G), and keywords were assigned to the statements. In

discussions with the co-authors, the assignments and the keywords were discussed and grouped into categories and presented in a table in Article #3 (see Table 1). A selection of the tensions (see Figure 3 in Appendix G) was presented in a table in Article #3, and the spreadsheet was used for further analysis in Article #4 and Article #6 (see Table 1).

In the second cycle, the researcher aggregates, discusses, organises and compares the collected text to identify emerging themes and patterns. This second cycle coding is described as an interpretive and iterative process. An example of the related progress in categorising the challenges in the EA institutionalisation process is shown in Table 1 and Figure 2 in Appendix G. In the second cycle, the theoretical lens was selected, then the coded data were assessed and compared with the theory. The bottom-up approach used to identify the institutional logics in Article #4 and Article #6, where patterns associated with the logics emerge inductively from the data, is similar to the 'pattern inducing' technique by Reay and Jones (2016). The results of the analysis, leading to the conclusion, was presented in the articles.

In the analysis of the interviews, observations and literature reviews, I used NVivo, a specialised tool for qualitative data analysis, in combination with Excel. In the analysis of documents, I used Word, utilising the property headings and navigation. In NVivo, the categories are represented as nodes, and making new nodes and child nodes and revising the coding are easy. I kept records of the meanings of the nodes and wrote reflection memos along the process. Excel was useful for statistical work, making diagrams, different sorting purposes and closer examinations. An example of the memos of the analysing process for categorising the EA challenges is shown in Figure 1 in Appendix G, and Figure 3 in Appendix G shows parts of the Excel spreadsheet used in the analysis for finding the rationale for EA and the different logics applied, as well as identifying the tensions; the example is for the enterprise architects. In this example, different colours and fonts are used to distinguish among the themes.

4.2.6 Limitation of the research design

Although the study was conducted over a three-year period, and historical documentations and reflections on the past were collected, the research design has its limitations. In a longitudinal study, the researcher can follow how the EA implementation unfolds over time. However, the length of the implementation process

has prevented me from following it to the end, that is, the EA implementation for the whole hospital sector in Norway is not yet accomplished; neither is it for the region under investigation. Nevertheless, an enhanced understanding of how an EA approach in the context of Norwegian hospitals influences the systems, its stakeholders and surroundings and vice versa is captured in this study.

Another limitation is that I have investigated only one health region, whereas interpretive case studies often use additional cases for comparison (Walsham, 1993). The choice of not including another region was justified by the exploratory design, the large scope, the time constraints and finally, the limited access to resources. The findings could have been different, since the other regions are much smaller in size and thus have less complexity. Nevertheless, the other regions have the same types of organisational issues and stakeholders involved. The same conditions apply to the exclusion of an additional case in another country.

In the first phase of the research, I only interviewed enterprise architects and managers, so medical professionals' views and experiences were excluded. This limitation was to a certain degree addressed in the second phase, but I could have interviewed more clinical personnel. Especially, two areas could have been investigated further in relation to the institutional logic perspective, that is, the clinicians' role in the process and a post-implementation evaluation of the clinical system to assess if the EA approach has been successful.

5 Research articles

In this thesis, I have included four conference articles, one journal article and one manuscript that are under revision. In the rest of the thesis, the articles and the manuscript are named articles, each with a number (#) corresponding to the # in Table 10. In the following subsections, the articles are presented with the main results and connected to the overall research question.

Table 10. Overview of articles.

#	Title	Outlet	Authors
1	Enterprise architecture in healthcare and underlying institutional logics: a systematic literature review of IS research	Pacific Asia Conference on Information Systems (22nd, 2018). Association for information systems electronic library (AISeL)	Anne Kristin S. Ajer
2	Enterprise architecture challenges: a case study of three Norwegian public sectors	European Conference on Information Systems (26th, 2018). AISeL	Anne Kristin S. Ajer and Dag. H. Olsen
3	Enterprise architects' logics across organisational levels: a case study in the Norwegian hospital sector	Mediterranean Conference on Information Systems, (12th,2018). AISeL	Anne Kristin S. Ajer, Eli Hustad and Polyxeni Vassilakopoulou
4	Enterprise architecture in hospitals: resolving incongruence issues	World Congress on Medical and Health Informatics (17th, 2019). IOS Press	Anne Kristin S. Ajer, Eli Hustad and Polyxeni Vassilakopoulou
5	Enterprise architecture implementation is a bumpy ride: a case study in the Norwegian public sector	The Electronic Journal of e-Government (2020)	Anne Kristin S. Ajer, and Dag. H. Olsen
6	Enterprise architecture and institutional pluralism: the case of the Norwegian hospital sector	Submitted to the Information Systems Journal (currently under second revision round, revise and resubmit)	Anne Kristin S. Ajer, Eli Hustad and Polyxeni Vassilakopoulou

5.1 Enterprise architecture in healthcare and underlying institutional logics: a systematic literature review of IS research

In this paper (Article #1), I report on a systematic literature review of empirical studies in the IS literature, focusing on EA in healthcare. In total, 30 papers have been selected for an extended analysis. The identified studies are analysed, aiming to trace the different institutional logics represented and to map the relevant theoretical concepts leveraged. I focus on the logics of IT professionalism, medical professionalism and managerialism. Specifically, the review aims to answer the following research questions: *1). How are the different logics of IT professionalism, medical professionalism and managerialism addressed in prior healthcare EA research? 2) What theoretical concepts relevant to institutional aspects have informed prior healthcare EA research?*

5.1.1 Results

In the selected studies, I assess the foci of interests, the clusters of IT applications that are highlighted and the stakeholders involved. Three areas of interests are categorised, related to the following: 1) IS for healthcare used for a clinical purpose, 2) organisational implications when an EA approach is adopted and 3) EA tools.

Two-thirds of the studies revolve around the second area of interest/issue, and the studies mainly address the IT professionals' logics. In these studies, IT professionalism represents a strong institutional logic that can be beneficial for the chief information officers (CIOs) and the enterprise architects in discussions with their superiors, arguing for strategic ICT investments and necessary organisational adaptations. Another finding is that a researcher could have expected to find more studies addressing the managerial profession since one of the main factors for succeeding with EA is top management support (Ylimäki, 2006; Venkatesh, et al., 2007; Lee, S., Oh and Nam, 2016). The logic of medical professionalism is also scarcely addressed (only in four studies); however, the aim of improved healthcare quality is the rationale for most of the studies in this review.

Of the 30 studies, 12 neither use theories or concepts nor build on specific research streams or fields. Furthermore, the terms *theory* and *concept* are used inconsistently (e.g., theory of EA, EA concept). The analysis proves that EA research revolves around several issues in the same study because of the broad scope of EA.

This can be disadvantageous, and there is a need to address specific EA topics through in-depth studies.

Overall, the findings demonstrate that research on EA within healthcare is scarce in the IS community, and EA research is immature in terms of theoretical contributions.

5.1.2 Relation to the whole

This article has enhanced my understanding of how the main actors' power and institutional logics influence EA projects at different organisational levels. This is important knowledge in the work related to RQ2 of this dissertation, *What kinds of tensions emerge between different professional institutional logics and the EA institutional logic in the introduction of EA in the hospital sector?*

The most influential rationalities in the design process of health IS are technical, managerial and medical (Heeks, 2006). To be able to influence the EA institutionalisation process, which means holistic thinking and a large degree of collaboration among the stakeholders, I conclude that in the three professions, IT professional, medical professional and manager, institutional logics need more exploration and improved understanding.

To gain advantages from EA, it is important to understand the sociocultural identities of different professional communities co-existing in a work context (Boland and Tenkasi, 1995; Brown and Duguid, 2001). In the healthcare setting, stakeholders come from different institutional backgrounds and may have distinct perceptions about EA and its implementation. The multiple (and sometimes competing) institutional logics need to be taken into account (Currie and Guah, 2007; Reay and Hinings, 2009; van den Broek, Boselie and Paauwe, 2014). Prior research has pointed out the importance of different institutional logics, but the logic of enterprise architects has not been explicitly explored. To gain insights about EA introduction in hospital settings, it is essential to make sense of the worldviews of the enterprise architects themselves and the tensions that arise when they encounter the established logics. This has led me to the third step in my PhD project, the study of the impact of major institutional logics on EA institutionalisation in the hospital sector.

5.2 Enterprise architecture challenges: a case study of three Norwegian public sectors

In this explorative study (Article #2), we aim to provide an understanding of the central challenges in organisational acceptance of EA projects in the Norwegian public sector. We examine the antecedents of EA adoption and the strategies for EA implementation, as well as the EA challenges in an interorganisational setting, where national and regional goals guide the development of the ICT landscape. We sum up the challenges and offer an institutional analysis of institutional pressure and how the pressure is addressed by the organisations. The research questions are as follows: *1) What are the key issues and challenges of EA implementation in the public sector? 2) What are the institutional indicators of EA adoption, and how is the subsequent institutional pressure addressed in the Norwegian public sector?*

5.2.1 Results

We have identified key challenges of EA implementation in the hospital sector, the higher education sector, and the labour and welfare sector. EA is perceived as important for achieving national goals for better coordination of the ICT systems to provide citizens with improved services. In the case study, we have identified 26 concepts, grouped into five broader categories. The findings yield three major challenges of the EA initiative, involving the *autonomy* of the organisational units, the national objectives that are not followed up with *financial* initiatives, and the lack of *understanding of EA*.

Additionally, we demonstrate how institutional analysis can be used to identify elements that influence EA institutionalisation. Finally, we discuss how organisational structures and cultural conditions affect engagement in collaboration and coordination towards common national ICT solutions.

The challenges related to EA institutionalisation are highly intertwined. The units' autonomy allows them to dismiss or only partly participate in the EA initiative. The top management and other stakeholders have a limited understanding of EA, whose benefits and value are not clear to the decision makers. Showing the overall value for the organisations is an insurmountable task for the architects alone. The implication is that the organisations must raise the competency level across the

board and particularly of the top management. We argue in particular that the need for organisational changes related to EA is under-communicated. Governance arrangements and the authority related to architectural development and decisions should be strengthened. Finally, an evaluation of the current financial model is overdue.

5.2.2 Relation to the whole

Article #2 informs the dissertation's RQ1 and RQ3: *What are the main challenges of EA institutionalisation in the hospital sector? How can the challenges of EA institutionalisation in the hospital sector be addressed?* The initial phase is exploratory, and we first analyse the challenges without a theoretical framework. However, by utilising Scott's (2014) analytical framework for how institutions are created and maintained, as well as Oliver's (1991) typology of strategic and tactical responses that organisations enact to enforce institutional pressure for conformity, we could understand the challenges by assessing the strengths of the different institutional pillars. Additionally, we discuss how actors' behaviour could be explained in relation to their different professions. Finally, we point to initiatives that could improve EA institutionalisation. We suggest extended education of the organisations' members in the EA approach, the need for organisational changes related to governance arrangements and the authority related to architectural development and decisions, as well as an evaluation of the current financial model. These initiatives could be regulative and normative and could strengthen the institution and influence the actors' behaviour (i.e., their institutional logic).

The conclusion from the first phase of the research is that by understanding the underlying challenges of EA implementation in an organisation, the importance of the different institutional elements and the institutional logics among the agents involved, the challenges of EA institutionalisation can be better addressed. For researchers, a comprehensive understanding is imperative because 'without understanding the meanings of a concept it is impossible to figure out what we are actually observing' (Meyer, R.E., 2008, p.530). Thus, I have continued my study for my dissertation to focus on the different actors' rationale for EA and their logics; this is reported in Article #3.

Another avenue that I have continued my study for my dissertation is based on the finding about the different organisational responses to the uptake of EA. The national regulation directs the public sector to use EA; however, it is the responsibility of the organisations themselves to develop their specific EA. Since my co-author and I have found that EA is just partly used in the organisations that we have studied, we have also been encouraged to conduct a more in-depth investigation of EA evolution in the hospital sector; this is reported in Article #5.

5.3 Enterprise architects' logics across organisational levels: a case study in the Norwegian hospital sector

In this paper (Article #3), we aim to elucidate the intricacies of introducing EA in the Norwegian hospital sector through the analysis of empirical material collected across different levels of the sector – national (macro), regional (meso) and local (micro). We utilise institutional logics as theoretical lens, focusing on the enterprise architects' logic that is underexplored in IS research. To gain insights about EA introduction, our research traces the institutional logic of enterprise architects by answering the following two questions: 1) *How do enterprise architects and managers perceive the contributions of EA*? 2) *What kinds of tensions are experienced?*

5.3.1 Results

The findings are classified into nine categories, with illustrative statements from the informants, demonstrating their reasoning about the contributions of EA. We find no significant differences between the enterprise architects' and the managers' perspectives when considering the aimed contributions of EA ('why EA?'), irrespective of their institutional affiliations and roles. However, we identify tensions between enterprise architects and managers and between enterprise architects and medical professionals, which indicate the co-existence of multiple competing institutional logics. The most prominent tension is the paradox of EA – demands for local flexibility and autonomy at the micro level versus the predefined rules and standardisation that EA imposes across all levels – which makes institutionalising challenging. The enterprise architects' logic demonstrates similarities and differences across the various levels, indicating heterogeneity. We conclude this article with a suggested persona of the enterprise architect, which illustrates the empirical findings.

5.3.2 Relation to the whole

Article #3 informs the thesis' RQ2, *What kinds of tensions emerge between different professional institutional logics and the EA institutional logic in the introduction of EA in the hospital sector?*

We find that the logic of the enterprise architect can differ from the logics of other IT professionals. However, the institutional logic of the enterprise architect was not previously described; thus, we have to identify it because 'the identification of these logics in organisational development is interesting for our understanding of how organisations can manage complex targets and processes' (Johansen and Waldorff, 2017, p.62).

Furthermore, the enterprise architects and the managers agree on their high-level EA rationale for the introduction of EA. Nevertheless, it can still be challenging to generate a shared understanding of how to operationalise EA principles in practical actions, as well as to reach a consensus on how the processes should be undertaken and supported. Therefore, we have conducted an analysis of the tensions experienced by the enterprise architects in their practical work in relation to managerial and medical professionals.

'A social arrangement is said to be institutionalized when it is widely practiced, largely uncontested, and resistant to change. Institutional change […] is the displacement of one set of institutionalized arrangements by another, or, the significant modification of prevailing arrangements either substantively (in that the arrangements themselves change) or symbolically (in that the meanings associated with the arrangements change)' (Suddaby and Greenwood, 2009, pp.176–177). Based on the tensions revealed, we conclude that EA as an institution and as a means for managing the national ICT portfolio is not fully institutionalised, and further work has to be done. To be able to suggest resolutions to the EA implementation/institutionalisation challenges reflected by the tensions, we have continued the analysis in two directions, reported in Article #4 and Article #6.

5.4 Enterprise architecture in hospitals: resolving incongruence issues

Despite the potential benefits and the Norwegian state's mandate for introducing EA, there have been significant delays and challenges. To gain insights about EA

introduction in Norwegian hospitals, we have conducted interviews with key actors at the local, regional and national levels across the hospital sector. Prior research has shown that the introduction of EA is far from straightforward and has pointed to the importance of a favourable organisational culture (Weiss, Aier and Winter, 2013; Aier, 2014; Niemi and Pekkola, 2016). Intrigued by this previous research finding, we specifically investigate the following research question: *Are there inherent issues related to incongruence between healthcare as a domain and the practice of EA?*

5.4.1 Results

This study (Article #4) suggests inherent issues in the introduction of EA in hospitals that relate to some level of incongruence between EA and the key characteristics of the healthcare domain. The first theme that we have identified is the planning approach – *bottom-up versus top-down*. EA is plan-driven, while healthcare has both traditions and needs for bottom-up initiatives. The second and the third themes are *clinical versus system knowledge* and *local versus global arrangements*. These stem from the EA characteristics of process standardisations, while in healthcare, the medical staff are responsible for patient care, independent of hierarchical positioning. Thus, there are challenges in gaining acceptance and trust in the sense that the processes inscribe appropriate clinical knowledge and provide support for local variations. The fourth theme is *patient safety versus patient privacy*, which is derived from the EA vision of data integration across organisational units and across IS. The architects are traditionally concerned about privacy and protection of sensitive data, but this can collide with the healthcare professionals' view of patient safety and the need for mission-critical data.

The article introduces a concept named 'mindful EA' as a healthcare-specific EA approach to systematically designing, planning and implementing process and technology changes. The mindful EA approach as a means to resolve the incongruence themes mentioned in the previous paragraph consists of three propositions. First, employ a middle-out planning approach to resolve the incongruence stemming from bottom-up versus top-down planning by providing incentives and support that encourage clinical providers to acquire systems that are technically or functionally compliant and to pursue innovations that keep their systems compliant

over time. Such an approach entails specifying commonly agreed compliance requirements. Second, the challenges related to clinical versus system knowledge and local versus global arrangements can be addressed by providing configurable solutions catering to both standardisation and local needs. Third, patient safety versus patient privacy can be addressed by involving the patients to a greater degree by allowing them to control their own data.

5.4.2 Relation to the whole

In this study, we have further analysed the tensions revealed in the analysis reported in Article #3, and we offer some solutions to the problem. Thus, this article informs both RQ2 and RQ3 of the dissertation. The foci are the tensions experienced by the enterprise architects and the managers involved in EA implementation at different levels (national, regional and local). The findings and the preceding discussion, with suggestions, provide an enhanced understanding of the intricacies in the comprehensive transformation of the digital landscape in the healthcare sector, thereby partly answering RQ2 and RQ3.

This research phase, which ends with Article #4, has encouraged me to further explore the theoretical lens of institutional logic's ability to answer the research questions. So far, the voice of the clinician's has been missing from the analysis; thus, for the next step in the research project, I have selected interviewees with a clinical background and responsibilities for taking care of the clinical perspective in the EA projects. Additionally, I have wanted to delve deeper into the reasons for the slow uptake of EA and the events that draw interest in EA. Therefore, the interview guide has been adjusted, with the aim to reveal differences in the logics among the professions involved in EA development, as well as historical and current events that have led to shifts in EA utilisation. The outcomes of these directions are Article #5 and Article #6.

5.5 Enterprise architecture implementation is a bumpy ride: a case study in the Norwegian public sector

By the end of the first phase of the interviews, the project roadmap for RCS was updated with the mandatory use of EA methodology. To enhance our understanding of how the progress of EA initiatives in the Norwegian public sector developed over time, we wanted to gain insights into how and why this new and updated

methodology was welcomed in the organisation. Thus, I interviewed the central people who participated in the EA initiative when it started in SERHA to gain more insights into the antecedents of its use and evolution. The development of this paper (Article #5) is guided by the following research questions: *1) How have the EA initiatives in Norway progressed? 2) What are the main challenges encountered by the EA initiatives?*

5.5.1 Results

When EA was introduced in the health, higher education, and labour and welfare sectors, it was perceived as an appropriate methodology to solve urgent organisational needs in order to realise the political visions related to the use of ICT (MLGM, 2009a). All of the sectors became interested in exploring EA and started to build their EA service. However, when they began the implementation by building the transition maps from 'as is' to 'to be' and equipping the organisations with the necessary mechanisms to accomplish the mission, they met a 'wall of complexity'. This undermined the EA initiatives and put them more or less on hold in all three cases.

The lack of top executive commitment, of involvement from others besides the IT department and of formalisation were important causes of the problems in the first phase of the EA initiatives. The EA approach was not sufficiently anchored in the organisations. Nevertheless, after a period of limited EA activity in SERHA, it was offered a new opportunity, with the reorganisation of RCS, to improve coordination among the projects. The EA governance was strengthened by establishing a formal structure; however, the initiative still faced severe challenges. We observed that architectural thinking and coordination would become more entrenched among the top management over time. This seemed to occur for several reasons, through crises in the organisations' ICT governance, from a strong push by the various ministries or from experiencing that EA would eventually yield significant value. Finally, we found a common evolution of the EA initiatives through phases of optimism, resistance, decline and finally, reconsolidation for the most persistent ones.

To answer the second research question, we have rearranged the data from the first analysis, presented in Article #2, and have ended up with seven categories and 28

challenges. The two first categories, *technical complexity* and *organisational complexity*, are grounded on the fact that all the organisations have utilised ICT for many decades. Hence, the 'as is' situation entails challenges caused by historical organisational structures and technical conditions, as well as challenges related to technical innovation and political initiatives, that the organisations should address to align with society's expectations. These structures provide inputs to the EA process, whose intention is to develop the 'to be' situation. The EA process has met many challenges, among others, from the third category, *the nature of EA* itself, with large projects and a long-time horizon. We have found that *organisational issues* constitute a specific category of challenges. Since lack of *competency* has challenges in many important facets, we have classified it as a separate category even if it could be argued that it is also an organisational issue. We suggest that the two categories, organisational issues and competency, are mainly the top managers' responsibility. In the sixth category, *EA execution process,* we have sorted the challenges related to the enterprise architects' work for which the architects themselves have the main responsibility, likewise for the challenges related to the final category, *EA technical issues*.

5.5.2 Relation to the whole

Similar to Article #2, this one informs the dissertation's RQ1 and RQ3. In Article #2, the challenge categories have been created by grouping related issues. In this study, we adjust the categories in relation to the EA process. The findings suggest that organisational and technical complexities and lack of understanding of EA are severe obstacles to EA implementation. These problems lead to challenges in building the organisations' EA service capabilities, such as EA governance mechanisms. Altogether, the multifarious challenges lead to problems with anchoring the EA approach, which causes delays in the implementation and inhibits the diffusion of EA.

With the enhanced understanding of the challenges and based on suggestions from the respondents and the literature, we suggest four lessons learned to partly answer RQ3, as follows: 1) It is advisable to take small steps. 2) The use of external consultants should be carefully considered. 3) Formal architectural governance mechanisms are important for legitimacy and enforced use. 4) Executive commitment and understanding of EA are crucial for achieving a sustainable EA initiative.

5.6 Enterprise architecture and institutional pluralism: the case of the Norwegian hospital sector

In this study (Article #6), we further investigate the tensions identified in Article #3 and in Article #4, where we have suggested an incongruence between EA and healthcare characteristics. We have conducted more interviews to bring in the view from the clinicians who shall take care of the clinical perspective in the transformation projects. We employ the lenses of institutional logics to capture the dynamics of EA introduction in hospitals, while providing a new explanation for the mixed outcomes and reasons for the delays in EA institutionalisation. By understanding the key logics at play, we can make better sense of experiences with the EA initiative. Our research traces the tensions experienced by enterprise architects by answering two questions: *1) What kinds of tensions emerge in the relationship between EA and managerial, medical and IT logics? 2) How can the tensions be dealt with?*

5.6.1 Results

Although we find no significant differences when considering the aimed contributions of EA, we identify tensions between enterprise architects and other key actors regarding EA operationalisation. Based on the findings, we suggest that EA itself has a distinctive institutional logic, which we describe along three dimensions (principles, assumptions and sources of legitimacy) adapted from the works of Berente, et al. (2019) and Hansen and Baroody (2019). We use the principle dimension to identify three categories of tensions stemming from incongruence between the EA logic and the logics of IT professionals, managers and clinicians (see Table 13). The first tension concerns *fractional versus holistic orientation*. The IT professionals are used to abstracting systems into components, while the EA logic involves relating parts to the whole. The managers' logic reflects an immediate scope with cost control, while EA emphasises the ongoing transformation. The medical logic is incongruent with EA because the clinicians emphasise specialising in a defined patient group, condition or treatment stage instead of an all-inclusive strategic view.

The second tension concerns *bottom-up localisation versus top-down standardisation.* This tension involves the decision-making level. Who should be in control? Should the control structures be decentralised or centralised? The hospital sector

has a long tradition of having decentralised and autonomous entities that decide which local systems should be implemented in each hospital. This is in contrast to an EA approach, which builds on principles of centralised control in decision making. Especially, the innovativeness of the clinicians at the local hospitals suffers from the EA approach.

The third tension pertains to *short-/medium-term versus long-term outlook.* It is difficult for the other actors to prioritise the long-term activities that characterise the EA logic over supporting the urgent needs of the hospitals.

By analysing how specific projects had addressed different tensions, we find that the enterprise architects had an intermediator role and aimed to settle the tensions through a dialectic approach of dynamic balancing by trying to conciliate the conflicting institutional logics. For the first tension, the enterprise architects promoted iterative and agile principles in system projects. This could be controlled through a common way of documenting and by the use of specific EA tools. For the second tension, the enterprise architects suggested supporting local innovations to become pilots for a whole region. An architecture and design committee for regional programmes could audit the initiatives. Regarding the third tension, the balance could be achieved with enhanced EA understanding, knowledge and competencies. There should be mandatory checkpoints on project roadmaps to ensure that EA values (oriented to the long term) are included.

An important finding is that the different actors related to multiple institutional logics to achieve different goals and activated the different logics selectively; thus, institutional pluralism emerged. However, the conciliations of the coexisting logics by taking into account the logics' distinct characteristics during EA operationalisation produced different outcomes in the EA projects. We have created a model that illuminates different scenarios, as follows: a) The EA visions will be ingrained in systems and processes if the EA logic becomes foregrounded or blended with the other logics. b) The influence of EA visions on systems and processes will be insignificant if many decisions suppress EA. c) Projects or parts of them may be halted at any point if tensions remain unsettled.

5.6.2 Relation to the whole

Similar to Article #4, this one informs the dissertation's RQ2 and RQ3. However, we have brought the clinicians' voice into the analysis, which Article #1 calls for. Furthermore, in this article, we theorise the phenomena by utilising the institutional logics as theoretical lenses. This study has revealed potential tensions between different professional institutional logics and the EA institutional logic when an EA approach is introduced in national and regional health ICT programmes. The study also suggests how the tensions among the logics can be resolved or at least be moderated by dynamic balancing. This insight and holistic understanding can help organisations to develop solutions that will incorporate the logics in the systems by using a dialectic approach. The EA team must accept the co-existence of multiple logics and seek conciliating rather than trying to suppress the differences. However, if the tensions persist, there will be risks of failure in developing the desired solutions. At the same time, the enterprise architects suggest that a coercive approach aiming to impose EA principles in practice is necessary; this means that because of the organisational response to the EA initiative, the institutional elements must be reinforced. In other words, the theorising phase of the institutionalisation process is not ready, and the coercive pillar must be strengthened. Furthermore, it is important to address the incongruence during the pre-implementation phase of the actual health IS. If the EA effort will be perceived as fulfilling the value to the logics at play, EA will be legitimate and earn the opportunity for extended use and further institutionalisation. The response reflecting the institutional logics will then reinforce and strengthen the normative and the cultural pillars.

5.7 Overview of the logical flow of the articles

This thesis includes six articles, each with separate research questions aiming to answer the three coherent research questions (RQ1, RQ2 and RQ3) accounted for in this thesis.

Article #2 and Article #5 answer RQ1: *What are the main challenges of EA institutionalisation in the hospital sector?*

Article #2 and Article #5 reveals the challenges encountered in introducing holistic thinking and EA work practices. The analytical level deals with the public sector's

EA implementation, where one of the cases involves the hospital sector. The interviews from the hospital sector showed that one of the challenges comprised tensions among the different professionals; thus, I conducted a structured literature review (Article #1), where I examined prior empirical research in the context of EA and healthcare in the light of how the different institutional logics of IT professionalism, medical professionalism and managerialism were addressed. I concluded that all the logics needed more attention, especially those of the managers and the medical professionals. Article #1 provided the foundation to pursue RQ2: *What kinds of tensions emerge between different professional institutional logics and the EA institutional logic in the introduction of EA in the hospital sector?* Answering this question required descriptions of the different professionals' rationale for EA and the enterprise architects' logics. These results are presented in Article #3. The analytical level spans the hierarchical levels (national, regional and local). However, I followed up with additional interviews to include the clinicians' voice for further analysis. This is reported in Article #6.

Additionally, Article #6 addresses RQ3: *How can the challenges of EA institutionalisation in the hospital sector be addressed?* This question is also addressed in Article #4, where the tensions stemming from the incongruence between EA characteristics and healthcare characteristics are reported. Article #2 and Article #5 also contribute to answer RQ3. The relations among the data collection, the articles and the research questions are illustrated in Figure 11.

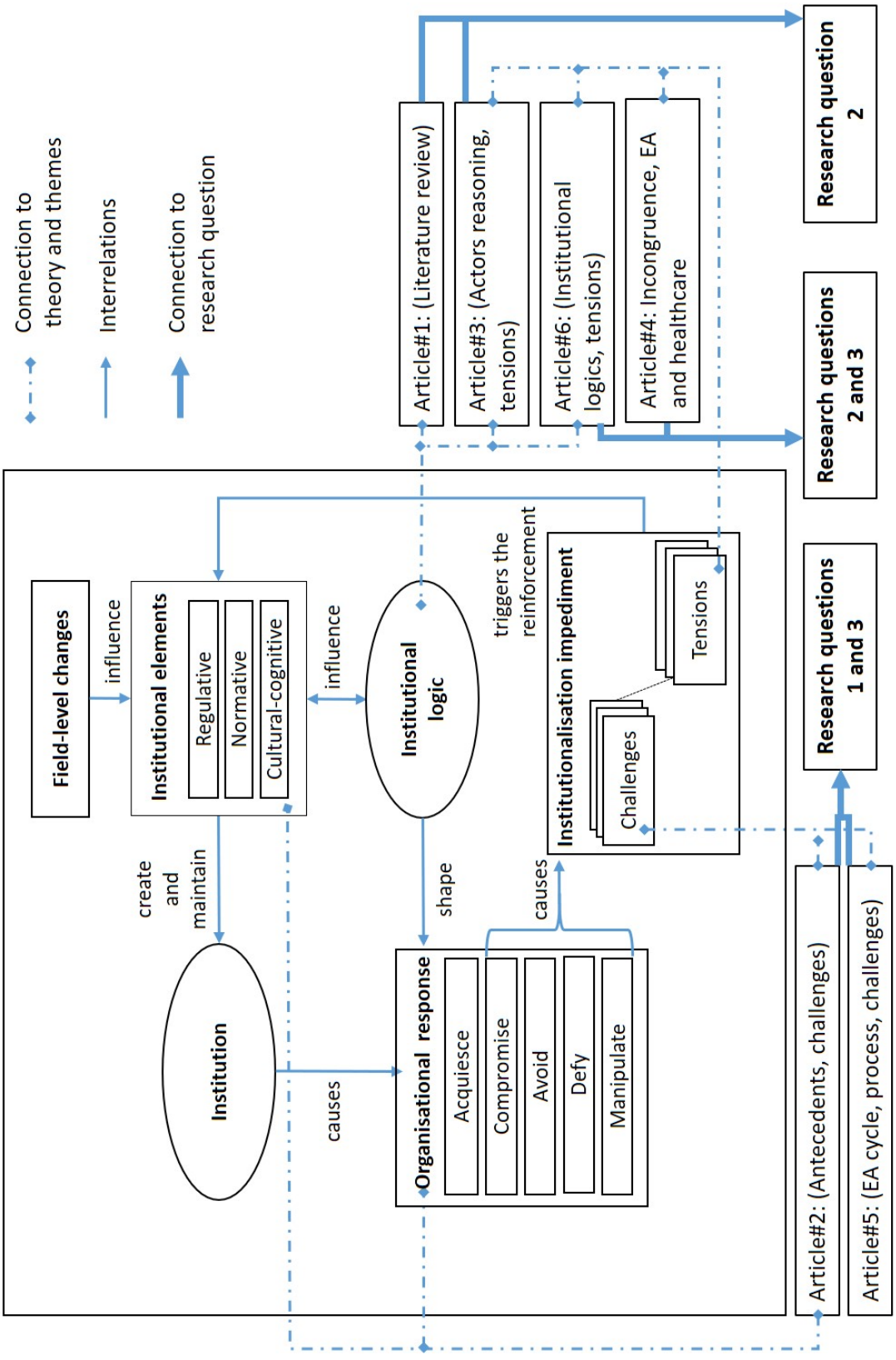


Figure 11. Overview of the articles in relation to the research questions.

6 Summary of the key findings

The Sections 6.1–6.3 discuss the answers to the three research questions formulated in Section 1.1. The answers are supported by the six articles accounted for in Chapter 5 and an additional analysis related to institutional work (see Appendix I). The theoretical and the methodological approaches are discussed respectively in Chapter 3 and Chapter 4.

Figure 12 presents an overview of the study's empirical findings. Section 3.4 provides the theoretical arguments for the model. First, there is a political demand for coordination and collaboration in the healthcare sector. At the same time, EA is perceived as an appropriate approach to deal with the demands of coordination and collaboration. Via institutional elements, EA rises as an institution, and EA institutionalisation across the sector starts. The institutional elements influence the institutional logics of the actors, and the actors' or the organisational responses are shaped by these logics. However, the logics of the actors will also influence the institutional elements. For example, the managers' logics shapes actions to influence the clinicians' logics, so the EA approach becomes normative. The responses vary from acquiescence to defiance. Some of the actors embrace the idea of EA and work for the organisations to adhere to the EA institution, some parts of the organisations start to use EA partly in portfolio programmes, and other parts of the organisations are not on board with the EA approach when it starts being used. Responses other than acquiescence cause an impediment to EA institutionalisation. Such obstacles can be experienced as challenges in the enterprise architects' work and be observed as tensions between the characteristics of healthcare and of EA and among the actualised institutional logics. When an impediment occurs, this can trigger reinforcement of institutional elements. Actors can, via institutional work, reinforce the institutional elements to diffuse EA acceptance and use. An example of institutional work is anchoring meetings to build normative acceptance, and formalisation of EA practices is a regulative element.

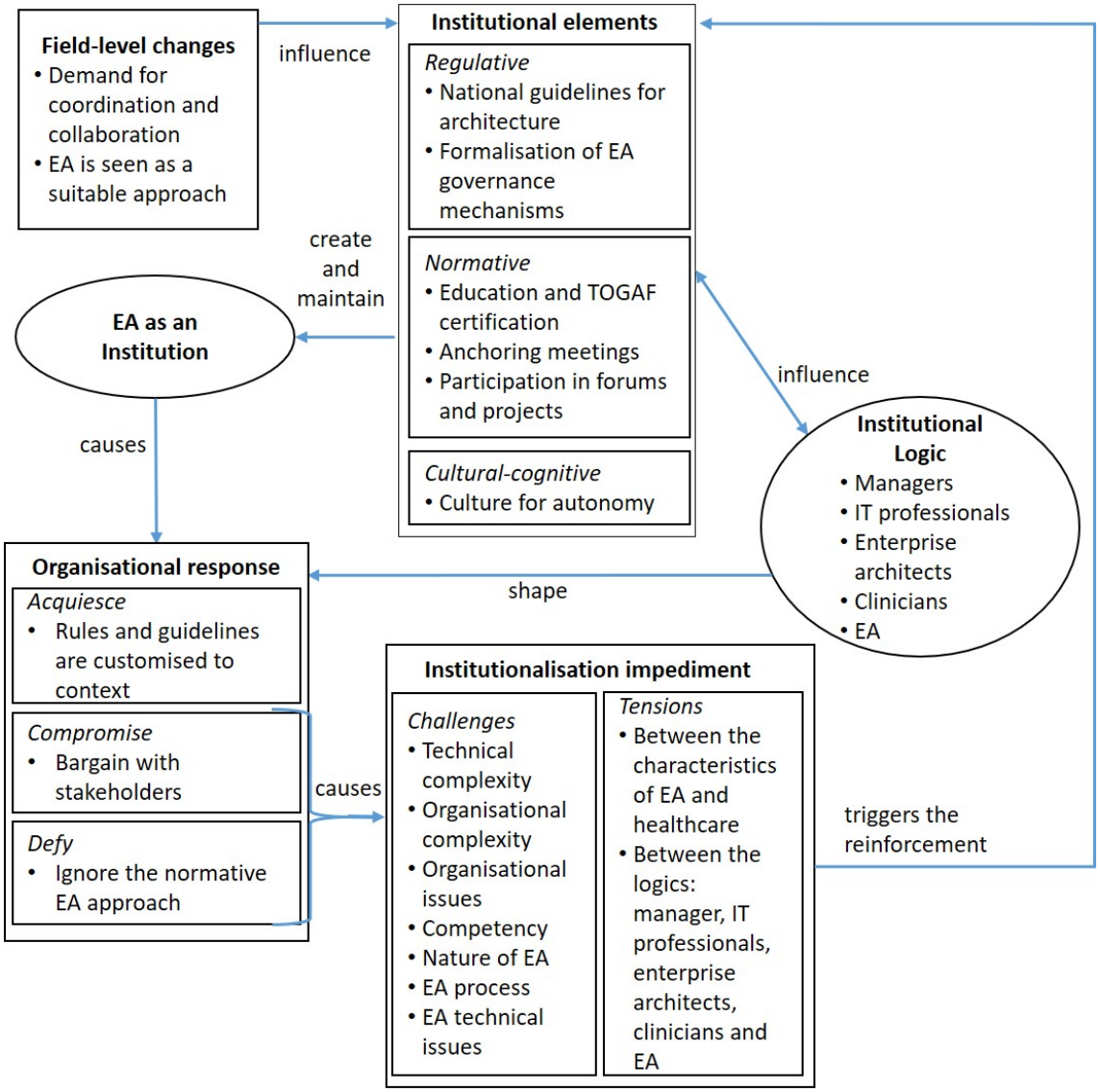


Figure 12. Overview of the key findings.

(Acronyms in the figure: EA = enterprise architecture, TOGAF = The Open Group Architecture Framework, IT = information technology)

6.1 Main challenges of EA institutionalisation

To recap, RQ1 is *what are the main challenges of EA institutionalisation in the hospital sector?*

Explicitly for hospitals, the first analysis yields seven important challenges, as follows: 1) autonomous units, 2) financial issues, 3) lengthy processes, 4) tool support, 5) lack of willingness to change, 6) lack of understanding of EA and 7) visualisation of the value of EA. Furthermore, the challenges are turned into questions

of the nature of the challenges, the causes of the challenges, their effects on the EA initiative, and the party responsible for addressing the challenges. This analysis shows that the lack of understanding of EA and its methodology, especially among top managers, leads to problems with anchoring the EA approach in the organisation and facilitating the necessary EA arrangements to induce the promised benefits of EA, which is a necessary requirement to build legitimacy for the EA initiative. Management commitment is regarded as a prerequisite for other stakeholders to perceive the usefulness of EA efforts (Ojo, Janowski and Estevez, 2012). A summary of the main challenges of EA institutionalisation, their origins and the problem owners is shown in Table 11.

Table 11. Main challenges of EA initiatives, their origins and the problem owners

Challenge	Origin	Responsibility
Autonomous units	Organisational structures History, juridical	National health authorities
Financial issues	Organisational structures. Traditional accounting and budget processes	Management at all levels (national, regional and local)
Lengthy processes	Complex context	EA governance
Diversity in tool support	Different strengths of the tools and preferences of the architects	EA governance and EA team
Lack of willingness to change	Autonomous units, power Financial issues Understanding of EA Visualisation of the EA value	See the respective prior cells in this table
Lack of understanding of EA	Lack of competency	Management at all levels (national, regional and local)
Visualization of the value of EA	Uncertainty about the EA value, and difficulty in presentation	EA team and top management

Seen from an institutionalisation process perspective (see Subsection 3.3.3), the innovation step has been taken at hierarchical levels higher than the level of the organisational units with the operationalisation responsibility. However, EA is partly implemented in parts of the organisational productive life under the RCS programme. Obviously, the EA approach is normative at the national level and among the enterprise architects in all sub-organisations. However, the insufficient

focus on the efforts needed to carry out the theorising phase makes it challenging for the EA approach to be diffused to all actors. At the national level, the coercive rules and guidelines are very general; thus, the regulative pillar is weak, and consequently, it is difficult to launch the process.

Informal forums were also established at the national level, with participants from all RHAs. There was an informal forum for enterprise architects at SERHA at an early stage, but it ended at a time when EA lost momentum in the organisation. The forums' advisory nature also posed a challenge. Nevertheless, the normative pillar to institutionalise EA seemed strong among the persons who were actually educated as enterprise architects or TOGAF-certified. However, for other important stakeholders, such as business managers and clinicians, the meaning and value of EA seemed unclear. Hence, the normative pillar was overall weak for these actors, which led to insufficient commitment to the EA initiative, in turn causing subsequent challenges related to autonomy, financial issues and the willingness to change. Notwithstanding these problems, in the interviews with the clinicians who had worked in EA programmes and the managers who had to restructure the organisations because of crises in the operations, they reported that the normative pillar was strengthened over time.

To further the diffusion among the actors, EA needs to prove its value. Since this is challenging for the EA initiative, the inability to trace the value back to EA is a critical obstacle to the institutionalisation process. This is in line with Tolbert and Zucker's (1983) suggestion that early rejection of an innovation can occur if there is a lack of consensus on its value. Moreover, crediting EA initiatives is difficult when the progress is slow (Bui, 2015).

Even if the EA lost momentum in SERHA, it gained new opportunities approximately one year after the start of Digital Renewal. The CEO wanted improved coordination across the projects; thus, enterprise practices were developed and approved in 2015, and the new practices were used in the RCS programme. However, RCS faced challenges of EA thinking and use. To cite some examples, the project methodology that was owned by HP did not support EA, the personnel from HP or from different consultancy companies were unfamiliar with the practices in RCS, and some project managers avoided involving enterprise architects. The lack of a common repository and the use of different tools did not give the organisation the benefit of an overview of the interdependencies across the ICT landscape.

Measures taken by the SERHA to improve the situation is reported in Subsection 6.3.

In the study, some challenges had more principle characteristics regarding how the EA should be governed and the appropriateness of regional EA in the hospital context. The tensions were observed among enterprise architects at different levels of the organisation, among enterprise architects, healthcare managers and IT managers, and between enterprise architects and clinicians. Thus, RQ2 arose, which is the theme of the next section.

6.2 Tensions between professional logics and the EA logic

To recap, RQ2 is *what kinds of tensions emerge between different professional institutional logics and the EA institutional logic in the introduction of EA in the hospital sector?* The different professional institutional logics in the analysis are managerialism, medical professionalism and IT professionalism, which are asserted to be the dominant logics for design decisions on health IS (Heeks, 2006). The EA logic is derived and described in Article #6.

The analysis showed tensions grounded on the incongruence between EA characteristics and healthcare characteristics (see Table 12). To offer a theoretical explanation for the tensions, more data were collected, and the analysis proceeded using the institutional logic lens. This analysis yielded a more nuanced picture, making it possible to describe the tensions among the different logics and EA observed in ongoing EA projects in SERHA (see Table 13).

Table 12. Incongruence between EA and healthcare.

Incongruence themes identified	Description
Top-down versus bottom-up planning	A plan-driven EA approach collides with continuous innovation from the healthcare practitioners
System versus clinical knowledge	EA aims for process standardisation, which collides with clinicians' autonomy and judgement of the best quality of care
Global versus local arrangements	Process standardisation collides with a local unit's specific process customisation
Patient privacy versus patient safety	Data integration demands a high level of privacy and authorisation arrangement, which collides with healthcare personnel's need for quick access to all relevant data

Table 13. Overview of tensions between the enterprise architecture (EA) logic and the prevailing logics in hospitals

Tensions related to operationalising EA	Logic incongruences
T1: Fractional versus holistic orientation	
Breaking down systems into components versus relating parts to the whole	IT professionalism versus EA
Controlling endeavours with a definite scope versus stimulating ongoing transformation	Managerialism versus EA
Specialising in a defined patient group, condition or treatment stage versus providing an all-inclusive strategic view	Medical professionalism versus EA
T2: Bottom-up localisation versus top-down standardisation	
Local process support versus global standards	IT professionalism versus EA
Organisational unit view versus health system-wide view	Managerialism versus EA
Systems inscribing clinical knowledge versus innovation from the top	Medical professionalism versus EA
T3: Short-/medium-term versus long-term outlook	
Immediate functional needs versus long-term visions	IT professionalism versus EA
Resources for immediate return versus future improvement	Managerialism versus EA
Hands-on clinical work versus design activities	Medical professionalism versus EA

This study suggests conceptualising EA as a distinct institutional logic. As EA becomes part of the institutional context, its logic becomes part of the resources that actors can draw on in their everyday interactions. Consequently, points of friction from the analysis can be traced to incongruences between the EA logic and the other established logics in healthcare. The established logics are ingrained in the customary ways of working and the established power structures, as identified in prior research on IS in hospital contexts (Heeks, 2006; Boonstra, Albert, van Offenbeek and Vos, 2017; Boonstra, A., Eseryel and van Offenbeek, 2018). In the studied case, although the reasoning for the introduction of EA is clear and the high-level aims are universally accepted, differences between the EA logic and the other dominant institutional logics emerge during action taking.

Despite the one-to-one mapping of incongruences between EA and the different professionalism logics shown in Table 13, the empirical material shows that the actors do not always adhere to the logics of their professional groups. The actors

may activate several different institutional logics selectively, and it is essential to be aware of the importance of the actors' discretion in their everyday use of the logics available in a domain. Prior IS research generally assumes that actors adhere to the logics of their professional roles due to the differences in their work, education and overall socialisation patterns (Boonstra, A., Eseryel and van Offenbeek, 2018). This simplification reduces action taking to a few given patterns that hardly change. Thus, the findings of this thesis question whether this one-to-one mapping between logics and actor roles is adequate.

6.3 Addressing challenges of EA institutionalisation

To recap, RQ3 is *how can the challenges of EA institutionalisation in the hospital sector be addressed?*

From the interviews and the documents, I could draw a timeline for SERHA with respect to important events and descriptions that had an impact on EA institutionalisation (see Appendix H). Furthermore, I analysed the identified activities to institutionalise EA and to address the challenges, as well as the time periods when these were implemented. The institutional work is mapped into Lawrence and Suddaby's (2006) framework (see Appendix I), but this is not an exhaustive list.

In the first period (2007–2011), EA was a new approach that had not been previously used in the organisation. The institutional work in this first phase was to make the organisation ready, involving hiring staff, certification of key personnel and building legitimacy to EA by conducting a large education programme.

EA as a methodology was introduced in SERHA around 2009, and the deputy director and the CIO were facilitating and supporting the EA initiative coming from IT strategists. New hiring, TOGAF certification and education of stakeholders were on the agenda. The types of institutional work were advocacy, defining (e.g., a hierarchical structure with chief enterprise architect) and education in order to create a new institution, which were under the regulative and the cultural categories of institutional elements. The few actors involved in the beginning had already been exposed to normative pressure via networks, as well as the discourse at that time. When the first enterprise architects were certified, they developed an education programme that was intended to prepare the organisation for enterprise architecture thinking, which was a step towards changing the normative association

with how IS development should be conducted in the future. More than 100 different stakeholders were educated in this first phase.

In 2011, EA lost momentum in SERHA. Despite putting the EA initiative on hold, the chief enterprise architect and the CIO participated in developing EA practices at the national level. In this way, the CIO acquired good knowledge of the concept. In 2013, a new CEO was hired, and SERHA started the portfolio programme Digital Renewal. The over 3,000 anchoring meetings arranged by the two project managers represented institutional work of the *constructing identities* type, where the actors in the field were exposed to the new normative situation.

Approximately one year after the start of Digital Renewal, the CEO wanted improved coordination across the projects; thus, enterprise practices were developed and approved in 2015. Digital Renewal became organised into three programmes, and the new practices were used in one of the programmes, named RCS. The institutional work entailed participating in normative network, and doing so would produce knowledge; thus, cultural and cognitive processes would be at work. The enterprise architects had advocated EA as a means for coordination of the portfolio in Digital Renewal. This advocacy resulted in two formal mechanisms for vesting – the architectural board and the architecture and design group having the power to guide the RCS programme. Vesting is a regulative mechanism to monitor and manage a new institution.

RCS faced challenges with the adoption of EA thinking and use. To cite several examples, the project methodology that was owned by HP did not support EA, and the personnel from HP or from different consultancy companies were unfamiliar with the practices in RCS. The lack of a common repository and the use of different tools did not give the organisation the benefit of an overview of the interdependencies across the ICT landscape. To remedy the conditions in RCS, EA was made mandatory from mid-2017, including a template for the TOGAF Architecture Definition Document, the use of a shared repository and the decision to use common tools. This is an example of how organisational response leading to challenges can reinforce new institutional elements to maintain the new institution, in this case, by introducing new regulative elements (see Figure 12). Appendix H shows a timeline of the historical events in SERHA that altogether influenced EA institutionalisation.

The methodology was (in the autumn of 2018) adjusted after a year of experience. There are educational and support activities in conjunction with these changes. The enabling work is necessary to maintain and strengthen the institution and forms a regulative pressure. The organisation follows up with education in the form of small courses, and the architecture and design group uses the regular meetings to show and discuss how to use the enhanced methodology. These actions are of the embedding and routinising type, used to influence the project members' normative attitude. The architecture and design group also monitors the work and argues for following the methodology, thereby policing towards compliance. The RCS programme do not apply deterrence other than the implicit risk that the contracts of external consultants will not be renewed.

We see that advocacy is prior to vesting, and all creating activities are cyclical, as anticipated by Lawrence and Suddaby (2006). The narrative demonstrates that in large organisations, where the responsibility for the organisational architecture is distributed among different autonomous units with varying approaches to EA, the normative work is especially challenging, and it will take a long time to change the actors' mindset. In fact, the actors probably change their mindset, depending on which project they work on (Sommerville, 2011). As the findings show, this implies that creation activities and maintenance activities have to be performed in parallel because there will continuously be new projects, new people and even new sub-units involved. Without maintenance, 'the coercive foundations for institutions are likely to crumble, becoming empty threats or promises rather than self-activating means of institutional control' (Lawrence and Suddaby, 2006, p.232).

From the experiences outlined above and from the interviewees' suggestions to improve the situations, I have connected the institutional work that can support EA institutionalisation with respect to the challenges outlined in Section 6.1. To address the three tensions described in Article #6 (see Subsection 5.6.1, Table 13 and Section 6.2), dynamic balancing of the different professional institutional logics can be a useful tactic towards successful EA projects. The enterprise architects, together with the project management, play an important role as intermediators, but support from the top management and directorates is necessary. Normative work is imperative; however, regulative support to make the task manageable and controllable is even more necessary. Table 14 summarises the suggestions to deal with the major challenges and tensions.

Table 14. Suggestions to deal with the major challenges.

Challenges and *tensions*	Institutional work	Example of empirical support
Autonomous units	Regulative: Assessment of the governance arrangements and the authority related to architectural development and decisions, at both national and regional levels	Only part of the ICT programmes use EA When EA is used in programmes, there can be defiance of EA practices if they are not formalised
Financial issues	Regulative: National changes of finance model Normative: Buy-out arrangements among jurisdictional units	Demanding to take money from the daily operations related to the treatment of the patients Financial issues can hinder knowledgeable and legitimate people from participating in the projects
Lengthy processes	Cultural-cognitive: Enable iterative and incremental development	Lead to useful results along the way, provide better opportunities for agility and innovation, and build trust in the EA approach
Tool support	Normative and cultural: Adjust tools to fit normative assumptions and cultural needs Regulative: Adjust frameworks to achieve coherent management	Development and formalised use of TOGAF Architecture Definition Document, with subsequent maintenance
Lack of willingness to change	See financial issues Additional normative: 1. Provide incentives for clinical personnel to participate in projects 2. Provide incentives for managers to free up personnel (a specialist is not easy to replace, e.g., collaboration across the country) 3. Education and participation in EA work, valid for all professions 4. Improvement in visualisation of the EA value Additional cultural-cognitive: Peer principle (advocacy, education and training in new systems are undertaken by peers)	Anchoring meetings Adjustment of EA artefacts, so the clinicians understand the outlined process The end users listen to their colleagues from the same profession (physician to physician, nurse to nurse)

Table 14. Continued.

Challenges and *tensions*	**Institutional work**	**Example of empirical support**
Lack of understanding of EA	See point 3 in the above cell	
Visualisation of the EA value	Small increments can facilitate proof Visions must comply with the normative understanding of the actors	A project is deliberately narrowed down to the most imperative for the end users, and the value of EA becomes visible though the EA vision is not realised
Fractional versus holistic orientation	Work to deinstitutionalise the old institution Work towards reducing the use of stage-gate methods in system development, and promote iterative and agile principles in system projects Regulative support can be formal guidelines for common ways of documentation and use of specific EA tools	Established system development practices and project management approaches create challenging trade-offs
Bottom-up localisation versus top-down standardisation	Normative work to reach consensus and have a collaborative environment with the vendors Encourage the vendors to deliver solutions that are technically or functionally compliant and to pursue innovations that keep their systems compliant over time Regulative elements entail specifying commonly agreed compliance requirements A formal architecture and design committee for regional and national programmes is also recommended	Support and embrace local innovations that can become pilots for a whole region or for the nation
Short-/medium-term versus long-term	Work in the normative sphere with education and theorising activities Regulative support can be establishing mandatory checkpoints on project roadmaps to ensure that EA values (oriented to the long term) are included	Enhance the EA understanding of all actors, the knowledge about managing EA, and the competencies in EA work

7 Contributions

In this section, I present the contributions of this thesis. The contributions lie in the intersection between two bodies of literature – the institutional and the EA literature. First, I discuss the contributions to theory, followed by a summary of the contributions for practice.

7.1 Contributions to theory

Interpretive research has certain limitations, according to what kinds of theories can be developed. IS researchers have traditions for developing theories in accordance with the five theory types described by Gregor (2006), when reporting on phenomena related to 'what is, how, why, when, where and what will be'. The researchers' goals and aims steer what theory types they pursue to develop. Especially for interpretive case studies, Walsham (1995) argues how theory can be built through a single case study and identifies four types of generalisations in IS case studies: 1) development of concepts, 2) generation of theory, 3) drawing of specific implications and 4) contributions of rich insights. My research consists of *'what'* and *'how'* questions. The thesis provides an explanation for a complex socio-technical issue but is limited to a specific context.

Altogether, the thesis makes contributions of rich insights (Walsham, 1995), as well as builds on and enhances the knowledge base of the EA research community. The thesis provides more knowledge about the complex process of EA institutionalisation in the hospital sector. The thesis shows the importance of understanding the different institutional logics when an organisation's EA is developed, as well as how institutional work can be used to strengthen EA as an institution and influence the institutionalisation process.

The contribution to the EA research discipline spans several research streams. The research fits in the category of the most recent approach mentioned by (Rahimi, Gøtze and Møller, 2017), which includes organisational strategy and business development. This thesis contributes to the streams of EA implementation, EA use and EAM. The thesis provides increased knowledge of EAM and architectural practices when EA is used as a strategy in the public sector in general and within the hospital sector in particular.

The key challenges of EA implementation are pointed out and discussed in Article #2 and Article #5. Article #3, Article #4 and Article #6 describe a particular type of challenge, observed as tensions among major stakeholders in the EA initiative in the hospital context. Additionally, Article #5 describes a common evolution of EA initiatives in the public sector. This study responds to calls for more research related to problems with EA implementation and adoption issues (Dang and Pekkola, 2017). Dang and Pekkola (2016) also call for more research related to problems with EA in the public sector by using case studies from other countries.

Article #3 contributes to the EA knowledge base by describing the persona of enterprise architects, which illuminates the differences among them, depending on which organisational level they belong. Researchers have described the enterprise architect's multifaceted functions; for instance, a 'unique role that the enterprise architect provides is aligning technology with the business goals and objectives by managing the complex set of interdependencies to communicate a common or shared vision of the strategic direction of the enterprise' (Strano and Rehmani, 2007, p.386). Furthermore, Gøtze (2013) notes the importance of understanding the organisation and the dialectical skills of the architect. While previous research on enterprise architects provides normative and descriptive accounts of their roles, our study delivers a sociocultural account of enterprise architects' institutional logics in a hospital setting.

Article #6 suggests that EA can be conceptualised as a distinct institutional logic. As EA becomes part of the institutional context, its logic becomes part of the resources that actors can draw on in their everyday interactions. It is the first time the EA logic is described along three different dimensions (principles, assumptions and sources of legitimacy) that are adapted from the works of Hansen and Baroody (2019) and Berente, et al. (2019).

Article #5 introduces a stepwise model of how an EA initiative will evolve over time. Article #6 presents a conceptual model of how EA projects can unfold in relation with different institutional logics by highlighting the importance of dynamic balancing across different logics when introducing EA as a governance framework. To achieve this dynamic balancing, it is important to explore rather than suppress tensions (Lewis, 2000). This means that the existing culture and the logics at play in the hospital sector should not be undermined by introducing EA.

Finally, the thesis contributes with development of a new empirically grounded model synthesising theoretical concepts with research findings to explore EA institutionalisation (see Sections 3.4 and 5.7 and the introduction to Section 6). This is an important contribution to forward EA practices in response to Winter's (2016) call for further studies to understand the institutionalisation's dynamics in their specific environments to reveal contingencies influencing the institutionalisation process.

7.2 Contributions to practice

This thesis has identified key challenges of EA implementation in the hospital sector. EA is important for achieving better coordination of the ICT systems to provide citizens with improved services. These are important goals at the ministry level. However, the thesis shows that the units' autonomy allows them to dismiss or only partly participate in the EA initiative. The results from the thesis can inform managers and enterprise architects about dependencies related to EA institutionalisation.

Article #5 proposes a pattern of what organisations can anticipate when embarking on an EA journey if they lack a firm mandate from the start. The findings presented in Sections 6.1 and 6.2 show several sources that can impede the initiative. The results indicate that regulative pressure alone is not enough, but normative work is imperative to have the actors ready for the new institution. Enterprise architects must spend time on advocating the EA approach and the need for formal governance elements. At national and regional levels, the top managers must realise that they have to follow up the initiative with normative work among the other managers and subject matter specialists. Section 6.3 provides a summary of the implications for practice, with concrete suggestions on how the major challenges can be addressed.

The thesis also shows incongruences in the characteristics of EA and of healthcare leading to tensions between professional actors; it would be wise to take these insights into account in the ICT strategy. Based on a synthesis of prior literature, Article #4 proposes a set of resolutions for the identified incongruence themes. These resolutions can guide the practitioners involved in the introduction of EA in hospital settings.

8 Conclusions

In this thesis, I have studied EA institutionalisation in the hospital sector. I have examined the phenomena through three research questions. RQ1 has been formulated to explore and understand the key challenges to the EA approach and its implementation. With RQ2, I have tried to understand the tensions that emerged among the different professions involved when EA was implemented or operationalised in the specific context of hospitals. RQ3 has been formulated to synthesise the findings related to how the challenges and the tensions can be addressed. An interpretive case study has been conducted to explore EA institutionalisation in Norwegian hospitals, with a special focus on the South Eastern Region.

To identify the key challenges, I have used a grounded theory approach and have identified the categories of the challenges through an analytical process. To study the introduction of EA, I have used the organisational theory of the creation of an institution and the theory of the organisational response to institutional pressure. Furthermore, efforts have been made to depict the EA process and point to the causes of the changes in the momentum for the initiative that either impeded the process or gave rise to new opportunities.

The challenges that have been revealed have encouraged me to orient the research towards the institutional logics of the main actors in the design of hospital IS. The main actors are the IT professionals, the managers and the medical professionals. However, the EA logic itself requires attention to understand the whole picture in relation to everyday action taking. The empirical data show that prioritising the EA logic is difficult in hospitals despite regulative and normative support. The differences among the institutional logics, in addition to the incongruence between healthcare as a domain and the practice of EA, lead to tensions that have to be resolved.

In the final research question, where I have sought to explain how the challenge can be resolved or at least mitigated, I bring in theories of institutional work to show how different institutional pillars can be used to create and maintain EA as an institution.

This doctoral thesis contributes to EA research by offering an enhanced understanding of EA institutionalisation in the hospital sector. First, challenges are identified across the EA process from ‘as is’ until ‘to be’, and the rationale behind the

challenges are explained. Through an empirical example, I have shown how specific institutional work can be used to facilitate EA institutionalisation. By developing a description of the enterprise architects' logics and assigning an institutional logic to EA itself, the EA community receives improved tools to utilise in future research. I have also shown how different institutional logics influence EA projects. This thesis suggests some solutions to the various tensions related to EA, but there is clearly the need for more research on how the tensions can be resolved in mega projects spanning several hospitals and jurisdictional organisations.

The explanations for the challenges are grounded on theory. Both these explanations and the suggestions made on the basis of the explanations can inform organisations about what to expect when embarking on an EA journey and how to prepare the organisations for EA in interorganisational healthcare initiatives.

8.1 Limitations and future research

In this section, I discuss the limitations regarding the generalisability of my research findings. The limitations related to the research design are explained in Subsection 4.2.6. I recognise that the limited stakeholder groups involved in the study restricts the generalisability of the insights presented in the articles and in the final contribution. The findings reported in this thesis are based on empirical data, complemented by an extensive document review and analysed in an iterative way. Nonetheless, the research has limitations, thus providing future research possibilities.

I have studied the hospital sector; thus, other significant segments, such as primary healthcare, have not been examined. Further research could address this context to obtain a more complete understanding about the EA implementation issues and challenges in healthcare. Despite the limitations to the generalisability, the findings should serve to enlighten government enterprises about the challenges related to EA institutionalisation. Since the Scandinavians have similarities in their cultures, the findings are relevant in the Scandinavian context but can be questioned in other countries and cultures. Further research should integrate the results of similar studies in other countries.

Second, more research on the complex conditions that arise when EA is introduced should be encouraged. The institutionalisation processes are described by other

researchers (e.g. Tolbert and Zucker 1996), but there is a lack of elaboration on the necessary practical work that accompanies the processes (Lawrence and Suddaby, 2006). I suggest that it is important to continue investigating institutional work for the introduction of EA, as well as how institutional orders perform a function in this context.

Third, in the structured literature review, Article #1, I call for more research related to the challenges of describing the value of EA. Researchers can address the managerial professionalism institutional logics with further studies revolving around evaluation and measurement to facilitate the explanation of the EA benefits and value for healthcare organisations. Another knowledge gap that I observe is that because of the strong impact of clinicians (Currie and Guah, 2007; Bradley, Pratt, Thrasher, et al., 2012), there should be more knowledge about how to support them to adopt the holistic view demanded by pervasive healthcare. In that respect, this study's findings about the incongruences between EA and healthcare can be sources of new ideas.

List of references

Aanestad, M., Grisot, M., Hanseth, O. and Vassilakopoulou, P. 2017. Information Infrastructures and the Challenge of the Installed Base. In: M Aanestad, M Grisot, O Hanseth & P Vassilakopoulou eds. 2017. *Information Infrastructures within European Health Care. Working with the Installed Base*, London: Springer, pp.25–33.

Aier, S., 2014. The role of organizational culture for grounding, management, guidance and effectiveness of enterprise architecture principles. *Information Systems and e-Business Management*, 12(1), pp.43–70.

Aier, S., Gleichauf, B. and Winter, R., 2011. Understanding enterprise architecture management design-an empirical analysis. In: *10th International Conference on Wirtschaftsinformatik*. Zurich, Switzerland, 16–18 Feb. 2011. alexandria.unisg.ch.

Alford, R.R. and Friedland, R., 1985. *Powers of theory: Capitalism, the state, and democracy.* Cambridge University Press.

AlSoufi, A., 2014. Bahrain National Enterprise Architecture Framework: a Platform towards a GCC EA Initiative. *GSTF Journal on Computing*, 2(1), pp.73–80.

Alvesson, M. and Ashcraft, K.L. 2012. Interviews. In: G Symon & C Cassell eds. 2012. *Qualitative organizational research: core methods and current challenges*, Sage, pp.239–257.

Armour, F.J., Kaisler, S.H. and Liu, S.Y., 1999. A big-picture look at enterprise architectures. *IT professional*, 1(1), pp.35–42.

Bakar, N.A.A. and Selamat, H., 2016. Investigating Enterprise Architecture implementation in public sector organisation: A case study of Ministry of Health Malaysia. In: *3rd International Conference on Computer and Information Sciences*, Kuala Lumpur, Malaysia, 15–17 Aug. 2016. IEEE.

Banaeianjahromi, N., 2018. The Role of Top Management Commitment in Enterprise Architecture Development in Governmental Organizations. *Complex Systems Informatics and Modeling Quarterly*, 17, pp.95–113.

Banaeianjahromi, N. and Smolander, K., 2016. Understanding Obstacles in Enterprise Architecture Development. In: *24th European Conference on Information Systems*. Istanbul, Turkey, 12–15 June 2016. AISeL.

Barber, R.M., Fullman, N., Sorensen, R.J., Bollyky, T., McKee, M., Nolte, E., Abajobir, A.A., Abate, K.H., Abbafati, C. and Abbas, K.M., 2017. Healthcare Access and Quality Index based on mortality from causes amenable to personal health care in 195 countries and territories, 1990–2015: a novel analysis from the Global Burden of Disease Study 2015. *The Lancet*, 390(10091), pp.231–266.

Barley, S.R. and Tolbert, P.S., 1997. Institutionalization and structuration: Studying the links between action and institution. *Organization studies*, 18(1), pp.93–117.

Battilana, J., Leca, B. and Boxenbaum, E., 2009. How actors change institutions: towards a theory of institutional entrepreneurship. *The Academy of Management Annals*, 3(1), pp.65–107.

Benbasat, I. and Zmud, R.W., 2003. The identity crisis within the IS discipline: Defining and communicating the discipline's core properties. *MIS Quarterly*, pp.183–194.

Berente, N., Lyytinen, K., Yoo, Y. and Maurer, C., 2019. Institutional logis and pluralistic respons to enterprise system implementation: A qualitativ meta-anlysis. *MIS Quarterly: Management Information Systems*, 43(3), pp.873–902.

Bergland, C. 2018, *På vei mot én innbygger – én journal*, Video, 9 March, Directorate of eHealth, vimeo.com.

Bernard, S.A., 2012. *An introduction to enterprise architecture.* 3rd ed. Bloomington IN, United States: AuthorHouse.

Berwick, D.M., Nolan, T.W. and Whittington, J., 2008. The triple aim: care, health, and cost. *Health Affairs*, 27(3), pp.759–769.

Bloomberg, J., 2014. *Is Enterprise Architecture Completely Broken?* [online] Forbes. Available at: <https://www.forbes.com/sites/jasonbloomberg/2014/07/11/is-enterprise-architecture-completely-broken/#5a495c843710> [Accessed 15 Dec. 2016].

Bloomberg, J., 2016. *Change As Core Competency: Transforming The Role Of The Enterprise Architect*. [online] Forbes. Available at: <https://www.forbes.com/sites/jasonbloomberg/2016/06/16/change-as-core-competency-transforming-the-role-of-the-enterprise-architect/#4849269a164a> [Accessed 15 Dec. 2016].

Boh, W.F. and Yellin, D., 2006. Using enterprise architecture standards in managing information technology. *Journal of Management Information Systems*, 23(3), pp.163–207.

Boland, R.J. and Tenkasi, R.V., 1995. Perspective Making and Perspective Taking in Communities of Knowing. *Organization science*, 6(4), pp.350–372.

Boonstra, A., Eseryel, U.Y. and van Offenbeek, M.A.G., 2018. Stakeholders' enactment of competing logics in IT governance: polarization, compromise or synthesis? *European Journal of Information Systems*, 27(4), pp.415–433.

Boonstra, A., van Offenbeek, M.A. and Vos, J.F., 2017. Tension awareness of stakeholders in large technology projects: a duality perspective. *Project Management Journal*, 48(1), pp.19–36.

Boxenbaum, E. and Jonsson, S. 2008. Isomorphism, diffusion and decoupling. In: R Greenwood, C Oliver, K Sahlin & R Suddaby eds. 2008. *The Sage handbook of organizational institutionalism*, Sage, pp.78–98.

Bradley, R.V., Pratt, R.M.E., Byrd, T.A., Outlay, C.N. and Wynn Jr, D.E., 2012. Enterprise architecture, IT effectiveness and the mediating role of IT alignment in US hospitals. *Information Systems Journal*, 22(2), pp.97–127.

Bradley, R.V., Pratt, R.M.E., Byrd, T.A. and Simmons, L.L., 2011. The role of enterprise architecture in the quest for IT value. *MIS Quarterly Executive*, 10(2), pp.73–80.

Bradley, R.V., Pratt, R.M.E., Thrasher, E., Byrd, T.A. and Thomas, C., 2012. An examination of the relationships among IT capability intentions, IT infrastructure integration and quality of care: A study in U.S. hospitals. In: *45th Hawaii International Conference on System Sciences*. Maui, HI, USA, 4–7 Jan. 2012. IEEE.

Brevig, B., 2006. Utfordringer ved interdisiplinær systemutvikling: En studie av brukermedvirkning og prosessorganisering ved Rikshospitalet. Master. University of Oslo.

Brinkman, S. and Kvale, S., 2015. Interviews: Learning the craft of qualitative research interviewing, Thousand Oaks, CA: Sage.

Brown, J.S. and Duguid, P., 2001. Knowledge and Organization: A Social-Practice Perspective. *Organization science*, 12(2), pp.198–213.

Buckl, S., Ernst, E.M., Lankes, J., Matthes, F. and Schweda, C.M., 2009. *State of the art in enterprise architecture management* . München: Technische Universität München.

Bui, Q., 2015. Increasing the Relevance of Enterprise Architecture through "Crisitunities" in US State Governments. *MIS Quarterly Executive*, 14(4), pp.169–179.

Bygstad, B., Hanseth, O. and Le, D.T., 2015. From it silos to integrated solutions. A study in e-health complexity. In: *23rd European Conference on Information Systems*. Münster, Germany, 26–29 May.

Bygstad, B. and Munkvold, B.E., 2011. Exploring the role of informants in interpretive case study research in IS. *Journal Of Information Technology*, 26(1), pp.32–45.

Bygstad, B. and Pedersen, N., 2012. Arkitektur handler om praktisk arbeid i organisasjonen, ikke en tegning. En forskningsagenda om IT-arkitekters utfordringer. In: *NOKOBIT*, Universitetet i Nordland, Norway, 19–21 Nov 2012. NOKOBIT-stiftelsen og Akademika forlag.

Carota, S., Corradini, F. and Re, B., 2010. The role of applicative cooperation in the Marche Region Enterprise Architecture. In: *eChallenges e2010*. Warsaw, Poland, 27–29 Oct. 2010. IEEE.

Chen, D., Doumeingts, G. and Vernadat, F., 2008. Architectures for enterprise integration and interoperability: Past, present and future. *Computers in industry*, 59(7), pp.647–659.

Currie, W.L. and Guah, M.W., 2007. Conflicting institutional logics: A national programme for IT in the organisational field of healthcare. *Journal Of Information Technology*, 22(3), pp.235–247.

Dale, M. and Scheepers, H., 2019. Enterprise architecture implementation as interpersonal connection: Building support and commitment. *Information Systems Journal*.

Dang, D.D. and Pekkola, S., 2016. Root Causes of Enterprise Architecture Problems in the Public Sector. In: *20th Pacific Asian Conference on Information Systems*. Chiayi, Taiwan, 27 June–1 July 2016. AISeL.

Dang, D.D. and Pekkola, S., 2017. Systematic Literature Review on Enterprise Architecture in the Public Sector. *The Electronic Journal of e-Government*, 15(2), pp.132–154.

Delanty, G. and Strydom, P. eds., 2003. *Philosophies of social science: The classic and contemporary readings*, Maidenhead: Open Univeristy Press.

Den-Norske-Legeforeningen, 2015. *Fra da til nå - den lange historien om elektronisk pasientjournal i legekontor*. [pdf]. Available at: <https://beta.legeforeningen.no/contentassets/9030375a5fff460ea7c037ef98f90ad2/151027-allmennlegene-og-ikt.pdf> [Accessed 03 July 2019].

Denert-Stiftungslehrstuhl, E., 2015. *IT Architecture Standardization Survey*, . München: Technische Universität München.

DIFI, 2010. *Nasjonale felleskomponenter i offentlig sektor*. [pdf] Agency for Public Management and eGovernment Available at: <https://www.difi.no/sites/difino/files/difi-rapport-2010-17-nasjonale-felleskomponenter-i-offentlig-sektor-pdf-.pdf> [Accessed 06 Oct. 2016].

DIFI, 2012. *Overordnede IT arkitekturprinsipper for offentlig sektor*. [pdf] Agency for Public Management and eGovernment Available at: <http://www.difi.no/sites/difino/files/arkitekturprinsipper-2.1.pdf> [Accessed 28 May 2015].

DIFI, 2017. *Årsrapport 2016*. [online]. Available at: <https://www.difi.no/sites/difino/files/arsrapport_difi_2016.pdf> [Accessed 24 Oct. 2017].

DIFI, 2019. *Si din mening om prinsippene for IT-arkitektur i offentlig sektor*. [online]. Available at: <https://www.difi.no/nyhet/2019/05/si-din-mening-om-prinsippene-it-arkitektur-i-offentlig-sektor> [Accessed 30 May 2019].

DiMaggio, P. 1988. Interest and agency in institutional theory. In: LG Zucker ed., 1988. *Research on Institutional Patterns and Organizations: Environment and Culture*, Cambridge, MA: Ballinger, pp.3–21.

DiMaggio, P. and Powell, W.W., 1983. The iron cage revisited: Collective rationality and institutional isomorphism in organizational fields. *American Sociological Review*, 48(2), pp.147–160.

Directorate of eHealth, 2017a. *IKT-organisering i helse- og omsorgssektoren*. [pdf] Directorate of eHealth. Available at: <https://ehelse.no/Lists/Publikasjoner/Attachments/12/Rapport%20-%20IKT-organisering%20i%20helse-%20og%20omsorgssektoren.pdf> [Accessed 30. Nov. 2018].

Directorate of eHealth, 2017b. *Nasjonal e-helsestrategi og mål 2017-2022*. [pdf] Directorate of eHealth. Available at: <https://ehelse.no/Documents/Nasjonal%20e-helsestrategi%20og%20handlingsplan/Nasjonal%20e-helsestrategi%20og%20m%C3%A5l%202017-2022.pdf> [Accessed 30 Nov. 2017].

Directorate of eHealth, 2017c. *Nasjonal e-helsestrategi 2017-2022*. [pdf]. Available at: <https://ehelse.no/Documents/Nasjonal%20e-helsestrategi%20og%20handlingsplan/Nasjonal%20e-helsestrategi%202017-2022%20(PDF).pdf> [Accessed 29 March 2018].

Directorate of eHealth, 2017d. *Nasjonal handlingsplan for e-helse 2017-2022*. [pdf] Directorate of eHealth. Available at: <https://ehelse.no/Documents/Nasjonal%20e-helsestrategi%20og%20handlingsplan/Nasjonal%20handlingsplan%20for%20e-helse%202017-2022%20(PDF).pdf> [Accessed 29 March 2018].

Directorate of eHealth, 2017e. *Komparativ analyse av de regionale helseforetakene på IKT-området*. [pdf] Directorate of eHealth. Available at: <https://ehelse.no/Lists/Publikasjoner/Attachments/22/Komparativ%20analyse%20av%20de%20regionale%20helseforetakene%20p%C3%A5%20IKT-omr%C3%A5det.pdf> [Accessed 27 March 2018].

Directorate of eHealth, 2018a. *Styringsdokumenter*. [online]. Available at: <https://ehelse.no/styringsdokument> [Accessed 10 March 2018].

Directorate of eHealth, 2018b. *Veikart for realiseringen av målbildet for Én innbygger – én journal*. [pdf] Directorate of eHealth. Available at: <https://ehelse.no/Lists/Publikasjoner/Attachments/20/Veikart%20for%20realiseringen%20av%20m%C3%A5lbildet%20%C3%89n%20innbygger%20-%20%C3%A9n%20journal.pdf> [Accessed 2. Feb. 2018].

Directorate of eHealth, 2018c. *Nasjonal arkitekturstyring i helse- og omsorgssektoren*. [pdf] Directorate of eHealth. Available at: <https://ehelse.no/styrer-og-utvalg/nufa-fagutvalget/_/attachment/download/24795ab1-23bc-4606-9e9f-bef9dc9587f1:eae93b16292d6c50f2cf343f20bb69df393acd83/Vedlegg%202-a_Sak%2038-18_Nasjonal%20arkitekturstyring_NUFA%207.-8.11.18.pdf> [Accessed 3. Nov 2018].

Directorate of Health, 2014. *Utredning av «en innbygger – én journal»*. [pdf]. Available at: <https://www.regjeringen.no/contentassets/355890dd2872413b838066702dcdad88/ikt_utfordringsbilde_helse_omsorgssektoren.pdf> [Accessed 3. July 2019].

Drews, P. and Schirmer, I., 2014. From enterprise architecture to business ecosystem architecture. In: *18th International Enterprise Distributed Object Computing Conference Workshops and Demonstrations*, Ulm University, Germany, 1–5 Sept. 2014.

Drucker, P.F., 2007. Management challenges for the 21st century. Routledge.

Ellingsen, G.A., 2003. Global reach, local use: design and use of electronic patient record systems in large hospitals. PhD. Norwegian University of Science and Technology.

Fallmyr, T. and Bygstad, B., 2014. Enterprise Architecture Practice and Organizational Agility: An Exploratory Study. In: *47th Hawaii International Conference on System Sciences*. HI, USA, 6–9 Jan. 2014. IEEE.

Fitzgerald, B. and Howcroft, D., 1998. Towards dissolution of the IS research debate: from polarization to polarity. *Journal Of Information Technology*, 13(4), pp.313–326.

Flick, U., 2009. *An introduction to qualitative research.* Sage Publications Limited.

Fountain, J.E., 2004. Building the virtual state: Information technology and institutional change. Brookings Institution Press.

Friedland, R. and Alford, R.R. 1991. Bringing society back in: Symbols, practices and institutional contradictions. In: WW Powell & PJ DiMaggio eds. 1991. *The new institutionalism in organizational analysis*, University of Chicago Press, pp.232–263.

Galliers, R., 1992. Information systems research: Issues, methods and practical guidelines. Blackwell Scientific.

Gandhi, P.K., S ; Ramaswamy, S, 2016. *Which Industries Are the Most Digital (and Why)?* [online] Harvard Business Review. Available at: <https://hbr.org/2016/04/a-chart-that-shows-which-industries-are-the-most-digital-and-why> [Accessed 15 Feb. 2018].

Gardner, D., Fehskens, L., Naidu, M., Rouse, W.B. and Ross, J., 2012. Point-counterpoint: Enterprise architecture and enterprise transformation as related but distinct concepts. *Journal of Enterprise Transformation*, 2(4), pp.283–294.

Gartner, 2019. *Enterprise Architecture*. [online]. Available at: <https://www.gartner.com/it-glossary/enterprise-architecture-ea/> [Accessed 11 Sept.].

Gebre-Mariam, M. and Bygstad, B., 2016. The organizational ripple effect of IT architecture in healthcare. In: *24th European Conference on Information Systems*. Istanbul, Turkey, 12–15 Jun. 2016. IEEE.

Geiger, R.S. and Ribes, D., 2011. Trace ethnography: Following coordination through documentary practices. In: *44th Hawaii International Conference on System Sciences*. Koloa, Kauai, HI, USA, 4–7 Jan. 2011. IEEE.

Gong, Y. and Janssen, M., 2019. The value of and myths about enterprise architecture. *International Journal of Information Management*, 46, (pp.1–9.

Goodrick, E. and Reay, T., 2011. Constellations of institutional logics: Changes in the professional work of pharmacists. *Work and Occupations*, 38(3), pp.372–416.

Greefhorst, D., 2014. *Architecting the Family*. [online] SlideShare. Available at: <https://www.slideshare.net/dannygreefhorst/togaf-cobit-itil-pmbok-10/10> [Accessed 19 March 2018].

Greenwood, R., Oliver, C., Sahlin, K. and Suddaby, R. 2008. Introduction. In: R Greenwood, C Oliver, K Sahlin & R Suddaby eds. 2008. *The Sage handbook of organizational institutionalism*, Sage, pp.1–46.

Gregor, S., 2006. The nature of theory in information systems. *MIS Quarterly*, pp.611–642.

Guba, E.G., 1981. Criteria for assessing the trustworthiness of naturalistic inquiries. *Ectj*, 29(2), p.75.

Guba, E.G. and Lincoln, Y., 2001. Guidelines and Checklist for Constructivist (a.k.a. Fourth Generation) Evaluation.

Guba, E.G. and Lincoln, Y.S. 1994. Competing paradigms in qualitative research. In: *Handbook of qualitative research*, pp.105–117.

Guest, G., Namey, E.E. and Mitchell, M.L., 2012. Collecting qualitative data: A field manual for applied research. Sage.

Guillemette, M.G., Mignerat, M. and Paré, G., 2017. The role of institutional work in the transformation of the IT function: A longitudinal case study in the healthcare sector. *Information and Management*, 54(3), pp.349–363.

Günther, W.A. and Heijstek, W., 2015. Measuring Enterprise Architecture Effectiveness using Key Performance Indicators. *Journal of Enterprise Archictecture*, 11(1), pp.41–54.

Gøtze, J., 2013. The changing role of the enterprise architect. In: *17th International Enterprise Distributed Object Computing Conference Workshops*. Vancouver, BC, Canada, 9–13 Sept. 2013. IEEE.

Hansen, S. and Baroody, A.J., 2019. Electronic Health Records and the Logics of Care: Complementarity and Conflict in the US Healthcare System. *Information Systems Research*, pp.Articles in Advance, pp. 1–19.

Heeks, R., 2006. Health information systems: Failure, success and improvisation. *International journal of medical informatics*, 75(2), pp.125–137.

Hjort-Madsen, K., 2006. Enterprise architecture implementation and management: A case study on interoperability. In: *39th Annual Hawaii International Conference on System Sciences*. Kauai, HI, USA, 4–7 Jan. 2006. IEEE.

Hjort-Madsen, K. and Burkard, J., 2006. When enterprise architecture meets government: An institutional case study analysis. *Journal of Enterprise Architecture*, 2(1), pp.11–25.

Hjort-Madsen, K. and Pries-Heje, J., 2009. Enterprise architecture in government: Fad or future? In: *42nd Annual Hawaii International Conference on System Sciences*. Waikoloa, HI, USA, 5–8 Jan. 2009. IEEE.

Hope, T., 2015. *The critical success factors of enterprise architecture*. PhD. University of Technology, Sydney.

Hosiaisluoma, E., Penttinen, K., Mustonen, J. and Heikkilä, J., 2018. Lean Enterprise Architecture Method for Value Chain Based Development in Public Sector. In: *18th European Conference on Digital Government*, Santiago de Compostela, Spain, 25–26 Oct. 2018.

Hultin, L. and Mähring, M., 2013. Visualizing institutional logics in sociomaterial practices. In: *34th International Conference on Information Systems*. Milano, Italy, 15–18 Dec. 2013.

Hübert, E., 2017. *Sluttrapport*. [online] nasjonalikt.no. Available at: <https://nasjonalikt.no/Documents/Prosjekter/Tiltak%2053%20Sluttrapport%20Metier.pdf> [Accessed 25 June 2017].

Hylving, L. and Bygstad, B., 2019. Nuanced Responses to Enterprise Architecture Management: Loyalty, Voice, and Exit. *Journal of Management Information Systems*, 36(1), pp.14–36.

iso-architecture.org, 2011. *Defining architecture*. [online]. Available at: <http://www.iso-architecture.org/ieee-1471/defining-architecture.html> [Accessed 25 July 2019].

Jackall, R., 1988. Moral mazes: The world of corporate managers. *International Journal of Politics, Culture, and Society*, 1(4), pp.598–614.

Janssen, M. and Hjort-Madsen, K., 2007. Analyzing enterprise architecture in national governments: The cases of Denmark and the Netherlands. In: *40th*

Hawaii International Conference on System Sciences Hawaii, USA, 3–6 Jan. 2007. IEEE.

Janssen, M. and Klievink, B., 2012. Can enterprise architectures reduce failure in development projects? *Transforming Government: People, Process and Policy*, 6(1), pp.27–40.

Jensen, T.B., Kjærgaard, A. and Svejvig, P., 2009. Using institutional theory with sensemaking theory: a case study of information system implementation in healthcare. *Journal Of Information Technology*, 24(4), pp.343–353.

Johansen, C.B. and Waldorff, S.B. 2017. What are Institutional Logics-and Where is the Perspective Taking Us? In: *New Themes in Institutional Analysis*, Edward Elgar Publishing, Incorporated, pp.51–76.

Jonkers, H., Lankhorst, M.M., ter Doest, H.W., Arbab, F., Bosma, H. and Wieringa, R.J., 2006. Enterprise architecture: Management tool and blueprint for the organisation. *Information Systems Frontiers*, 8(2), pp.63–66.

Kaushik, A. and Raman, A., 2015. The new data-driven enterprise architecture for e-healthcare: Lessons from the indian public sector. *Government Information Quarterly*, 32(1), pp.63–74.

Kellermann, A. and Jones, S., 2013. What it will take to achieve the as-yet-unfulfilled promises of health information technology. *Health Affairs*, 32(1), pp.63–68.

Klein, H.K. and Myers, M.D., 1999. A set of principles for conducting and evaluating interpretive field studies in information systems. MIS Quarterly, pp.67–93.

Kotusev, S., 2016. *Enterprise Architecture Frameworks: The Fad of the Century*. [online]. Available at: <http://www.bcs.org/content/conWebDoc/56347> [Accessed 02 Nov. 2017].

Kotusev, S., 2018. Enterprise Architecture: A Reconceptualization Is Needed. *Pacific Asia Journal of the Association for Information Systems*, 10(4), pp.1–36.

Kotusev, S., Singh, M. and Storey, I., 2015. Consolidating enterprise architecture management research. In: *48th Hawaii International Conference on System Sciences*, HI, USA, 5–8 Jan. 2019. IEEE.

Kudlawicz, C., da Costa, R.S., Senff, C.O., Pancote, A., da Veiga, C.P. and Duclos, L.C., 2015. Popperian Falsifiability on Enterprise Architecture Is Suitable from a Scientific Standpoint. *Review of European Studies*, 7(12), pp.160–169.

Kvale, S., 1996. Interviews: An introduction to qualitative research interviewing. Sage.

Lange, M., Mendling, J. and Recker, J., 2016. An empirical analysis of the factors and measures of Enterprise Architecture Management success. *European Journal of Information Systems*, 25(5), pp.411–431.

Langenberg, K. and Wegmann, A., 2004. *Enterprise architecture: What aspects is current research targeting*, EPFL Technical Report IC/2004/77, Ecole Polytechnique Fédérale de Lausanne, Lausanne, Switzerland.

Latifov, M.A. and Sahay, S., 2012. Data warehouse approach to strengthen actionability of health information systems: Experiences from tajikistan. *Electronic Journal of Information Systems in Developing Countries*, 53(1), pp.1–19.

Lawrence, T.B. and Suddaby, R. 2006. Institutions and Institutional Work. In: S R., SR Clegg, C Hardy, TB Lawrence & WR Nord eds. 2006. *The Sage Handbook of Organization Studies*, 2nd edn, London: Sage, pp.215–254.

Lee, S., Oh, S.W. and Nam, K., 2016. Transformational and Transactional Factors for the Successful Implementation of Enterprise Architecture in Public Sector. *Sustainability*, 8(5), p.456.

Lee, Y.-J., Kwon, Y.-I., Shin, S. and Kim, E.-J., 2013. Advancing government-wide Enterprise Architecture-A meta-model approach. In: *15th International Conference on Advanced Communication Technology*. PyeonhChang, Republic of Korea, 27–30 Jan. 2013. IEEE.

Legeforeningen, 2019. *Styrings- og finansieringsmodeller for effektiv e-helseutvikling i Norge*. [pdf]. Available at: <https://beta.legeforeningen.no/contentassets/9030375a5fff460ea7c037ef98f90ad2/rapport-modeller-for-e-helseutvikling.pdf> [Accessed 15 May].

Lewis, M.W., 2000. Exploring paradox: Toward a more comprehensive guide. *Academy of management review*, 25(4), pp.760–776.

Lucke, C., Krell, S. and Lechner, U., 2010. Critical issues in enterprise architecting–a literature review. In: *Americas Conference on Information Systems*. Lima, Peru, 12–15 Aug. 2010. AISeL.

Löhe, J. and Legner, C., 2012. From Enterprise Modelling to Architecture-Driven IT Management? A Design Theory. In: *20th European Conference on Information Systems*. Barcelona, Spain, 10–13 June 2012. AISeL.

Löhe, J. and Legner, C., 2014. Overcoming implementation challenges in enterprise architecture management: a design theory for architecture-driven IT Management (ADRIMA). *Information Systems and e-Business Management*, 12(1), pp.101–137.

Mannion, R. and Exworthy, M., 2017. (Re) Making the procrustean bed? Standardization and customization as competing logics in healthcare. *International Journal of Health Policy and Management*, 6(6), p.301.

Martin, A., 2012. Enterprise IT Architecture in Large Federated Organizations: The Art of the Possible. *Information Systems Management*, 29(2), pp.137–147.

Meyer, J.W. and Rowan, B., 1977. Institutionalized organizations: Formal structure as myth and ceremony. *American journal of sociology*, pp.340–363.

Meyer, R.E. 2008. New sociology of knowledge: Historical legacy and contributions to current debates in institutional research. In: R Greenwood, C Oliver, K Sahlin & R Suddaby eds. 2008. *The Sage handbook of organizational institutionalism*, Sage, pp.519–538.

Mezzanotte, D.M. and Dehlinger, J., 2014. Developing and building a quality management system based on stakeholder behavior for enterprise architecture. In: *15th International Conference on Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing* Las Vegas, NV, USA, 30. June–2. July 2014. IEEE.

MHCS, 2008. *Samspill 2.0. Nasjonal strategi for elektronisk samhandling i helse- og omsorgssektoren 2008 – 2013*. [pdf]. Available at: <https://www.uio.no/studier/emner/medisin/helseadm/HINF1102/h08/undervisningsmateriale/tilleggslitteratur/Samspill2_0.pdf> [Accessed 7 Dec. 2017].

MHCS, 2009. *Samhandlingsreformen: Rett behandling – på rett sted – til rett tid*. [pdf] regjeringen.no. Available at: <https://www.regjeringen.no/contentassets/d4f0e16ad32e4bbd8d8ab5c21445a5dc/no/pdfs/stm200820090047000dddpdfs.pdf> [Accessed 03 June 2015].

MHCS, 2012. *Meld. St. 9 – Én innbygger – én journal: Digitale tjenester i helse- og omsorgssektoren*. [pdf] regjeringen.no. Available at: <https://www.regjeringen.no/contentassets/33a159683925472aa15ad74f27ad04cc/no/pdfs/stm201220130009000dddpdfs.pdf> [Accessed 02. June 2015].

Mignerat, M. and Rivard, S., 2009. Positioning the institutional perspective in information systems research. *Journal Of Information Technology*, 24(4), pp.369–391.

Miles, M.B., Huberman, A.M. and Saldaña, J., 2014. *Qualitative data analysis: A methods sourcebook.* 3rd ed. Thousand Oaks, California, USA: Sage Publications.

Ministry of Finance, 2001. *St.meld. nr. 30 (2000–2001)*. [pdf] regjeringen.no. Available at: <https://www.regjeringen.no/contentassets/d79f6790c6674f6ab63a515afe78dffa/no/pdfa/stm200020010030000dddpdfa.pdf> [Accessed 13th March 2018].

Ministry of Labor and Administration, 2004. *Arkitektur for elektronisk samhandling i offentlig sektor*. [pdf]. Available at: <https://www.regjeringen.no/globalassets/upload/kilde/mod/red/2000/0002/ddd/pdfv/216451-arkitektur.pdf> [Accessed 22 July 2019].

Ministry of Social Affairs, 1978. *St. Meld. 35 – Bruk av EDB i helsevesenet*. [pdf] Stortinget. Available at: <https://www.stortinget.no/no/Saker-og-publikasjoner/Stortingsforhandlinger/Lesevisning/?p=1978-79&paid=3&wid=c&psid=DIVL440&pgid=c_0419&s=True> [Accessed 26 June 2019].

MLGM, 2009a. *St.meld. nr. 19 - Ei forvaltning for demokrati og fellesskap*. [pdf] regjeringen.no. Available at: <https://www.regjeringen.no/contentassets/307c7a3832184bbba25b75f4b6c5a40e/no/pdfs/stm200820090019000dddpdfs.pdf> [Accessed 29 May 2015].

MLGM, 2009b. *Bedre planlegging og samordning av IKT-relaterte investeringer i staten*. [online] regjeringen.no. Available at: <https://www.regjeringen.no/no/dokumenter/bedre-planlegging-og-samordning-av-ikt-r/id577170/> [Accessed 14 March 2018].

MLGM, 2017. *Hva er digitaliseringsrundskrivet?* [online]. Available at: <https://www.regjeringen.no/no/tema/statlig-forvaltning/ikt-politikk/hva-er-digitaliseringsrundskrivet/id2462894/> [Accessed 14 March 2018].

Moreno, L.M.M., Páez, J.O.T., Parra, A. and Campos, D., 2014. The Colombian Government Enterprise Architecture Framework. In: *1st International Conference on Electronic Governance and Open Society: Challenges in Eurasia*. St. Petersburg, Russian Federation, 18–20 Nov. 2014. ACM.

MRA, 2006. *St.meld. nr. 17 – Eit informasjonssamfunn for alle*. Available at: <https://www.regjeringen.no/contentassets/25977d684a26494ead8da4106fdd267f/nn-no/pdfs/stm200620070017000dddpdfs.pdf> [Accessed 22 July 2019].

MRA, 2007a. *Felles IKT-arkitektur i offentlig sektor*. [pdf]. Available at: <https://www.regjeringen.no/globalassets/upload/fad/vedlegg/ikt-politikk/felles_ikt_arkitektur_off_sektor.pdf> [Accessed 22 July 2019].

MRA, 2007b. *St.Prop. 1 2007–2008*. [pdf]. Available at: <https://www.regjeringen.no/contentassets/f5f7f963d66b43138a3f73d04d26ae1e/nn-no/pdfs/stp200720080001faddddpdfs.pdf> [Accessed 23 July 2019].

Myers, M., 1999. Investigating information systems with ethnographic research. *Communications of the Association for Information Systems*, 2(4), pp.1–19.

Myers, M.D., 1997. Qualitative research in information systems. Management Information Systems Quarterly, 21(2), pp.241–242. MISQ Discovery,

updated version, last modified: January 4, 2008 http://www.qual.auckland.ac.nz/

Myers, M.D. and Newman, M., 2007. The qualitative interview in IS research: Examining the craft. *Information and organization*, 17(1), pp.2–26.

NICT, 2008. *Tjenesteorientert arkitektur i spesialisthelsetjenesten*. [pdf] National ICT. Available at: <https://nasjonalikt.no/Documents/Prosjekter/Avsluttede%20prosjekter/Tiltak%2012%20Tjenesteorientert%20arkitektur%20sluttrapport.pdf> [Accessed 4 Oct. 2016].

NICT, 2011. *Tiltak 42: Videreutvikling av spesialisthelsetjenestenes virksomhetsarkitektur*. [pdf] National ICT. Available at: <https://nasjonalikt.no/Documents/Prosjekter/Avsluttede%20prosjekter/Tiltak%2042%20sluttrapport%20Prosjektrapport.pdf> [Accessed 28 May 2015].

NICT, 2012. *Nasjonal IKTs strategiplan for 2013–2016*. [pdf] National ICT. Available at: <https://nasjonalikt.no/documents/saksdokumenter%20for%20styrem%C3%B8te%20og%20pf/strategi%20nikt%202013%20-%202016.pdf> [Accessed 28 May 2015].

NICT, 2014a. *Sluttrapport – Nasjonal IKT Tiltak 48: Klinisk dokumentasjon for oversikt og læring*. [pdf] National ICT. Available at: <http://nasjonalikt.no/filestore/Dokumenter/Prosjekter_og_tiltak/Sluttrapporter/48.pdf> [Accessed 01. June 2015].

NICT, 2014b. *Sluttrapport Nasjonal IKT Tiltak 50: Kunnskapsbasert pasientplanlegging*. [pdf] National ICT. Available at: <https://nasjonalikt.no/Documents/Prosjekter/Avsluttede%20prosjekter/Tiltak%2050%20-%20Kunnskapsbasert%20pasientplanlegging%20-%20sluttrapport.pdf> [Accessed 19 Oct. 2016].

NICT, 2014c. *Tiltak 42.2: Praksis for virksomhetsarkitektur i Nasjonal IKT*. [pdf] National ICT. Available at: <https://nasjonalikt.no/Documents/NIKT%20FA/Praksis%20for%20virksomhetsarkitektur%20i%20Nasjonal%20IKT%20-%20Tiltak%2042.2.pdf> [Accessed 27 Oct. 2016].

NICT, 2015. *Årsregnskap 2014*. [pdf] National ICT. Available at: <https://nasjonalikt.no/Documents/Saksdokumenter%20for%20styrem%C3%B8te%20og%20PF/%C3%85rsrapporten%202014.pdf> [Accessed 17 Nov. 2016].

NICT, 2016a. *Årsregnskap 2015*. [pdf] National ICT. Available at: <https://nasjonalikt.no/Documents/Saksdokumenter%20for%20styrem%C3%B8te%20og%20PF/%C3%85rsrapporten%202015.pdf> [Accessed 21 Nov. 2016].

NICT, 2016b. *Fagforum for arkitektur*. [online]. Available at: <https://nasjonalikt.no/forumer/fagforum-for-arkitektur> [Accessed 3 Nov. 2018].

NICT, 2016c. *Systemeierforum*. [online]. Available at: <https://nasjonalikt.no/forumer/systemeierforum> [Accessed 1 Aug. 2019].

NICT, 2016d. *Fagforum for klinisk IKT*. [online]. Available at: <https://nasjonalikt.no/forumer/fagforum-for-klinisk-ikt> [Accessed 3 Nov. 2018].

NICT, 2016e. *Teknologiforum for medisinske kvalitetsregistre*. [online]. Available at: <https://nasjonalikt.no/forumer/teknologiforum-for-medisinske-kvalitetsregistre> [Accessed 1 Aug. 2019].

NICT, 2017. *Fagforum for porteføljestyring*. [online]. Available at: <https://nasjonalikt.no/fagforum-for-portefoljestyring#sammensetning> [Accessed 3 Nov. 2018].

NICT, 2018. *Fagforum for klinisk IKT*. [online]. Available at: <https://nasjonalikt.no/forumer/fagforum-for-klinisk-ikt#sammensetning> [Accessed 3 Nov. 2018].

NICT, 2019. *Årsrapport 2018*. [pdf]. Available at: <https://nasjonalikt.no/Documents/Saksdokumenter%20for%20styrem%C3%B8te%20og%20PF/%C3%85rsrapport%202018%20-%20Nasjonal%20IKT%20HF.pdf> [Accessed 31 July 2019].

Niemi, E., 2006. Enterprise architecture benefits: Perceptions from literature and practice. In: *Conference Internet & Information Systems in the Digital Age*. Brescia, Italy, 14–16 Dec. 2006. www.cs.jyu.fi.

Niemi, E. and Pekkola, S., 2016. Enterprise Architecture Benefit Realization: Review of the Models and a Case Study of a Public Organization. *ACM SIGMIS Database*, 47(3), pp.55–80.

Nikpay, F., Selamat, H., Rouhani, B.D. and Nikfard, P., 2013. A Review of Critical Success Factors of Enterprise Architecture Implementation. In: *International Conference on Informatics and Creative Multimedia*. Kuala Lumpur, Malaysia, 4–6 Sept. 2013. IEEE.

NOU, 1973. Elektronisk databehandling i helsevesenet. Oslo: Universitetsforlaget.

NOU, 2016. *Organisering og styring av spesialisthelsetjenesten*. [pdf] The Ministries Secuirity- and Service Organization. Available at: <https://www.regjeringen.no/contentassets/6db6ac4fbfde49e6bc5f8bd615c6fa1e/no/pdfs/nou201620160025000dddpdfs.pdf> [Accessed 7. Dec. 2017].

Oates, B.J., 2006. *Researching information systems and computing.* London: Sage Publications.

OECD, 2017. Digital Government Review of Norway: Boosting the Digital Transformation of the Public Sector. Paris: OECD Publishing.

Ojo, A., Janowski, T. and Estevez, E., 2012. Improving Government Enterprise Architecture Practice-Maturity Factor Analysis. In: *45th Hawaii International Conference on System Science*. Hawaii, USA, 4–7 Jan. 2012. IEEE.

Oliver, C., 1991. Strategic responses to institutional processes. *Academy of management review*, 16(1), pp.145–179.

Oliver, C., 1992. The antecedents of deinstitutionalization. *Organization studies*, 13(4), pp.563–588.

Orlikowski, W.J. and Barley, S.R., 2001. Technology and institutions: What can research on information technology and research on organizations learn from each other? *MIS Quarterly*, 25(2), pp.145–165.

Orlikowski, W.J. and Baroudi, J.J., 1991. Studying information technology in organizations: Research approaches and assumptions. *Information Systems Research*, 2(1), pp.1–28.

Pettigrew, A.M., 1990. Longitudinal field research on change: Theory and practice. *Organization science*, 1(3), pp.267–292.

Plumb, J.J., Hains, I., Parr, M.J., Milliss, D., Herkes, R. and Westbrook, J.I., 2017. Technology meets tradition: The perceived impact of the introduction of information and communication technology on ward rounds in the intensive care unit. *International journal of medical informatics*, 105, pp.49–58.

Powell, W. 1991. Expanding the scope of institutional analysis. In: WW Powell & PJ DiMaggio eds. 1991. *The new institutionalism in organizational analysis*, Chicago: Sage, pp.183–203.

Purnawan, D.A. and Surendro, K., 2016. Building enterprise architecture for hospital information system. In: *4th International Conference on Information and Communication Technology*. Bandung, Indonesia, 25–27 May 2016. IEEE.

Rahimi, F., Gøtze, J. and Møller, C., 2017. Enterprise architecture management: Toward a taxonomy of applications. *Communications of the Association for Information Systems*, 40(1), pp.120–166.

Rasti, Z., Darajeh, A., Khayami, R. and Sanatnama, H., 2015. Systematic literature review in the area of Enterprise architecture during past 10 years. In: *2nd International Conference on Knowledge-Based Engineering and Innovation*. Tehran, Iran, 5–6 Nov. 2015. IEEE.

Reay, T. and Hinings, C.R., 2009. Managing the Rivalry of Competing Institutional Logics. *Organization studies*, 30(6), pp.629–652.

Reay, T. and Jones, C., 2016. Qualitatively capturing institutional logics. *Strategic Organization*, 14(4), pp.441–454.

Regjeringen.no, 2006. *Special print off sec. 6 National Health Plan for Norway (2007–2010)*. [pdf] regjerning.no. Available at: <https://www.regjeringen.no/globalassets/upload/kilde/hod/red/2006/0063/ddd/pdfv/296632-national_health_plan_for_norway_engelsk_del_1_02112006.pdf> [Accessed 5 July 2019].

Riksrevisjonen, 2014. *Riksrevisjonens kontroll med forvaltningen av statlige selskaper for 2013*. [pdf] Riksrevisjonen. Available at: <https://www.riksrevisjonen.no/rapporter/Documents/2014-2015/RiksrevisjonensKontrollMedForvaltningenAvStatligeSelskaperFor2013.pdf> [Accessed 02. June 2015].

Robertson, E., Peko, G. and Sundaram, D., 2018. Enterprise Architecture Maturity: A Crucial Link in Business and IT Alignment. In: *22nd Pacific Asia Conference on Information Systems*. Yokohoma, Japan, 26–30 June 2018. AISeL.

Romanow, D., Cho, S. and Straub, D., 2012. Editor's Comments: Riding the Wave: Past Trends and Future Directions for Health IT Research. *MIS Quarterly*, 36(3), pp.iii–x.

Ross, J.W., 2003. Creating a strategic IT architecture competency: Learning in stages. *MIS Quarterly Executive*, 2(1), pp.31–43.

Ross, J.W., Weill, P. and Robertson, D., 2006. *Enterprise architecture as strategy: Creating a foundation for business execution.* Boston, MA, United States: Harvard Business Review Press.

Rouhani, B.D., Ahmad, R.B., Nikpay, F. and Mohamaddoust, R., 2019. Critical Success Factor Model for Enterprise Architecture Implementation. *Malaysian Journal of Computer Science*, 32(2), pp.133–148.

Røren, R., 2016. *Én innbygger, én journal, og kjernejournal*. [pdf]. Available at: <https://gammel.fylkesmannen.no/Documents/Dokument%20FMTE/Helse%20og%20omsorg/2016%20kurs/H%C3%B8stkonferansen/Lysark/14%20En%20journal%20og%20kjernejournal,%20Rune%20R%C3%B8ren.pdf> [Accessed 12 March 2018].

Saarelainen, M.-M. and Hotti, V., 2011. Does enterprise architecture form the ground for group decisions in egovernment programme? In: *15th IEEE International Enterprise Distributed Object Computing Conference Workshops*. Helsinki, Finland, 29 Aug.–2 Sept. 2011. IEEE.

Sahay, S., Sæbø, J.I., Mekonnen, S.M. and Gizaw, A.A., 2010. Interplay of institutional logics and implications for deinstitutionalization: case study of HMIS implementation in Tajikistan. *Information Technologies & International Development*, 6(3), pp.19–32.

Schilling, R.D., Beese, J., Haki, K., Aier, S. and Winter, R., 2017. Revisiting the impact of information systems architecture complexity: a complex adaptive

systems perspective. In: *38th International Conference on Information Systems*. Seoul, South Korea, 10–13 Dec. 2017. AISeL.

Schilling, R.D., Haki, K. and Aier, S., 2018. Dynamics of Control Mechanisms in Enterprise Architecture Management: A Sensemaking Perspective. In: *39th International Conference on Information Systems*. San Francisco, USA, 13–16 Dec. 2018. AISeL.

Schmidt, C. and Buxmann, P., 2011. Outcomes and success factors of enterprise IT architecture management: empirical insight from the international financial services industry. *European Journal of Information Systems*, 20(2), pp.168–185.

Schultze, U. and Avital, M., 2011. Designing interviews to generate rich data for information systems research. *Information and organization*, 21(1), pp.1–16.

Schöenherr, M., 2008. Towards a common terminology in the discipline of enterprise architecture. In: *6th International Conference on Service-Oriented Computing*. Sydney, Australia, 1–5 Dec. 2008. Springer.

Scott, W.R., 2014. *Institutions and Organizations: Ideas, Interests, and Identities*. 4th ed. Thousand Oaks, California, USA: Sage Publications.

Seppänen, V., Penttinen, K. and Pulkkinen, M., 2018. Key Issues in Enterprise Architecture Adoption in the Public Sector. *Electronic Journal of e-Government*, 16(1), pp.46–58.

SERHA, 2015a. *IKT-strategi - Standardisering av teknologiske løsninger og arbeidsprosesser v2.0*. [pdf]. Available at: <https://www.helse-sorost.no/Documents/Digital%20fornying/086-2015%20Vedlegg%201%20-%20IKT-strategi.pdf> [Accessed 7 June 2017].

SERHA, 2015b. *Årsrapport 2014*. [pdf]. Available at: <https://www.helse-sorost.no/Documents/%C3%85rsrapport/2014%20-%20%C3%85rsrapport%20Helse%20S%C3%B8r-%C3%98st%20RHF.pdf> [Accessed 29 Jan 2019].

SERHA, 2015c. *Regional klinisk løsning (RKL) Programdirektiv*. [pdf]. Available at: <https://www.helse-sorost.no/Documents/Digital%20fornying/Regional%20klinisk%20l%C3%B8sning/Programdirektiv%20RKL_v1%200%20(2).pdf> [Accessed 4 June 2017].

SERHA, 2017. *Regional klinisk løsning (RKL) Programdirektiv v1.2*. [pdf]. Available at: <http://admininfo.helse-sorost.no/digitalfornying_/Documents/Programdirektiv%20RKL%20v1.2.pdf> [Accessed 03 April 2018].

SERHA, 2018a. *Submission to the Board (SAK NR 098–2018)*. [pdf]. Available at: <https://www.helse-

sorost.no/Documents/Styret/Styrem%C3%B8ter/2018/20181028/098-2018%20Saksframlegg%20-%20Finansieringsfullmakt%20til%20SP%20for%20utkj%C3%B8p%20av%20ustyr.pdf> [Accessed 6 Nov. 2018].

SERHA, 2018b. *Submissions to the Board (SAK NR 13–2018)*. [pdf]. Available at: <https://www.helse-sorost.no/Documents/Styret/Styrem%C3%B8ter/2018/20180102/013-2018%20Regional%20radiologil%C3%B8sning%20(sladdet%20-%20se%20forklaring%20under).pdf> [Accessed 2 Nov 2018].

SERHA, 2018c. *Teknologi og e-helse*. [online]. Available at: <https://www.helse-sorost.no/avdelinger/teknologi-og-ehelse> [Accessed 29 Oct 2018].

SERHA, 2018d. *Helse Sør-Øst RHF styrker kontroll og styring av IKT-arbeidet*. [online]. Available at: <https://www.helse-sorost.no/nyheter/helse-sor-ost-rhf-styrker-kontroll-og-styring-av-ikt-arbeidet> [Accessed 24 July 2019].

SERHA, 2018e. *Tertialrapport 3–2017*. [pdf]. Available at: <https://www.helse-sorost.no/Documents/Styret/Styrem%C3%B8ter/2018/201804/041-2018%20Vedlegg%20-%20Status%20og%20rapportering%20IKT-prosjektportf%C3%B8lje%20%203.%20tertial%202017.pdf> [Accessed 22 Oct 2018].

SERHA, 2018f. *Årsrapport 2017*. [pdf]. Available at: <https://www.helse-sorost.no/Documents/%C3%85rsrapport/2017%20-%20%C3%85rsrapport%20Helse%20S%C3%B8r-%C3%98st%20RHF.pdf> [Accessed 29 Jan. 2019].

SERHA, 2018g. *Nytt fra RKL–Okt. 2018*. [online]. Available at: <http://ext.mnm.as/r/0C1196D7-4E26-4B11-9646-8F805B33CD58> [Accessed 2 Nov 2018].

SERHA, 2018h. *Avlyser videre innføring av radiologiløsning*. [online]. Available at: <https://www.helse-sorost.no/nyheter/avlyser-videre-innforing-av-radiologilosning> [Accessed 2 May].

SERHA, 2019a. *Årsrapport 2018*. [pdf]. Available at: <https://www.helse-sorost.no/Documents/%C3%85rsrapport/2018%20-%20%C3%85rsrapport%20Helse%20S%C3%B8r-%C3%98st%20RHF.pdf> [Accessed 4 July 2019].

SERHA, 2019b. *Organisasjonskart Helse Sør-Øst RHF*. [pdf]. Available at: <https://www.helse-sorost.no/Documents/Organisasjonskart/Organisasjonskart%20per%2001042019.pdf> [Accessed 6 May 2019].

Shanks, G., Gloet, M., Someh, I.A., Frampton, K. and Tamm, T., 2018. Achieving benefits with enterprise architecture. *The Journal of Strategic Information Systems*, 27(2), pp.139–156.

Sidorova, A. and Kappelman, L.A., 2011. Better business-IT alignment through enterprise architecture: an actor-network theory perspective. *Journal of Enterprise Architecture*, 7(1), pp.39–47.

Silverman, D., 2013. Doing qualitative research: A practical handbook. Sage.

Simon, D., Fischbach, K. and Schoder, D., 2013. An exploration of enterprise architecture research. *Communications of the Association for Information Systems*, 32, pp.1–72.

Social_Sciences_Research, O.o.B., 2017. *Transcription Symbols*. [online]. Available at: <http://www.esourceresearch.org/Default.aspx?TabId=531> [Accessed 1 May 2017].

Sommerville, I., 2011. *Software Engineering.* 9 ed. Pearson.

Store Norske Leksikon, 2009. *Nasjonal helseplan*. [Type of Work] Stavanger: Store norske leksikon. Available at: <https://sml.snl.no/Nasjonal_helseplan> [Accessed 5 July 2019].

Strano, C. and Rehmani, Q., 2007. The role of the enterprise architect. *Information Systems and e-Business Management*, 5(4), pp.379–396.

Suddaby, R. and Greenwood, R. 2009. Methodological issues in researching institutional change. In: DA Buchanan & A Bryman eds. 2009. *The Sage handbook of organizational research methods*, Sage, pp.177–195.

Susman, G.I. and Evered, R.D., 1978. An assessment of the scientific merits of action research. Administrative science quarterly, pp.582–603.

Tamm, T., Seddon, P.B., Shanks, G. and Reynolds, P., 2011. How Does Enterprise Architecture Add Value to Organisations? *Communications of the Association for Information Systems*, 28(1), pp.141–168.

Tan, C. and Liu, K., 2013. An Organisational Semiotics Inspired Information Architecture: Pervasive Healthcare as a Case Study. In: *14th International Conference on Informatics and Semiotics in Organisation*, Stockholm, Sweden, 25–27 Mars 2013. centaur.reading.ac.uk/.

Thornton, P.H. and Ocasio, W., 1999. Institutional logics and the historical contingency of power in organizations: Executive succession in the higher education publishing industry, 1958–1990. *American journal of sociology*, 105(3), pp.801–843.

Thornton, P.H. and Ocasio, W. 2008. Institutional logics. In: R Greenwood, C Oliver, K Sahlin & R Suddaby eds. 2008. *The Sage handbook of organizational institutionalism*, Sage, pp.99–128.

Thornton, P.H., Ocasio, W. and Lounsbury, M., 2012. The institutional logics perspective: A new approach to culture, structure, and process. Oxford University Press on Demand.

Tolbert, P.S. and Zucker, L.G., 1983. Institutional Sources of Change in the Formal Structure of Organizations: The Diffusion of Civil Service Reform, 1880-1935. *Administrative science quarterly*, 28(1), pp.22–39.

Tolbert, P.S. and Zucker, L.G. 1996. The institutionalization of institutional theory. In: S Clegg, C Hardy & WR Nord eds. 1996. *Handbook of organization studies*, London: Sage, pp.175–190.

Urquhart, C. 2007. The evolving nature of grounded theory method: The case of the information systems discipline. In: A Bryant & K Charmaz eds. 2007. *The Sage handbook of grounded theory*, pp.339–359.

Urquhart, C., Lehmann, H. and Myers, M.D., 2010. Putting the 'theory'back into grounded theory: guidelines for grounded theory studies in information systems. *Information Systems Journal*, 20(4), pp.357–381.

Valtonen, K., Mäntynen, S., Leppänen, M. and Pulkkinen, M., 2011. Enterprise Architecture Descriptions for Enhancing Local Government Transformation and Coherency Management: Case Study. In: *15th IEEE International Enterprise Distributed Object Computing Conference Workshops*. Helsinki, Finland, 29 Aug. - 2 Sept. 2011. IEEE.

Valtonen, K., Seppanen, V. and Leppanen, M., 2009. Government enterprise architecture grid adaptation in Finland. In: *42nd Hawaii International Conference on System Sciences*. Waikoloa, HI, USA, 5–8 Jan. 2009. IEEE.

Van de Ven, A.H., 2007. Engaged scholarship: A guide for organizational and social research. Oxford University Press on Demand.

van den Broek, J., Boselie, P. and Paauwe, J., 2014. Multiple Institutional Logics in Health Care: 'Productive Ward: Releasing Time to Care'. *Public Management Review*, 16(1), pp.1–20.

Van Maanen, J. and Kolb, D., 1982. The Professional Apprentice: Observations on Fieldwork Roles in Two Organizational Settings, DTIC Document, www.dtic.mil.

van Veenstra, A.F., Aagesen, G., Janssen, M. and Krogstie, J., 2012. Infrastructures for Public Service Delivery: Aligning IT governance and architecture in infrastructure development. *e-Service Journal*, 8(3), pp.73–97.

Varshney, U., 2007. Pervasive healthcare and wireless health monitoring. *Mobile Networks and Applications*, 12(2–3), pp.113–127.

Vassilakopoulou, P. and Marmaras, N., 2015. Investigating technology-induced transitions in healthcare: work practice adaptations within their overall context. *Health Policy and Technology*, 4(3), pp.277–285.

Venkatesh, V., Bala, H., Venkatraman, S. and Bates, J., 2007. Enterprise Architecture Maturity: the Story of the Veterans Health Administration. *MIS Quarterly Executive*, 6(2), pp.79–90.

Vidgen, R. and Braa, K. 1997. Balancing interpretation and intervention in information system research: the action case approach. In: AS Lee, J Liebenau & JI DeGross eds. 1997. *Information systems and qualitative research. IFIP — The International Federation for Information Processing*, Boston, MA: Springer, pp.524–541.

Walsham, G., 1993. *Interpreting informations systems in organizations.* West Sussex, England: John Wiley & Sons Ltd.

Walsham, G., 1995. Interpretive case studies in IS research: nature and method. *European Journal of Information Systems*, 4(2), pp.74–81.

Walsham, G., 2006. Doing interpretive research. *European Journal of Information Systems*, 15(3), pp.320–330.

Weiß, K.S., 2015. Institutionalizing Architectural Coordination in Organizations. PhD. University of St. Gallen.

Weiss, S., Aier, S. and Winter, R., 2013. Institutionalization and the effectiveness of enterprise architecture management. In: *Thirty Fourth International Conference on Information Systems*. Milan, Italy, 15–18 Dec. 2013. AISeL.

Winter, R., 2016. Establishing 'architectural thinking'in organizations. In: *IFIP Working Conference on The Practice of Enterprise Modeling*. Skövde, Sweden, 8–10 Nov. 2016. Springer.

Winter, R., Legner, C. and Fischbach, K., 2014. Introduction to the special issue on enterprise architecture management. *Information Systems and e-Business Management*, 12(1), pp.1–4.

Wolfinger, N.H., 2002. On writing fieldnotes: collection strategies and background expectancies. *Qualitative research*, 2(1), pp.85–93.

Yin, R.K., 2013. Case study research: Design and methods. Sage publications.

Ylimäki, T., 2006. Potential critical success factors for enterprise architecture. *Journal of Enterprise Architecture*, 2(4), pp.29–40.

Ylinen, M. and Pekkola, S., 2018. Looking for a five-legged sheep: identifying enterprise architects' skills and competencies. In: *19th International Conference on Digital Government Research: Governance in the Data Age*. Delft, Netherlands, 30 May–1 June 2018. ACM.

Zachman, J.A., 1987. A framework for information systems architecture. *IBM systems journal*, 26(3), pp.276–292.

Zadeh, M.E., Lewis, E., Millar, G., Yang, Y. and Thorne, C., 2014. The use of viable system model to develop guidelines for generating enterprise architecture principles. In: IEEE International Conference on Systems, Man and Cybernetics. San Diego, California, USA, 5–8 Oct. 2014. IEEE.

Appendices

Appendix A. Interview guide – starting questions

- Who is your employer?
- Which department do you belong to?
- How many employees are in your department?
- (I found the total number of employees and the annual turnover in the reports).
- Do you confirm or have additional comments on the structure of the organisation? (In each interview, I brought the figure showing the organisational structure).
- Confirmation and elaboration of educational background (I had prepared notes from LinkedIn).
- Confirmation and elaboration of current position (I had prepared notes from LinkedIn).
    a. Number of years in the current position
    b. Number of years in the organisation
- Can you tell me about your department and your role?

Appendix B. Interview guide – initial phase

Interview guide for the CEO at hospital Health Trust

- How is a director involved in the work that has been done around the collaboration on and coordination of IT systems?
- About enterprise architecture (EA), terms, use etc..
- Can you comment on what it is like to offer resources as part of:
    a. national projects?
    b. projects audited by the Hospital Partner?
- Is it attractive for professionals to participate in such work and in a professional forum?
- How is the advice from NICT perceived at the local hospitals?
- At what level in the organisation are decisions made on which IT systems to renew?
- At what level in the organisation are decisions made about the procurement process itself?
- In the process of increased coordination of ICT services in the hospital sector, what do you think are the challenges with the today's approach?
- What do you think could have been better?

Interview guide for the enterprise architect at NICT

- Can you tell me about how you are organised and a little about the work tasks?
- Who has been involved in the implementation or the operationalisation of the EA initiative?
- How was communication going?
- What was the involved parties' general reaction to this initiative?
- What was the involved parties' general reaction to getting started with EA?
- How have these reactions affected the progression and outcome (of the initiative)?

    a. For the regional health authorities (RHAs) and their respective ICT units?
- For the vendors?
- Have the attitudes of those involved changed over time? Possibly how?
- What do you think is the greatest challenge around EA?
- How have these challenges been handled?
- Can you think of any measures that would make the EA programme easier to accept and make it progress?

Interview guide for the enterprise architect at a hospital Health Trust

- Can you tell me a little about the IT department – how are you organised?
- Can you tell me a little about your tasks as an enterprise architect?
- What do you think is the most important task of an enterprise architect?
- Do you use specific tools?
    a. Tools for documentation and for drawing processes?
- What do you think have been the greatest challenges in your work?
- How is the collaboration with the Hospital Partner?
    a. Meetings
    b. Shared documentation
- How is the collaboration with the Department of Technology and eHealth in South Eastern RHA?
- How is the collaboration between this hospital and other hospitals in the region?
- Do you have any idea of how the Chief Information Officer views EA in general?
- Can you say something about your role from an IT governance perspective?
- What tools are used for IT governance and portfolio management?
- Are there any enterprise architects represented in the steering group of the hospital?

- How is information transferred from one level to the next?
- Can you say what systems are regionally controlled, and what are governed at the local level?

Interview guide for the enterprise architect at the Hospital Partner

- Tell me a bit about your work as an enterprise architect.
- Is The Open Group Architecture Framework (TOGAF) used? How?
- Do you use other tools for governance?
- Who do you think is the customer?
- How is the collaboration with the other health regions?
- What relationship do you have with NICT?
- What relationship do you have with the Directorate of eHealth?
- What do you think has been the greatest challenge in working as an enterprise architect?

Appendix C. Interview guide – first phase of study

This is the interview guide for the first phase, that is, November 2016–February 2017. The following list provides a thematic overview of the main section of the interview with selected questions:

- Can you elaborate on your understanding of enterprise architecture (EA)?
- Can you elaborate on how projects are organised?
- EA use and approach
    - Can you describe how EA has been used?
    - Can you say something about how you proceed?
    - How do you experience EA and centralised processes in the context of local initiatives and innovation?
- EA governance
    - How are management and management mechanisms/evaluation conducted?
    - Can you say what systems are regionally controlled, and what are governed at the trust and at the local levels?
- EA documentation and tools
    - How do you document the systems?
    - In your opinion, what is the quality of the documentation?
    - What tools are used, and what are the lessons learned?
- EA acceptance, participation and collaboration
    - How is the acceptance of EA as a discipline among IT people, clinicians from the hospitals and management?
    - How has it been getting hold of people who have domain knowledge and good knowledge of what the system's functions should be?
    - Can you tell me about collaboration with others (health regions, hospitals, NICT, DIFI and Directorate of eHealth)?

    - Do you know of initiatives to prepare the organisation for the implications for EA and coordination of ICT services?
    - How are the projects received by the hospitals?
- Experiences with EA, results, challenges, improvement
    - In your opinion, in what ways does the current or intended work method contribute to successful EA projects?
    - What do you think are important factors in the progression of work on the introduction of new regional systems?
    - Do you see something about today's organisation that can hamper the process towards national systems?
    - What do you think are the major challenges?
    - What do you think have been the greatest challenges in your work as an enterprise architect?
    - What do you think could have been better, and possibly what measures could have been taken?

Appendix D. Interview guide – second phase

This is the main section of the interview conducted in the second phase, that is, November 2018–January 2019.

Questions/themes about the experience with the measures for the enterprise architecture (EA) practice in South Eastern Regional Health Authority (SERHA), which became valid effective June 2017.

For participants of the Regional Clinical Solutions (RCS) programme

- Have you been involved in any training related to this change?
    a. more known and accepted?
- Use and experience with documentation with The Open Group Architecture Framework's Architecture Definition Document (TOGAF ADD) standard?
- Use and experience with SPARX?
- Use and experience with TROUX?
- Status of access to the document archive (as of June 2017, only for architects)?
- Use of architecture in project portfolio management (PPM)
    a. How is the follow-up?
    b. Are there any sanctions?

For employees of the Hospital Partner (HP)

- How do departments work together?

For managers at the HP

- In your perception, how is architectural management taken care of in the current SERHA and HP?

- Are there any formal collaborative forums across departments and with RCS?
- In your perception, how is architectural management taken care of across the regions?
- Have the experiences from the work in RCS affected how the departments are organised in HP?
- How do you look at the use of (the large number of) hired consultants in [one specific department in] HP and RCS?
- How do you view EA as an approach/method?

For everyone

(I have modified some of the following questions after reading the work of Schilling, et al. (2017, p.3)).

- (National: Can you say something about the changes in relation to architecture management? Have you read the Directorate of eHealth's new report on architecture management?)
- Do you have any views on how architecture documents are suitable for communicating and discussing needs and solutions?
- If there are discussions about solutions, is the way you prioritise different from that of others – for example, other clinicians, health managers or IT personnel?
- Looking back on the use of architecture and the focus on architecture, has it had an impact on the project's success or ability to deliver?
- What was the contribution of architecture management in the past, and what is it today?
- Can you say something about how things have changed in relation to the use and follow-up of architecture – tools, management, selection/advisory body?
- Would you say that special events have led to changes?

- In your opinion, how important is the individual person when such EA methodology is used?
- Do you find that the existing architecture documentation is increasingly or decreasingly used in change management and prioritisation of work?
- How should local short-term goals be balanced with regional and national long-term goals?

Questions that can tell something about EA capability and maturity

- Who makes and uses the models?
- How do you describe the importance of the models – to whom?
- For which tasks and responsibilities are the models important – and how?
- Which interest groups can be supported by what types of models? What is the content of the models then?
- How easy is it for the various stakeholders to understand the models?
- Which category would you say the models are important for – the individual player, the organisation or the entire business/ecosystem?

Questions related to benefits

The questions are inspired by the work on the project benefits of Shanks, et al. (2018, pp.150-151).

For those who worked in SERHA after 2014

- Because of (the services from EA) the work done around EA, has it provided better decision making for the choices you have made in the conceptual phase – *in relation to processes* – and possibly later?
- Through architectural documentation, could you see if there are *good processes* in the enterprise today that fully or partially meet the priority needs?

- Because of (the services from EA) the work done around EA, has it provided better decision making for the choices you have made in the conceptual phase – *in relation to IT solutions* – and possibly later?
- Is it through EA services that you could see if there are *IT solutions* in the enterprise group today that fully or partially meet the priority needs?
- Has EA provided you with insights into dependencies between processes and other systems?
- Has the EA perspective had any impact on how the work has been coordinated with other projects in RCS, for example, for the electronic health record system?
- Has the EA methodology provided you with a quicker response to recognise any standards to be used? What will be delivered by the project?
- In your organisation, to what degree would you say that:
    a. We can develop new products and services on the basis of what EA provides us, that is, information about the company's existing resources and in relation to strategy.
    b. We use EA actively for product and service innovation.
    c. EA services allow us to reuse the organisation's resources.
    d. We reduce duplication due to circumstances identified by EA.

Questions on historical evolution

For those who worked in SERHA before 2014

- Do you remember how the work started? What was the starting point for this work?
- What was the position of the architecture forum in the organisational structure?
- How were your services used /what kind of work did you do?
- Do you have any comments on SERHA's top management's support and acceptance of this initiative?

- What do you think about the individual HTs' top management's anchoring and acceptance of this initiative?
- The Agency for Public Management and eGovernment (DIFI) issued a report in 2007/2008 that mentions EA and TOGAF as favourable work methodologies. Would you say that this affected you?
- Are there other influences that you can remember?
- Do you have any thoughts about why EA received different degrees of focus throughout your time in the organisation?
- Do you remember anything about what you achieved through the Architecture Forum (which was also helpful to you as a leader in decision making?)
- Can you say something about the relationship between HP and SERHA when you started working on architecture in SERHA?

Appendix E. Interview guide – final section

- Is there anything you would like to add to what we have been talking about now?
- Can you recommend someone else to talk to – enterprise architects, project managers, consultants or suppliers whose services or products you have used?
- If I use quotes from this interview, I will send you the article, so you can check whether it is okay before it is published.

Appendix F. Details from the data collection

Figure 1 shows an overview of the folders, and some examples of the documents are mentioned in Sections 2.4 and 4.1.

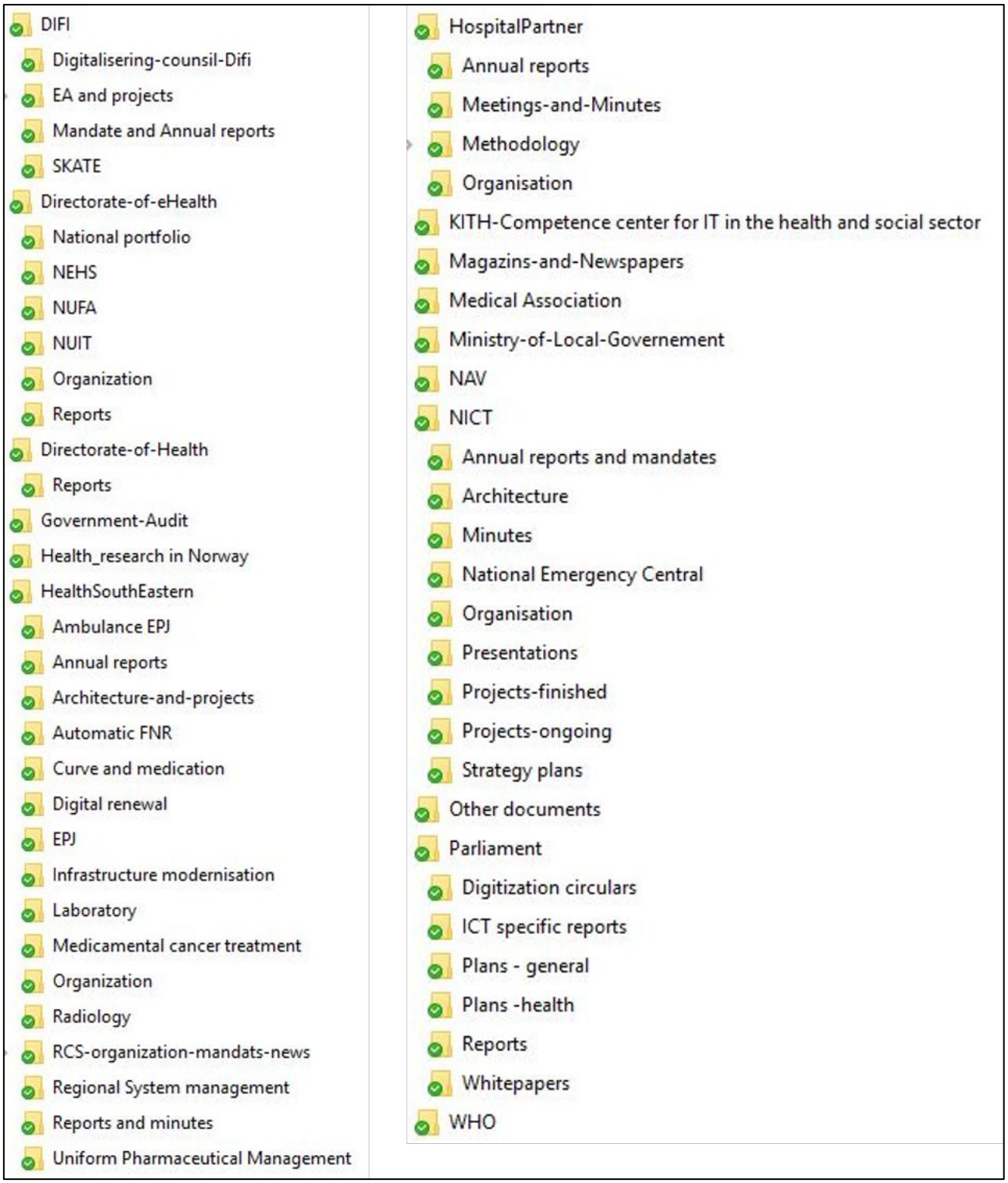


Figure 1. Folder structure for collected documents

Table 1. Examples of reviewed documents.

Organisation	Format, title, number of pages, reference.
Ministry of Health and Care Services	Report, pdf. Evaluation of the national hospital reform from 2002. 247 pages (Norwegian Official Report [NOU], 2016)
Directorate of eHealth	Report, pdf. National e-health strategy and goals for the period 2017-2022. 23 pages (Directorate of eHealth, 2017b)
	Report, pdf. Comparative analysis of the regional health authorities on ICT. 65 pages (Directorate of eHealth, 2017e)
	Report, pdf. National architecture governance in the healthcare sector. Attachment to a meeting request for the national committee for subject matter professionals. 23 pages (Directorate of eHealth, 2018c)
National ICT (NICT)	Web page. Information of the tasks and representatives in the national forum for clinical ICT. 2 pages (NICT, 2018)
	Report, pdf. Final report on the initiative no. 50, for knowledge-based patient planning. 47 pages (NICT, 2014b)
	Report, pdf. External evaluation of the stopped project of acquisition of new technology for emergency medical communication centers under the auspices of National ICT. 4 pages (Hübert, 2017)
	Annual report for 2015, pdf. 21 pages (NICT, 2016a).
South Eastern Regional Health Authority (SERHA)	Newsletter, web page. Monthly newsletter from Oct. 2018 from the Regional Clinical Solution programme. 11 pages (SERHA, 2018g)
	Report, pdf. Triannual status report on regional ICT project. 18 pages (SERHA, 2018e)
	Web page. Announcement of the stop of the regional radiology project. 3 pages (SERHA, 2018h)
	Submission, pdf, to the Board meeting in SERHA on the case of stopping the current regional radiology project. Background, and suggestions how to proceed. 10 pages (SERHA, 2018b)
Norwegian Medical Association	Report, pdf. Management and financing models for effective e-health development in Norway. The medical associations' input based on international experience. 28 pages (Legeforeningen, 2019)

Table 2. Overview of events with selected themes

Event, organiser	Most relevant themes and sessions attended
eHelse, 3–4 May 2017, Norwegian Association for IT Professionals	Experience from the introduction of a shared electronic health record (EHR) system in Copenhagen The 'innovation train' goes – where are the doctors? How to get clinicians involved in developing clinical solutions? How satisfied are hospital doctors with their EHR? Special theme on electronic curve and drug logistics One large or many small systems? Debate: Do we have the right drivers and resources? National governance model for digitising healthcare services National e-health strategy and action plan until 2022
EHIN, 31 October–1 November 2017, ICT Norway	Digital transformation in the health sector Health Data, knowledge base for national e-health solutions
eHelse, 18–19 April 2018, Norwegian Association for IT Professionals	Patient's online health service – the Nordic countries together for the future? National e-health strategy – common challenges and common solutions The patient's drug list is established in Norway Health Platform. Status on the new EHR for Central Norway National project for Digital Pathology Why do I as a physician work with ICT next to patients? Free choice of hospital – how can an EHR support the clinician? Clinicians and eHealth – a mutual addiction?
Arendalsuka, 15 August 2018, Directorate of eHealth	Debate: 'The future patient – how do we meet the challenges?'
EHIN, 13 October–14 November 2018, ICT Norway	Digital management and change How to design attractive eHealth services for the user? Debate: Do we need a new Coordination Reform? Lightweight ICT as a strategy to meet the challenges in future healthcare services A shared foundation for digital services

Appendix G. Details from the analysis

The following are figures and tables that show details from the analysis.

First cycle coding:

1) I sequentially coded the transcripts into nodes. I started with four broad pre-defend classes:
Enterprise Architecture, Project and programs, History of organization, Issues, National culture.
Further the nodes where created on the fly, with themes that was mentioned and discussed. One piece of text could get several nodes.
In total 107 nodes, the EA class had 13 child and 14 grand children node and 2 grad-grand children, and the Issues class had 56 nodes in total.

2) The EA Class were revised, and all challenges related to EA were put in one child node "EA challenges".

Second cycle coding, 1. iteration: The EA Challenges – split to issues.
Assessing the node EA Challenges and coded more specific issues. When new nodes were made, I looked at the transcripts to control if all relevant text was coded. Features in NVIVO, Highlight, and Coding strips was good help. 30 different issues were identified.

Second cycle coding - 2. iteration: The EA Challenges – from issues to categories.
Analyzed the text once more and created categories, the nodes were renamed or created accordingly. Some of the text was related to several categories. Total 8 categories and 19 sub-categories.

Second cycle coding - 3. iteration: The EA Challenges – grouping categories.
Assessed the coded categories and aggregated into broader main categories, in total 5 main categories.
Cross-checked the 56 issues node to see if there where any issues that could hamper the institutionalization process, that I had not coded to EA Challenges

Second cycle coding - 4. iteration: The EA Challenges – review sub-categories.
Reviewed the challenges, assigned all coding in the main categories to sub-categories, three new sub-categories were made, in total 26 sub-categories.

Figure 1. Extracts from memo on the analysing process for EA challenges.

Table 1. Example of the progress of coding of specific quotes.

Quotation	Themes First cycle Parent node: EA	Issues Second cycle iteration Parent node: EA – challenges	Main category and challenge Second cycle iteration Parent node: EA – challenges
'Tools that are good for modelling are not that good for reporting and vice versa'.	Child node: Enterprise architects – work Sub-node: Challenges – tools	Tool support	People and processes -> Tool support
'Organisationally, each HF is an autonomous unit, so it is difficult if some do not want to attend; there are few incentives'.	Child node: Challenges in EA General	Autonomous units AND Organisation	Organisation -> Autonomous units
'We live in a changing landscape, e.g., we are totally dependent on the infrastructure modernisation programme […] – it's clear that it's difficult. So things you thought you should do in one way a month ago, you can no longer do next month'.	Child node: Challenges in EA General	Changing landscape	Complexity -> Changing landscape

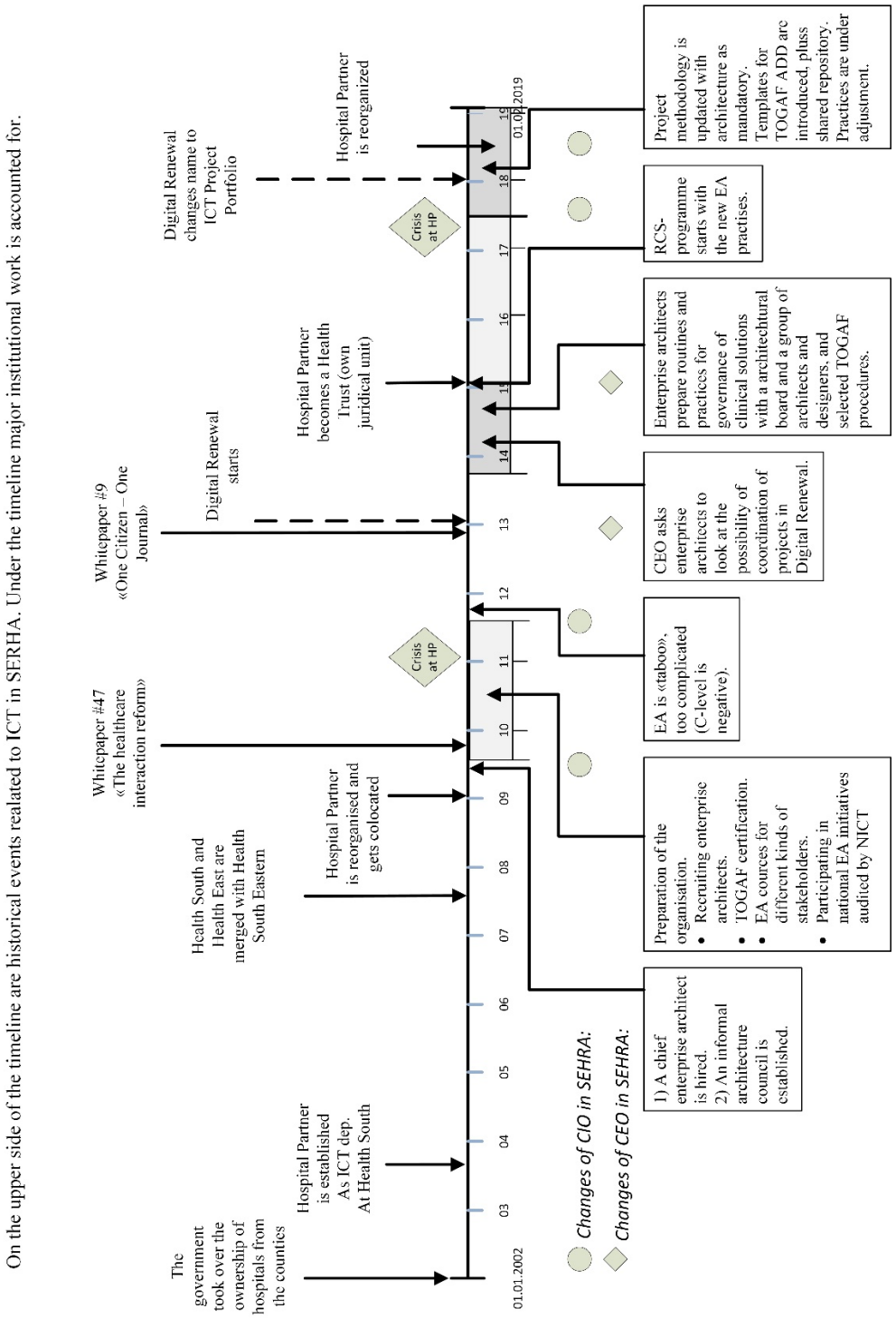
Figure 2. Development of the categories of EA challenges, using NVivo.

Level	Challenges	Challenges due to Conflicts	Initiatives for transition to next level / or to be institutionlaized	Logics / perceived logics	Engelsk translation of orginial text (*Why EA with read/italic*) (tension with green/bold)	EA professionalism (condenced from column F)
Macro	Understanding of EA, Trust to the enterprise arcitecture	Enterprise Architect: Enterprise architects wants to be a partner in strategic work, but do much portfolio management.		Enterprise architecture: EA can contribute to support the organizations strategy and deliver good results in the future. Logic: EA professionalism	"*... it [the focus] is really just the "as-is" picture. We really want to look at how can we support the strategy and how should we deliver the future on good results*".	• have an overview of the portfolio • support the organizations strategy • deliver value
Macro	Autonomy, Understanding of EA	Enterprise Architect: Physician want to choose systems themselves. They are having trouble adapting to the idea of common systems (Competing logic - Medical vs. Public -(Cultural, Power))	SUGGESTION: One have to work with getting understanding of the importance for collaboration	Enterprise architect: "Holistic view, cost reduction, standardization" (Order: State, Professional) Hybrid Logic: EA professionalism and business vs Mangers: "Best for my department" (logic: Clinician logic - safe)	"Yes, but I also think that you must see it from their [department managers] perspective when they claim that when they do not accept something, it's not for inhibiting something, it's because they think it's the best for their department. It is only *the understanding of the bigger picture* that may be missing a bit, and they may actually have to listen to the enterprise architect and look a bit further because - another thing is *the cost of running the way we operate in Norway, by everyone is sitting on their own pile* . [...] I think we should be better off working together and *finding solutions that everyone can have* and not just do their own demands. Still we have a long way to go there".	• Holistic view • Cost reduction • Standardization
Meso	Tools, EA vs Project management, Understanding of EA, Trust to the enterprise arcitecture	Enterprise Architect: Enterprise architects wants to be involved early, project managers does not respond to the demand since it is not described in the project roadmap.	Enterprise architect "In HSE we us a customized Project roadmap from Difi. For a long time we have fight for a pont that an enterprise architect shal be involved in the early phase, in the concept-phase. If the checklist say so, the project leader will do it."	Project manager: Follow the project guideline Logic: Project management logics vs Enterprise Architecture: Holistic view, and must be involved in the early phases. Logic: EA professionalism	"As long as it is not clear [in the project methodology] that 1) you will have an enterprise architect in the early stages and 2) the enterprise architect will deliver these deliveries, - it does not matter if you have TOGAF or what ever, nobody is going to invite you to anything, *before everything has colapsed and people wonder why things does not function* , then they ask "but who is the arcitect for this?"".	• must be involved in the early phases • assess the whole context
Meso	Understanding of EA	Enterprise architect: Wants to start from the vision, but managers or descition makers: Goes to fast to solutions		Enterprise architect: We have to think what do we want, how to achive, which organizational- and ICT changes is needed.	"There is one thing and then it's a culture - still in our organization, I'd say that is a jump right to solution without thinking what's what we want to achieve, how do we achieve it, *What changes must we make organizational and ICT-savvy to get it done, and then one can start looking at solutions*" .	• build on strategy • contribute to achive organizational goals
Micro	Not coded	Enterprise architect: Be a intermediary		Enterprise architect: "Understand the clinicians. Be a link to superior-organizations" Logic: Healthcare	"In our everyday lives we work to try to *understand the clinicians* , that's an important part. We meet the clinicians, try to understand them, and *be a useful link to both the Hospital Partner and the regional*" .	• Understand the clinicians • Be a intermediary to superior-organizations
Micro	C: Not coded (but under Issues, innovation)	Enterprise architect: Want to support the local physicians Organization: Sentralised	SUGGESTION: "We must agree upon some centralized principles, but there is a need to be able to do some local initatives - so we can be flecible!" SUGGESTION: "We could do local innovations, and can be pilots for the rest of the HSE".	Enterprise architect (local): Could have focus in our organization Logic: EA professionalism - micro vs Enterprise architect (meso): Standardization ? Logic: EA professionalism - meso	"Personally, I think it's *working in the way that [in direct contract with the doctors] is very good* , at the same time *I see the need for standardization* , and I wish these two things could be united. [...] it's clear that new development and change is difficult when standardizing, so it's very slowed down on the front [of local customizing]" .	• Standarization • Are constraind, wants to have focus in own organization

Figure 3. Extracts from the analysis related to the enterprise architects' logics, and identifications of tensions.

Appendix H. Timeline for South Eastern Regional Health Authority

On the upper side of the timeline are historical events realated to ICT in SERHA. Under the timeline major institutional work is accounted for.



Appendix I. Analysis of institutional work

Table 1 shows the analysis of the institutional work performed in the South Eastern Regional Health Authority, however this is not an exhaustive list. These activities are mapped to the framework of Lawrence and Suddaby (2006), see section 3.3.4 for explanation.

Table 1. Institutional work in the South Eastern Regional Health Authority (SERHA)

(ICT = information and communication technology, NICT = National ICT, HT = Health Trust, TOGAF = The Open Group Architecture Framework, IT = information technology, EA = enterprise architecture, RCS = Regional Clinical Solutions)

Activity in SERHA	Activity	Period
Participation in NICT forums for enterprise architects with the other regions (and others)	Constructing normative networks and Embedding and routinising	2007->
ICT strategists search alliance with director	Advocacy	2009–2011
Hiring of chief enterprise architect and other strategic hiring of professionals with architecture skills	Defining	2009–2012
TOGAF was selected as the framework.	Defining	2009–2011
The first three persons were certified in TOGAF; later, more IT personnel were certified	Education	2009–2011
Course activity in EA for different stakeholders (over 100 persons)	Constructing identities	2009–2011
Informal architectural council with enterprise architects from SERHA and HTs	Constructing normative networks	2009–2011
Participation in developing EA practices EA in NICT, 42.2 (1 September 2013– 31 March 2014)	Constructing normative networks and Education	2011–2015
Enterprise architects suggesting using EA methodology to improve coordination among projects in Digital Renewal	Advocacy and Mimicry	2013–2015
Meetings (3000) to anchor one of the projects in Digital Renewal	Constructing identities	2015–2016
Formal architectural board for RCS	Vesting	2015 ->
Formal architect and design group for RCS	Vesting and Policing	2015 ->

Table 1. Continued.

Activity in SERHA	Activity	Period
Meetings arranged by architect and design group for information and learning purposes	Changing normative associations and Mimicry and Embedding and routinising	2015->
Enterprise architect's effort of having architecture mandatory in the project methodology	Advocacy	2015–2017
Formalise architecture in project methodology	Enabling work and Defining and Disconnecting sanctions/rewards	2017->
Development and formalised use of TOGAF Architecture Definition Document	Enabling work and Defining	2017->
Information meeting to persuade people to use mandatory methodology	Constructing identities and Changing normative associations and Undermining assumptions and beliefs	2017->
TOGAF Architecture Definition Document updated in 2018	Enabling work	2017->
Information meeting to persuade people to use updated methodology	Embedding and routinizing	2017->
Finding ways to collaborate around architectural governance	Advocacy	2017->
RCS publish a monthly news-bulletin	Embedding and routinizing	2017->
External consultant can lose their possibility to prolong the contract if they disobey to use mandatory tools and methodology	Deterring	2017->

Appendix J. Thesis articles

The following research articles are included as part of this research project:

1. Ajer, A. K. S., 2018. Enterprise architecture in healthcare and underlying institutional logics: a systematic literature review of IS research. Paper presented at the *22nd Pacific Asia conference on information systems*. Yokohama, Japan, 26–30 June 2018. Association of Information Systems electronic Library (AISeL).
2. Ajer, A. K. S., & Olsen, D. H. 2018. Enterprise architecture challenges: a case study of three Norwegian public sectors. Paper presented at the *26th European conference on information systems*. Portsmouth, UK, 23–28 June 2018. AISeL.
3. Ajer, A. K. S., Hustad, E., & Vassilakopoulou, P., 2018. Enterprise architects' logics across organisational levels: a case study in the Norwegian hospital sector. Paper presented at the *12th Mediterranean conference on information systems*. Corfu, Greece, 28–30 Sept. 2018. AISeL.
4. Ajer, A., Hustad, E., & Vassilakopoulou, P., 2019. Enterprise architecture in hospitals: resolving incongruence issues. Paper presented at the *17th World congress of medical and health informatics*. Lyon, France, 25–30 Aug. 2019. Europe pmc.
5. Ajer, A. K. S., & Olsen, D. H., Enterprise architecture implementation is a bumpy ride: a case study in the Norwegian public sector. *The Electronic Journal of e-Government*.
6. Ajer, A., Hustad, E., & Vassilakopoulou, P., (submitted version after first revision) Enterprise architecture and institutional pluralism: the case of the Norwegian hospital sector. Currently under revision after second round of review for the *Information Systems Journal.*

MEDINFO 2019: Health and Wellbeing e-Networks for All
L. Ohno-Machado and B. Séroussi (Eds.)

doi:10.3233/SHTI190305

Enterprise Architecture in Hospitals: Resolving Incongruence Issues

Anne Kristin Ajera, Eli Hustada, Polyxeni Vassilakopouloua

[a] *Department of Information Systems, University of Agder, Kristiansand, Norway*

Abstract

Enterprise Architecture allows addressing technologies and processes in a holistic way and mirrors choices related to process standardization and data integration. It has the potential to address long-standing problems in health information systems related to fragmented IT portfolios, immature IT infrastructures, and silo-structured organizing. Nevertheless, uptake of Enterprise Architecture in hospitals has been slow. To understand the issues related to this slow uptake we have undertaken an interview study with architects and managers. The issues identified reveal a level of incongruence between healthcare as a domain and the practice of EA. Specifically, by analyzing the experiences of architects and managers we identified four different areas of such incongruence that create the need to reconcile a) Bottom-up vs. Top-down Planning b) Clinical vs. Systems´ Knowledge, c) Local vs. Global Arrangements and d) Patient Safety vs. Patient Privacy. Building on prior related research we propose ways for resolving the incongruence issues identified.

Keywords:

Architecture; Health Information Systems; Qualitative Research

Introduction

An organization's Enterprise Architecture (EA) describes in a hierarchical way its processes, the data and applications that support these processes, and all related information and communication technology (ICT) arrangements [3]. Practitioners and researchers have advocated EA as a systematic approach for designing, planning, and implementing process and technology changes [5; 21]. The EA approach addresses technologies and processes in a holistic way and mirrors choices related to standardization and integration [17]. During the last two decades, hospitals started EA initiatives aiming to address long-standing problems in health information systems related to fragmented IT portfolios, immature IT infrastructures, and silo-structured organizing.

Norway has formally adopted EA as a strategic tool for hospital information systems and processes [14]. Nearly all hospitals in the country are public and organized as health trusts that can include several local hospitals. The trusts are allocated to four independent regional health authorities under the jurisdiction of the Ministry of Health and Care Services. The strategic coordination, prioritization, and consolidation of key ICT issues across the regions are performed by a separate organizational entity dedicated to healthcare ICT called the National ICT (NICT). Four regional health authorities is jointly owned by NICT. The Norwegian government has issued several white papers that describe how ICT shall be used to achieve health policy objectives and deliver more effective and efficient services, with emphasis on quality and patient security [9]. Two of the most important white papers that guide the development of eHealth services are "The Healthcare Coordination Reform" (2009) and "One Citizen – One Record" (2012). The first one addresses issues related to collaboration, while the second one, sets the targets for the evolution of healthcare services [2; 8].

Norwegian hospitals are supported by complex information infrastructures that evolved over many years. The earliest use of electronic documentation of patient information in health services dates back to the 1970s while the first implementations of applications for entire hospital coverage started in the 1980s [7; 16]. With the adoption of EA, structured, comprehensive and aligned blueprints for current and future states of hospital systems and processes can be developed. Furthermore, EA can provide guidance for implementing processes and technology changes to operationalize strategies. Nevertheless, despite the potential benefits and the state mandate for introducing EA, there have been significant delays and challenges.

To gain insights about EA introduction in Norwegian hospitals, we performed interviews with key actors at the local, regional and national level across the hospital sector. Prior research has shown that the introduction of EA is far from straightforward and pointed to the importance of a favourable organizational culture [1; 15; 23]. Intrigued by this previous research finding, we specifically investigated the following research question: *are there inherent issues related to incongruence between healthcare as a domain and the practice of EA?*

The rest of the paper is structured as follows. First, we describe the empirical setting and explain our research method. Second, we provide the results. Third, we discuss the results and drawing from prior related research we propose ways for resolving the incongruence issues identified. We conclude the paper by pointing to the contributions and limitations of our research.

Methods

Data collection

Semi-structured interviews were conducted with Enterprise Architects and Managers involved in the introduction of EA in Norwegian hospitals at the local, regional, and national level. In total 17 interviews were performed between November 2016

and August 2017 (Table 1). All the informants interviewed had at least two years of experience in their current position. At the national level, most of the interviewees had been working since NICT started (2.5 years ago) while all were experienced before joining NICT. At the regional level, the enterprise architects had been employed for an average of about 5 years, and the managers for about 7 years. At the local level, the enterprise architects had been employed for an average of 10 years and the managers for 8 years on average. Interview questions explored the experiences of participants. The interviews included topics on how EA was used, the role of enterprise architects, and issues about national coordination and collaboration in eHealth. All interviews were audio recorded and transcribed.

Table 1– Interviews Performed

Level	Informants	# interviews
National	5 Enterprise Architects	5
Regional	4 Enterprise Architects and 2 Managers	7
Local	2 Enterprise Architects and 3 Managers	5

In Figure 1 we present the overall structure of the hospital sector in Norway (as described in the introduction) marking the specific units where interviews have been performed.

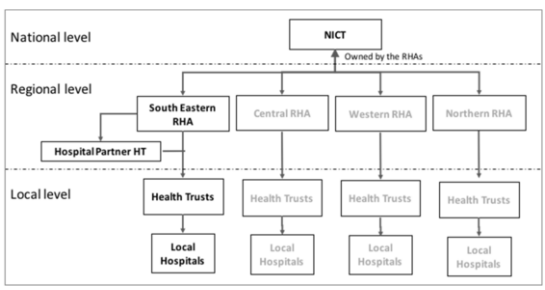


Figure 1–Overview of the Norwegian Hospital Sector (units covered by interviews are marked in bold)

Analysis

An iterative approach was followed for the data analysis. The coding followed the principles of first- and second-cycle coding [13]. The first cycle was done in NVivo where all anonymized transcripts were entered. The transcripts were further analysed and grouped into Excel forms. In the second cycle, the data were discussed, organized, and compared in an iterative process to identify emerging patterns. This initial analysis yielded a wide range of challenges, some related to the technological landscape, the financing mechanisms in place, the different logics of actors involved and the governance arrangements. Furthermore, we also encountered issues related to inherent healthcare characteristics that complexify the introduction of EA. Drawing from these initial findings, and building on previous research that points to the significance of idiosyncratic characteristics (such as culture) for the introduction of EA, we focused our analysis on issues related to incongruence between healthcare as a domain and the EA practice.

Results

We identified four key themes related to healthcare characteristics that create friction in the introduction of EA. In the paragraphs that follow we present the findings from the interviews organized according to these key themes.

Clinical vs Systems Knowledge

Several informants expressed concerns related to the instances where core hospital processes need to be redefined. In such instances, systems´ knowledge encounters medical knowledge. One of the architects wondered about the role of systems experts since they "*do not treat patients*". Another architect said, "*administrative tasks can be standardized, but for clinical ones we cannot suggest the best way*". One of the managers pointed to the singularity of healthcare domain related to the key role of the medical staff for setting the norms for patient care irrespectively of hierarchical positioning: "*the tax director does not understand that the health director cannot decide*". Another architect pointed to issues of distributed control in the domain "*you have so many strong doctors … you have strong departmental directors…there are many little kings*". Overall, hospitals unlike other large-scale organizations such as banks or public administrative services where EA has been successfully introduced, are characterized by strong professional practices that have a decisive role in process and systems optimization.

Local vs Global Arrangements

One of the architects lucidly expressed a key challenge with EA work: "*they want their local systems, not regional ICT services*". The health trusts want autonomy to meet local needs and there is a power struggle with the regional authorities. The regional authorities do own the health trusts, but they do not treat patients directly, so they do not experience day-to-day operational challenges. A manager explained that health trusts are similar to individual companies; they do not really have a "*mother-daughter*" relationship within the overall healthcare structure. One of the enterprise architects said, "*a model that ensures both standardization and taking care of local wishes may be beneficial*". Another architect pointed to concrete differences between two major hospitals: "*hospital A is much more IT mature than B, doctors and many nurses are involved in the IT department, they are much closer to the users*". A manager explained that although the needs may be similar in different regions there are different cultures across hospitals and these cultural differences matter.

Bottom-up vs Top-down Planning

EA is a plan-driven approach, however, holistic planning of ICT within healthcare can be especially challenging as explained by one of the architects interviewed "*the biggest challenge is to maintain local understanding…it should be taken from patients to clinicians and upwards not top-down*". Another architect explained that it is important to follow a bottom-up approach because clinicians often have good solutions to their own problems. Nevertheless, one of the managers pointed to the importance of top-down approaches that allow better coordination, the manager pointed to the need for a stronger central role "*everybody wants new systems,*

nobody wants to change". Balancing bottom-up with top-down planning has proven to be challenging for the EA initiatives.

Patient Safety vs Patient Privacy

An architect pointed to the need to consider data flows not only in terms of security and privacy but also in terms of patient safety. The standard regulations and procedures for systems analysis and risk containment are addressing issues related to data security and patient privacy but not issues of patient safety. Architects are not experts in issues related to patient safety. Another architect explained how important it is to make available patient data when patients move from region to region, but this is not straightforward to implement. A manager pointed also to the need for data exchanges between primary care and hospitals. Overall, the visions for data integration are bringing up unresolved issues related to balancing patient safety and privacy.

Table 2 provides an overview of the results, mapping the four key themes identified to key EA features that are challenged by the singularities of the healthcare domain. Specifically, the practice of EA is plan-driven and oriented towards process standardisation, and data integration and these characteristics relate to friction experienced when introducing EA in healthcare.

Table 2– Incongruence Themes Identified

EA characteristics	Healthcare characteristics	Incongruence themes identified
Plan-driven	National strategies but also pivotal bottom-up initiatives	Bottom-up vs Top-down Planning
Process standardisation	Processes inscribe clinical knowledge Local variation	Clinical vs Systems´ Knowledge Local vs Global Arrangements
Data integration	Sensitive but also mission-critical data	Patient Safety vs Patient Privacy

Discussion

The issues identified reveal a level of incongruence between healthcare as a domain and the practice of EA. The friction themes identified, can be related to prior research findings in Health Informatics. Healthcare is "work regarded as unusually complex, uncertain, and of great social importance." To ensure the best possible outcomes under these difficult circumstances, "the strategy pursued is to couple capability with discretion in one responsible actor and place him or her as close as possible to the problem situation … legitimate control over the nature and quality of professional practice is vested in the professional staff, not in the administration" [18]. Prior research [20] has identified that in healthcare universality is always "local universality" in the sense that it "always rests on real-time work and emerges from localized processes of negotiations and pre-existing institutional, infrastructural, and material relations". Furthermore, along the same line of thought, researchers [4] have conceptualized the distinction between conjoint and context-dependent design negotiations showing how in successful standardization processes stakeholders define and agree on boundary factors (elements that are meaningful across borders) while creating possibilities for local reconfigurations.

Prior research has also pointed to the fact that frequently, advancements in healthcare come out of practice-driven initiatives without a predetermined strategy and without the initial support of management; a novelty in healthcare usually entails extensive work over lengthy periods of time by different participants [10; 11; 19]. An approach that balances between bottom-up and top-down approaches for the evolution of Health IT Systems has been proposed in the literature [6]. The approach is labelled "middle-out" and is described as a situation where governments provide incentives and support that encourage clinical providers to acquire systems that are technically or functionally compliant, and to pursue innovations that keep their systems compliant over time. Such an approach entails specifying commonly agreed compliance requirements.

Ensuring data security and privacy while catering for patient safety is one of the big challenges when it comes to streamlining data flow and pursuing data integration in healthcare. A possible way to address this challenge is by enabling a more active role for the patients. A patient-centric logic not only spans the whole spectrum of patients' needs from preventive healthcare, to treatments and long-term care but also presumes a more active role for the patients themselves. Patients can contribute through information sharing, self-service, and assisting healthcare staff acting as resource integrators [12]. To do this, they need to be able to access, manipulate and contribute data. Moreover, they need to stay informed about who is accessing their data and be able to manage access. Enabling patients to control data flows entails ensuring the clarity, user-friendliness, and transparency of patient-oriented data handling solutions.

Overall, healthcare is a safety-critical domain that requires everyday coping with uncertainty. Patients can have unique combinations of conditions and this explains the acknowledged need for medical discretion. Reliability in healthcare is not only the outcome of protocols and formal procedures but also, of an acquired capacity to perform even though working conditions fluctuate and are not always known in advance. This capacity frequently found in high-reliability settings is a mix of risk anticipation and containment encapsulated in the term "mindfulness" [22]. Mindfulness is analysed to: a) preoccupation with failure; healthcare practitioners are concerned with success as much as with failure – Hippocrates' Oath "do no harm", b) reluctance to simplify; simplifications are avoided, c) sensitivity to operations; attention is given to process dependability under diverse circumstances, d) commitment to resilience; healthcare professionals need to be able to recover from mishaps and cope with surprises pursuing alternative means to goals, and paying attention both to error prevention and containment, and e) deference to expertise; the need for a wide array of specialisms is acknowledged and respected. EA initiatives need to retain and possibly further enhance mindfulness in the domain.

Implications for Practice

The findings suggest that in order to advance with EA in hospitals, it is important to resolve key issues related to the characteristics of EA and the singularities of the domain. There is limited prior research on the domain-specific characteristics

that hinder the introduction of EA in healthcare. This is work that we have begun to undertake. The table that follows (Table 3) is building upon prior related research to propose a set of resolutions for the incongruence themes identified. These proposed resolutions can guide practitioners involved in the introduction of EA in hospital settings.

Table 3– Resolutions for Incongruence Themes Identified Directions for Mindful EA Initiatives

Incongruence Themes	Proposed Resolutions	Brief Description
Bottom-up vs Top-down Planning	Middle-out	Incentivize clinicians to acquire compliant systems (based on common requirements).
Clinical vs Systems´ Knowledge Local vs Global Arrangements	Configurable solutions catering for both standardisation and local needs	Technology accommodating clinical discretion and local variation.
Patient Safety vs Patient Privacy	Stronger patient role – patient data access management	Patients can contribute acting as resource integrators.

Limitations and Strengths

The study has been conducted within Scandinavian healthcare so we cannot judge to what extent the findings reflect friction and tension with the introduction of EA in hospitals in different countries that have different institutional characteristics. However, the issues identified relate to the characteristics of healthcare as a practice in general and are also found in prior research conducted in different countries. A strength of our study is that it links to prior related research to propose concrete resolutions. Furthermore, it provides detailed qualitative data on the experiences of architects and managers involved in the implementation of EA at different levels (local, regional, national) and can provide insights for those that seek to contribute to such initiatives.

Conclusions

This study suggests that there are inherent issues in the introduction of EA in hospitals that relate to some level of incongruence between EA and the key characteristics of the healthcare domain. Specifically, by analyzing the experiences of architects and managers we identified four different areas of such incongruence that create the need to reconcile a) Bottom-up vs. Top-down Planning b) Clinical vs. Systems´ Knowledge, c) Local vs. Global Arrangements and d) Patient Safety vs. Patient Privacy. Our study can be used as a basis for further research towards the development of a measurement instrument to assess trade-offs in the four incongruence areas identified. As these areas relate to the nature of healthcare delivery, prior research has brought insights related to potential resolutions. Although the introduction of EA in hospitals is far from straightforward, working towards resolutions for the specific incongruence themes identified can be a basis for mindful EA initiatives. Mindful EA can be a healthcare-specific EA approach for systematically designing, planning, and implementing process and technology changes.

Acknowledgements

We would like to thank the informants that shared their experiences and views. We would also like to thank the anonymous reviewers for their constructive comments that helped us improve our manuscript.

References

[1] S. Aier, The role of organizational culture for grounding, management, guidance and effectiveness of enterprise architecture principles, *Information Systems and E-Business Management* **12** (2014), 43-70.

[2] C. Bergland, På vei mot én innbygger - én journal, (2018). https://vimeo.com/258664516 (accessed March 14, 2018).

[3] S.A. Bernard, *An introduction to enterprise architecture*, *3rd Edition*, AuthorHouse, Bloomington IN, United States, 2012.

[4] P. Bjørn, S. Burgoyne, V. Crompton, T. MacDonald, B. Pickering, and S. Munro, Boundary factors and contextual contingencies: configuring electronic templates for healthcare professionals, *European Journal of Information Systems* **18** (2009), 428-441.

[5] R.V. Bradley, R.M.E. Pratt, T.A. Byrd, C.N. Outlay, and D.E. Wynn Jr, Enterprise architecture, IT effectiveness and the mediating role of IT alignment in US hospitals, *Information Systems Journal* **22** (2012), 97-127.

[6] E. Coiera, Building a national health IT system from the middle out, *Journal of the American Medical Informatics Association* **16** (2009), 271-273.

[7] P. Doupi, E. Renko, and S. Giest, S., Ehealth Strategies - Country Brief: Norway, (2010). http://ehealth-strategies.eu/database/documents/Norway_CountryBrief_eHStrategies.pdf (accessed March 25, 2018).

[8] Directorate of eHealth, IKT-organisering i helse- og omsorgssektoren, (2017). https://ehelse.no/Lists/Publikasjoner/Attachments/12/Rapport - IKT-organisering i helse- og omsorgssektoren.pdf (accessed November 30, 2018).

[9] Directorate of eHealth, Styringsdokument (2017). https://ehelse.no/styringsdokument (accessed March 10, 2018).

[10] A. Essén, and S. Lindblad, Innovation as emergence in healthcare: unpacking change from within, *Social Science & Medicine* **93** (2013), 203-211.

[11] M. Janssen, A. Stoopendaal, and K. Putters, Situated novelty: Introducing a process perspective on the study of innovation, *Research policy* **44** (2015), 1974-1984.

[12] J.R. McColl-Kennedy, S.L. Vargo, T.S. Dagger, J.C. Sweeney, and Y. van Kasteren, Health care customer value cocreation practice styles, *Journal of Service Research* **45** (2016), 370-389.

[13] M.B. Miles, A.M. Huberman, and J. Saldaña, *Qualitative Data Analysis: A Methods Sourcebook*, *3rd Edition*, Sage Publications, Thousand Oaks, California, USA, 2014.

[14] NICT, Nasjonal IKTs strategiplan for 2013-2016, (2012). https://nasjonalikt.no/documents/saksdokumenter for

styremøte og pf/strategi nikt 2013 - 2016.pdf (accessed May 28, 2015).
[15] E.I. Niemi, and S. Pekkola, Enterprise Architecture Benefit Realization: Review of the Models and a Case Study of a Public Organization, *ACM SIGMIS Database: the DATABASE for Advances in Information Systems* **47** (2016), 55-80.
[16] Norwegian Center for Electronic Patient Records, EPR Monitor: Overview of prevalence and use of ICT in healthcare services, (2009). http://hiwiki.idi.ntnu.no/images/7/79/EPJ-monitor-2008-hovedrapport.pdf (accessed May 28, 2015).
[17] J.W. Ross, P. Weill, and D. Robertson, *Enterprise architecture as strategy: Creating a foundation for business execution*, Harvard Business Review Press, Boston, MA, United States, 2006.
[18] W.R. Scott, Managing Professional Work: Three Models of Control for Health Organizations, *Health Services Research* **17** (1982), 213-240.
[19] T. Thune, and A. Mina, Hospitals as innovators in the health-care system: A literature review and research agenda, *Research Policy* **45** (2016), 1545-1557.
[20] S. Timmermans, and M. Berg, Standardization in action: Achieving local universality through medical protocols, *Social Studies of Science* **27** (1997), 273-305.
[21] V. Venkatesh, H. Bala, S. Venkatraman, and J. Bates, Enterprise architecture maturity: the story of the veterans health administration, *MIS Quarterly Executive* **6** (2007), 79-90.
[22] K.E. Weick, K.M. Sutcliffe, and D. Obstfeld, Organizing for high reliability: Processes of collective mindfulness, *Research in Organizational Behavior* **21** (1999), 81-123.
[23] S. Weiss, S. Aier, and R. Winter, Institutionalization and the effectiveness of enterprise architecture management, in *Thirty Fourth International Conference on Information Systems*, Association for Information Systems, 2013, 1 - 19.

Address for correspondence

Associate Professor Polyxeni Vassilakopoulou
Information Systems Department, University of Agder
Universitetsveien 25, 4630, Kristiansand, Norway
Email: polyxenv@uia.no

Enterprise Architecture Implementation Is a Bumpy Ride: A Case Study in the Norwegian Public Sector

Ajer, Anne Kristin S., University of Agder, Kristiansand, Norway, anne.k.ajer@uia.no

Olsen, Dag Håkon, University of Agder, Kristiansand, Norway, dag.h.olsen@uia.no

Abstract

Enterprise architecture (EA) is a widespread approach for the development of new digital solutions in a planned and controlled way for large and complex organisations. EA is also viewed as a prerequisite for the digitalisation of the public sector. However, public sector organisations struggle to implement EA programmes, and research has demonstrated that organisational and managerial issues are critical obstacles to EA implementation. This study aims to increase our understanding of EA implementation in the public sector by investigating the central challenges for EA initiatives and to trace the progress of current EA initiatives in the Norwegian public sector. An additional goal is to disclose some ways to improve the situation. We conducted three interpretive case studies in the hospital, higher education, and labour and welfare sectors. We have identified 28 challenges to the EA initiatives. We find that organisational and technical complexities, as well as a limited understanding of EA and lack of formal EA governance mechanisms, are significant obstacles. Among others, the lack of understanding of EA and its methodology will lead to problems with anchoring the EA approach in the organisation and facilitating the necessary EA arrangements to induce the promised benefits of EA, which are necessary requirements to establish the EA initiative's legitimacy and foster the organisation's willingness to implement change. Our study provides four lessons learned for planning and implementing EA initiatives, as follows: #1. It is advisable to take small steps. #2. The use of external consultants should be carefully considered. #3. Formal architectural governance mechanisms are important for legitimacy and enforced use. #4. Executive commitment and understanding of EA are crucial for achieving a sustainable EA initiative. Finally, we find a common evolution of the EA initiatives through the phases of optimism, resistance, decline and finally, reconsolidation of the most persistent ones.

Keywords: enterprise architecture, digital transformation, public sector, e-government

1 Introduction

Enterprise architecture (EA) is viewed as an important requirement for success in the digital transformation in the public sector (Hjort-Madsen and Pries-Heje, 2009; Ojo, Janowski and Estevez, 2012) and has become a common approach among European governments (Królikowska, 2011; Bakar and Selamat, 2016). EA is a systematic way to develop and maintain business processes and related information and communications technology (ICT) in a coherent way and in accordance with an organisation's vision and strategy (Jonkers, et al., 2006; Ross, Weill and Robertson, 2006). EA management (EAM) is the discipline used to plan and control the transformation (Aier, Gleichauf and Winter, 2011). The major internal drivers for EA are business–IT alignment and cost reduction, and the major external drivers are legal requirements (Schöenherr, 2008). Despite an increasing interest in EA research in this millennium, EA implementation remains a problematic endeavour (Simon, Fischbach and Schoder, 2013; Dale and Scheepers, 2019). Moreover, it is more problematic in the public sector than in the private sector, but the underlying reasons are not clear (Mezzanotte and Dehlinger, 2014). Over the last decade, EA has been regarded as the instrument for achieving the national goals of ICT coordination and interoperability for the Norwegian public sector (NICT, 2008; Ministry-of-Health-and-Care-Services, 2009; Ministry-of-Local-Government-and-Modernisation, 2009). The Norwegian Agency for Public Management and eGovernment (Difi), Difi (2012), states that an EA consists of princi-

ples, methods and models, whose purpose is to develop and implement solutions in a holistic and coherent way, with the aim of securing the alignment between work processes and IT, as well as avoiding silos. However, research has documented substantial challenges in obtaining appropriate results from the current EA initiatives in the Norwegian public sector. Ulriksen, Pedersen and Ellingsen (2017) report challenges related to a specific standard for an electronic health record (EHR) system, and Øvrelid, Bygstad and Hanseth (2017) report disputes on how centralised governance for a specific EHR system can impede local innovation. However, these studies position themselves in the information infrastructure literature and do not address the challenges within the EA research stream. Importantly, from the perspective of our research interest Ulriksen, Pedersen and Ellingsen (2017) call for more studies on the complex power dynamics among stakeholders in the process.

In our literature review, we have found case studies covering EA challenges in several countries (e.g. Janssen and Hjort-Madsen, 2007; Carota, Corradini and Re, 2010; Valtonen, et al., 2011; AlSoufi, 2014; Moreno, et al., 2014; Zadeh, et al., 2014; Bakar and Selamat, 2016). Nevertheless, Dang and Pekkola (2016) call for more research related to problems with EA in the public sector, for example, using case studies from other countries. Moreover, Dang and Pekkola (2017) find that the research in the public sector is immature, and they recommend further studies on implementation and adoption issues. We find these calls appropriate because many of the identified challenges in EA come from studies in the private sector, or in a mix of private and public sectors, and the public sector has institutional constraints that influence inter organisational collaboration in ways other than those in the private sector (Fountain, 2004). Since research on EA methods is well covered, researchers should address establishing architectural thinking (Seppänen, Penttinen and Pulkkinen, 2018). Improving EA governance still requires in-depth knowledge on how EAM is integrated into the organisation, the characteristics of the enterprise architects and the factors that influence the evolution of EAM (Rahimi, Gøtze and Møller, 2017; Rouhani, et al., 2019), as well as the dynamic nature of EA (Schilling, Haki and Aier, 2018). To contribute to the EA literature by addressing the calls for more country-specific studies related to challenges in EA implementation in the public sector and to enrich insights into EAM, we find it useful to more closely address the following questions: *How have the EA initiatives in Norway progressed? What are the main challenges encountered by the EA initiatives?* To answer these questions and aiming for generalisability, we have conducted an interpretive case study with qualitative interviews and document reviews in three Norwegian public sectors.

We continue this paper as follows: In Section 2, we account for our study's theoretical grounding. Next, we describe the research context and method in Section 3. In Section 4, we present our findings from three case studies. In Section 5, we discuss the findings in light of previous research. Finally, we conclude with a brief summary, suggest some implications for the national authorities and offer recommendations for future work.

2 Enterprise Architecture and Challenges

Since the 1990s, EA has been used as an approach in large organisations to manage complex information technology (IT) landscapes in a systematic way (Ross, Weill and Robertson, 2006; Bernard, 2012). There is no common definition of EA (Rahimi, Gøtze and Møller, 2017), but it is usually perceived as the recognition of an organisation's need for ICT solutions from a holistic perspective. A holistic perspective on EA provides the architecture to support the organisation as a whole (Jonkers, et al., 2006; Ross, Weill and Robertson, 2006; Bernard, 2012). EA is viewed as the enabler for making the transition from lower to higher maturity states, for example, this would aid an organisation in progressing from isolated silos to integrated solutions across the organisation, making the IT landscape efficient, robust and flexible (Ross, Weill and Robertson, 2006). The scope of EA has expanded from applying a technical approach, via integrating the business, to including organisational strategy and business development (Rahimi, Gøtze and Møller, 2017).

Based on the definitions of Jonkers, et al. (2006); Ross, Weill and Robertson (2006); Bernard (2012), we synthesise the following definition of EA: EA is a hierarchical description of organisations' current and future states, represented by artefacts describing the business processes and IT components, including information models, hardware and software to support the business processes. EA thus enables the transition towards the organisations' vision in a coherent and systematic way. Consequently, the organisations' capability to be agile and responsive to change is strengthened.

In an effort to arrive at the problematic transition between strategy and implementation of complex systems, Zachman (1987) prepared a framework to improve this conversion. Today, there are several EA frameworks, and one of the most popular is The Open Group Architecture Framework (TOGAF) (Simon, Fischbach and Schoder, 2013; Denert-Stiftungslehrstuhl, 2015). However, the frameworks need adjustment for specific or-

ganisations (Buckl, et al., 2009) or can be used as conceptual models for new frameworks, as Armour, Kaisler and Liu (1999) did for the US Department of the Treasury, where they used concepts from three frameworks, namely Zachman's, TOGAF and the Technical Architecture Framework for Information Management (TAFIM). Additionally, there are frameworks for specific industries (Gong and Janssen, 2019), yet some organisations only use parts of a framework (Fallmyr and Bygstad, 2014) or none at all (Denert-Stiftungslehrstuhl, 2015). However, frameworks can be hard to use and understand. For example, in an attempt to solve practical problems with the national EA framework for Finland, an alternative concept called Lean EA development was formulated (Hosiaisluoma, et al., 2018).

An EA approach is about how an organisation plans and develops its EA. Kotusev, Singh and Storey (2015) compare three different approaches to EA identified in the literature, as follows: a traditional stepwise approach with strong support from frameworks, the Massachusetts Institute of Technology approach where the vision represented in a core diagram is essential, and a more dynamic 'ad hoc' approach. In short, achieving business strategy alignment with IT is important for all approaches. EAM is a separate discipline and a common term for the processes of planning, executing, controlling and maintaining the organisation's EA (Buckl, et al., 2009; Weiß, 2015).

Governance, management, planning, and communication and support are common success factors (CSFs) in five EA implementation success models (Nikpay, et al., 2013). In a recent study, Rouhani, et al. (2019) not only verify the top CSFs in the literature, *governance, management, support (top management commitment) and communication*, but also identify two additional CSFs *the readiness of technology and infrastructure* and *EA team capability*. Lange, Mendling and Recker (2016) and Löhe and Legner (2014) describe several challenges for EAM; EA requires a lot of effort, which leads to problems with measuring the benefits, and delays are common. The lack of governance, insufficient support for EA development from the business and IT management, as well as inadequate resources and skills, are central issues in their articles. The reason why top management commitment is so critical is summed up as follows: '[…] indeed, without management's commitment, the EA project is doomed to failure' (Banaeianjahromi, 2018a, p.102).

In an effort to explain how to achieve benefits from EA, Shanks, et al. (2018) conceptualise EA service capability, which is formed from four components: EA content, EA standards, EA stakeholder participation and EA skills and knowledge. EA content refers to models describing the business and the IT systems, as well as roadmaps for planning purposes. EA standards comprise policies, rules and guidelines that direct architects in designing and managers in controlling the EA. EA stakeholder participation involves stakeholders other than the EA team, including management, relevant business and IT personnel who are crucial in establishing the foundations for the EA service capability. Finally, EA skills and knowledge pertain to EA professionals' need to acquire extensive knowledge of an organisation's business and IT, in addition to being communitive.

Notwithstanding the knowledge about CSFs and well-developed EA frameworks, empirical studies in the public sector worldwide demonstrate challenging implementation issues for EA. A recurring problem pertains to organisational issues, such as inadequate support, involvement and understanding from management and business units (Hjort-Madsen and Pries-Heje, 2009; Banaeianjahromi and Smolander, 2016; Dang and Pekkola, 2016; Banaeianjahromi, 2018a; Seppänen, Penttinen and Pulkkinen, 2018). Furthermore, socio-technical issues related to the many different actors involved from different autonomous organisational units pose problems with authority, prioritising of projects and agreement on standards (Boh and Yellin, 2006; Hjort-Madsen, 2006; Saarelainen and Hotti, 2011; Drews and Schirmer, 2014; Bakar and Selamat, 2016; Dang and Pekkola, 2016). Another theme is EA governance and management, where the lack of guidelines and appropriate frameworks causes challenges (AlSoufi, 2014; Drews and Schirmer, 2014; Bakar and Selamat, 2016; Hosiaisluoma, et al., 2018). Likewise, insufficient tool support is problematic (e.g. the absence of shared repository and inadequate modelling tools for inter-organizational settings) (AlSoufi, 2014; Drews and Schirmer, 2014; Bakar and Selamat, 2016; Banaeianjahromi and Smolander, 2016). The last recurring theme that we pinpoint is the need for stable and knowledgeable EA and IT personnel (Bakar and Selamat, 2016; Banaeianjahromi and Smolander, 2016; Dang and Pekkola, 2016; Seppänen, Penttinen and Pulkkinen, 2018).

3 Research Setting and Method

3.1 Research Setting

In its effort to coordinate ICT investments, the Norwegian government, through the Ministry of Local Government and Modernisation (LGM), has developed principles for ICT architecture. Difi has subsequently described these as EA principles (Ministry-of-Local-Government-and-Modernisation, 2009; Difi, 2012). A directive from LGM states, 'To contribute to a coherent whole in public ICT-solutions and services, governmental enterprises shall follow common architectural principles [...] elaborated by Difi (Ministry-of-Local-Government-and-Modernisation, 2011). The sectors that we have studied are the hospital sector, the higher education sector (HES) and the Norwegian Labour and Welfare Administration (with the acronym NAV in Norwegian).

The hospital sector

Norwegian hospitals are organised into four independent enterprises, called regional health authorities (RHAs). This case focuses on South Eastern RHA (SERHA), which serves the country's largest region, with 10 health trusts (HTs) and 78,000 employees. In addition to a department for technology and eHealth, SERHA has organised its ICT operations as a trust, called Hospital Partner (HP).

The RHAs are owned by the Ministry of Health and Care Services (HCS). Each RHA exercises some authority over the HTs in its region; this is regulated by laws. For example, the RHA can influence and to a certain degree decide on what ISs the HTs shall use. Investments in ICT are made at both the regional and the trust levels. The National ICT (NICT) was established at the initiative of the HCS in 2003; in 2014, the NICT was reorganised as a separate trust owned by the four RHAs. The NICT's main work areas are strategic coordination, prioritisation and consolidation of a common approach to key ICT issues across the regions. One of the goals is to establish an EA strategy.

At SERHA, all the HTs have their own ICT portfolios, and SERHA has an ongoing portfolio programme called Digital Renewal to develop shared regional solutions for important areas in clinical and administrative settings and research. The budget allocation for Digital Renewal for 2013 – 2020 is 6585 MNOK, and the accumulated expenses in 2017 amounted to 4521 MNOK. One of the programmes is named Regional Clinical Solution (RCS); some of its large projects are consolidating its electronic patient journal system and implementing regional solutions for laboratory, radiology and multimedia.

The higher education sector

The second case involves the HES, which is under the authority of the Ministry of Education and Research. We have studied universities and university colleges (UUCs) and their challenges in establishing an EA practice. Of the 33 independent higher education institutions, 9 are fully accredited universities, and 24 are public institutions. There are some organizational units that work across the sector, e.g. the Joint Study Administrative Service Center.

The individual institutions and their systems have developed relatively independently, and the systems are usually different and have not always been designed to interface with one another. This situation makes cooperation among these entities difficult and expensive. There has been some progress with a few administrative systems, which are now operated as common resources. Pending the establishment of a formal council, an informal architectural council has elaborated on architectural principles for the sector.

The Norwegian Labour and Welfare Administration

The NAV is the third case, which involves yet another ministry, the Ministry of Labour and Social Affairs. The NAV was created in 2006 through a fusion of state agencies and municipal organisations for social services administration to make it more efficient, holistic and client friendly. The NAV employs around 19,000 people.

The organisation consists of seven departments, of which three comprise different business lines, and four are support departments, one being the ICT department. The NAV's services are innovated and developed in programmes and projects. The NAV has established an EA section to align the programmes and the projects with the NAV's long-term goals. NAV (2016), prepared by a group with members from the departments, describes the NAV's EA approach, explaining why EA is important, as well as the NAV's roles and responsibilities.

3.2 Research Approach, Data Collection and Analysis

We used a qualitative and interpretive research approach in these exploratory case studies (Walsham, 1995). In our initial studies from 2015 to 2017, we examined the use of EA and the general challenges related to the national EA initiative. The first case involved the HES sector, selected due to the easy access at our local university. However, due to the HES sector's limited use of and experiences with EA, we continued to investigate other sectors with more experience and with different organisational structures. From the interviews conducted in the hospital sector in 2017, we wanted to gain a comprehensive understanding of the challenges disclosed in the first studies and to gain insights from the use of EA during the last two years, in line with the hermeneutic approach (Klein and Myers, 1999). We held subsequent interviews in 2018 and 2019 to obtain information about the initiatives' status and progress.

The principles from Klein and Myers (1999) work were used to gain an in-depth understanding of the phenomena. The main data collection method consisted of semi-structured interviews; for some of the cases, the questions were revised after new insights emerged. Table 1 provides an overview of the interviewees. The units in the table refer to jurisdictional organisations, except for NAV, whose units are departments. The interviewees were selected by contacting key persons in the ICT departments or identified as enterprise architects at LinkedIn, followed by the snowballing technique where the interviewees recommended other relevant persons. All interviews were recorded and transcribed, except for one where the informant disapproved of the recording. The interviews included topics on the need for EA; the status of the EA work; how the EA work was organised; practices, competency, involvement of different stakeholders; and what the interviewees perceived as the main challenges to the EA initiative. Documents from each sector and documents related to the national architecture were collected from the organisations' websites.

Case and number of units investigated	**Year of interview**	**Number of interviews**	**Types of informants**	**Average length of interviews in minutes**	**Interview method**
UUC 9	2015	11	5 CIOs, 2 enterprise architects, 2 chief engineers, 2 group managers. The interviewees are from 5 universities, 3 university colleges, and 1 from the Joint Study Administrative Service Centre.	40	10 telephone 1 face-to-face
hospital#1 2	2015	12	9 enterprise architects and 3 group managers. The interviewees are from SERHA and HP.	40	Telephone
NAV 4	2017	16	4 directors, 7 enterprise architects, 1 project manager, 4 section managers. The interviewees are from 3 business lines and the ICT department.	45	Face-to-face
hospital#2 5 (3 additional units)	2017	16	1 CEO and 1 CIO from a HT; 10 enterprise architects from NICT, SERHA, HP, and 2 HTs; and 3 project managers from SERHA and HP.	70	3 telephone 1 video 12 face-to-face
hospital	2018–2019	15	5 enterprise architects, 3 project managers, 4 directors, and 3 managers. The interviewees are from SERHA and HP.	60	11 telephone 2 video 2 face-to-face
UUC	2019	2	1 CIO, and 1 CEO from one university.	15	Telephone
NAV	2019	1	1 CIO	20	Telephone

Table 1. Overview of cases and interviews.

The acronyms in Table 1 are: UUC = university and university colleges, NAV = Norwegian Labour and Welfare Administration, NICT = National ICT, SERHA = South Eastern Regional Health Authorities, HT = health trust, HP is Hospital Partner HT, CIO = chief information officer, and CEO = chief executive officer.

To analyse the challenges, the specialised tool for qualitative analysis, NVivo, was used in all cases. The transcripts from UUC and hospital#1 were analysed stepwise (Oates, 2006), with no predefined categories. The transcripts from NAV were assigned to categories taken from the studies of Banaeianjahromi and Smolander (2016) and Lucke, Krell and Lechner (2010). The second author was in charge of these three cases, while the transcripts from hospital#2 were coded and analysed by the first author, following the principles of first- and second-cycle coding (Miles, Huberman and Saldaña, 2014). The themes were created on the fly. In the second cycle for hospital#2, the data were aggregated, discussed, organised and compared in an interpretive and iterative process to identify emerging themes and patterns. In the first iteration of the second cycle, all EA challenges were combined in one group and coded into 30 concepts. In the second iteration, the concepts were reassessed and grouped into broader categories. This analysis ended up with five main categories and 26 challenges. The analysis continued in Excel, with mapping of the challenges from the other cases into the schema from hospital#2. Due to different coding and analysing approaches, we first reviewed the challenges found in the first three cases and aligned them with the challenges found in hospital#2, so we could compare the data. Surprisingly, we discovered only a few new problems. Competition among UUCs, as a hindrance to their commitment to EA, was a new issue. . Further analysis revealed the major challenges which are discussed by Author (year) (*to be specified if accepted*).

Further discussions led us to the questions of the nature of the challenges, the causes of the challenges, their effects on the EA process, and the party responsible for addressing the challenges. To examine the challenges in the scope of the progress of the EA initiatives from 'as is' until 'to be', we rearranged the challenges from the first analysis and ended up with seven categories and 28 challenges, as presented in section 4.2. At the same time, we drew a timeline for SERHA and discussed the similarities in the factors that had changed the direction of and attention to the EA initiative that we had observed at UUC and NAV. It was possible to obtain these findings due to the rich data we had collected from all cases, including the subsequent interviews in 2018 and 2019. For this analysis, we used Excel and compared the data related to the themes that emerged throughout the discussions, which comprised top management support, anchoring in the organisation, governance mechanisms, understanding of EA, and certain events that had an impact on the progress. The results of this analysis are presented in section 4.1.

In the discussion section, we provide four lessons learned which the analysis process, and in particular leaning on the discussions with key stakeholders, led us to select as the most significant ones. We conjectured that these lessons are related to solving the fundamental challenges.

4 Findings

First, we present the progress of the EA initiatives as they unfolded in the HES, the NAV and SERHA. Second, we cover the reported experienced challenges from the process.

4.1 Progress of EA Initiatives

When EA was introduced in the three sectors, it was perceived as an appropriate methodology to solve urgent organisational needs in order to realise the political visions related to the use of ICT (Ministry-of-Local-Government-and-Modernisation, 2009). All of the sectors became interested in exploring EA and started to build their EA service capability. This was done by educating their personnel in the EA framework, creating stakeholder awareness and starting to adapt and create guidelines and rules for EA practice. However, when they started the implementation by building the transition maps from 'as is' to 'to be' and equipping the organisations with the necessary mechanisms to accomplish the mission, they met a 'wall of complexity'. This undermined the EA initiatives and put them more or less on hold in all three cases. The lack of top executive commitment, of involvement from others besides the IT department and of formalisation were important causes of the problems in the first phase of the EA initiatives. From the UUC, the following quote from an informant show the situation in this early phase: 'These [architectural principles] are drawn from IT, and it is mainly the IT directors who are connected and give the assignments. This must also be anchored in the sector and in the management, and a comprehensive commitment to defining processes is still lacking'. Commitment was an issue at the NAV as well; an architect attributes this to the lack of ownership, resulting in projects being 'largely controlled by external consultants because the architecture topic was not hot in the usual operational context'. Moreover, an architect noted, '[…] the enterprise architecture initiatives have died out because they did not get the necessary impact'. At SERHA, we observed that top management commitment was key to the initiative's sustainability, as illustrated by the following quotes from two enterprise architects:

'A strategic leader and the chief enterprise architect together with some enterprise architects took the initiative to use EA [in SERHA]. […] The responsible director confirmed several times [the] interest [in] building up EA in the organisation. Many initiatives were taken, both regional and national. […] EA in the RHA vanished when the director and the chief architect quit', and '[…] the leaders simply did not understand it; they thought it was difficult, and it became very theoretical. […] The new CIO was pragmatic and wanted action'.

After a period of limited EA activity in SERHA, it was offered a new opportunity, with the reorganisation of RCS, to improve coordination among the projects. An enterprise architect noted, '[In the RCS programme], the managers of the HP and SERHA and the programme management […], agreed that we had to establish two architectural functions. One was architecture and design as an operational function in the RCS programme, and [the other was] an architectural board as an interdisciplinary body that could make architectural choices'. These changes became operative in 2015. The challenges experienced in the next two and a half years are embedded in the next section.

We observed that in all cases, architectural thinking and coordination would become more entrenched among the top management over time. This seemed to occur for several reasons, through crises in the organisations' ICT governance, from a strong push by the various ministries or from experiencing that EA would eventually yield significant value. In the HES, the Ministry of Education and Research initiated a new attempt to coordinate the sector, and some goals have now been achieved. In 2018, a new directorate was formed, the Norwegian Directorate for ICT and joint services in higher education and research. This directorate has been in charge of developing a plan to realise the goals in the digitalisation strategy for the UUC. A digitalisation council, with members drawn from the executive leaders of the various institutions, was established. This led to a firm commitment among the institutions and a strong renewed momentum in the EA efforts. In the spring of 2019, a chief information officer (CIO) at a university stated, 'There have been large changes [over] the two last years. The ministry has set the premises. Coordination at the administrative level has been operationalised, but in research and education, there is much work left'.

The NAV also had new initiatives, due largely to external pressure. An architect commented, 'We have had pressure from the outside. We had some attempts [in the organisation] earlier […]. In connection with our modernisation, […] we must establish a good enterprise architecture function. It has been a prerequisite for getting money to modernise our IT systems'. However, they still struggled with organisational acceptance and understanding among the top managers. A director stated, 'The initiative is well anchored. That being said, not everyone in the top management understands what they have been involved in. So even if it is thoroughly anchored, I would say that ownership is definitely a bit varying'.

Since 2015, SERHA has gained useful experiences with EA practices and has adapted the methodology accordingly. As assessed by an enterprise architect, 'Through the programme Regional Clinical Solutions, we have established a methodology, with templates, that is well connected with other issues, like project portfolio management, benefits realisation and change management. […] We are now assessing how we can lift the architectural board from RCS to a regional level'. In our latest interviews at SERHA in December 2018, we encountered both negative and positive experiences regarding the EA practices, but the sentiments were mainly positive. After some crises in parts of the Digital Renewal portfolio programme in 2017 and 2018, we found that architectural thinking had moved high up on the agenda among the top managers. A director commented, 'We agreed that one had to get better control of the architecture in HP. Since the beginning of 2018, we have been working on this, and the idea is that this will also be balanced with the regional architecture governance'.

From our findings, we have conjectured that the EA initiatives proceeds in four phases: optimism, resistance, decline and reconsolidation. This model is discussed in section 5.

4.2 Challenges in the EA Process

Figure 1 shows the seven categories with 28 associated challenges that we identified. The figure illustrates that in the 'as is' situation, there are challenges caused by historical organisational structures and technical conditions, as well as challenges related to technical innovation and political initiatives. These structures provide inputs to the EA process, whose intention is to develop the 'to be' situation. The process has met many challenges, among others, from the *nature of EA* itself, with large projects and a long time horizon. We have decided that *organisational issues* constitute a specific category of challenges that is related to the EA initiatives, although willingness to change and strategic choices are challenges in change management in general. Since *competency* has challenges in many important facets, we have classified it as a separate category, although it could be argued that it is also an organisational issue. We suggest that the two categories

organizational issues and competency are mainly the top managers' responsibility. In the category *EA execution process,* we have sorted the challenges related to the enterprise architects' work for which the architects themselves have the main responsibility, likewise for the challenges related to *EA technical issues*.

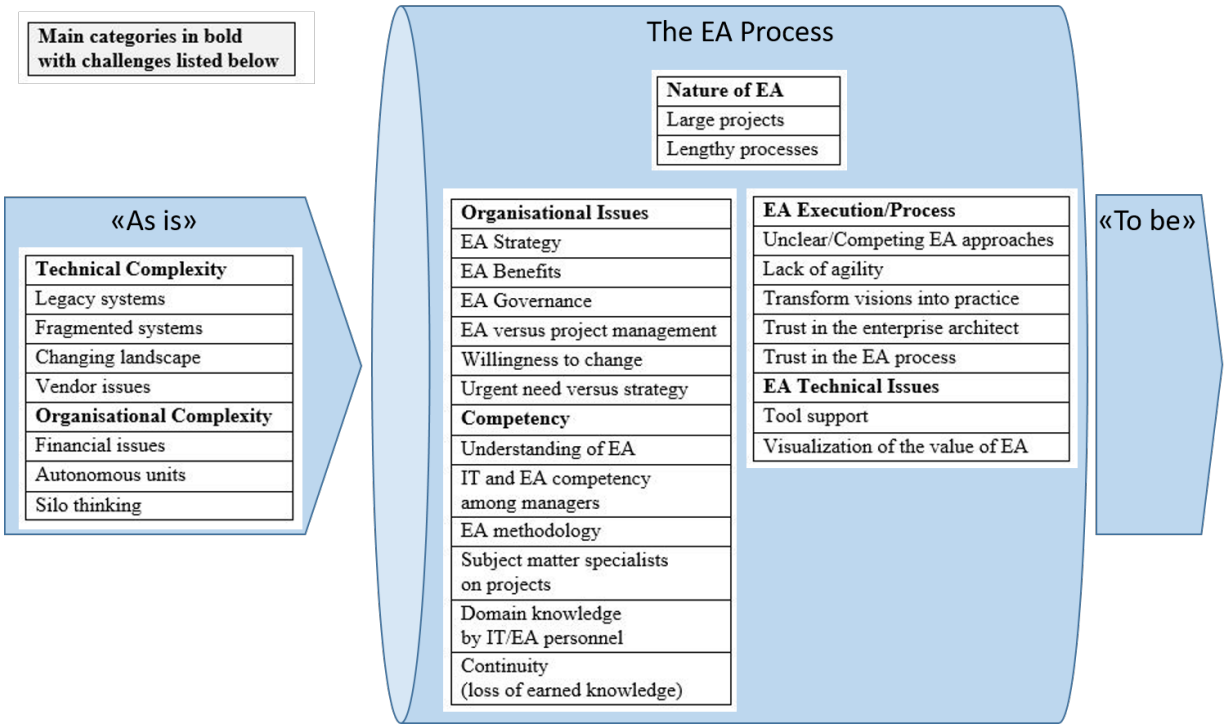


Figure 1. Challenges in EA implementation.

Due to this paper's space limitations, we describe only the challenges from the categories of *technical complexity, organisational complexity* and *competency*, as well as selected challenges from organisational issues. However, all categories received full attention in our analysis. The interviewees frequently mention the first two categories, which we find to be the major challenges leading to 'the wall of complexity' (see section 4.1). The other selected challenges mirror the lack of top managers' support or are underlying causes of such lack, which impede the EA initiative. However, when some of these challenges are addressed, the conditions for the EA initiatives improve. These challenges are therefore connected to the research question of how the EA initiatives have progressed.

Technical complexity

In the technical complexity category, we identified four challenges that caused the complexity in the IT landscape. First, the fact that there were prior large investments in *legacy systems* designed for the business lines was pinpointed in all cases. Such systems were not designed for integration, and some vendors were not very collaborative in facilitating integration. Second, *fragmented systems* had developed over time in SERHA and the UUC. Different systems and systems customised in different directions created challenges for integration and standardisation. Third, the *changing landscape* was an important issue in SERHA and the NAV, where new systems, changes in functionality and changes due to political decisions occurred frequently. Fourth, long-term *contracts with vendors* influenced the speed of changing and renewing the ICT portfolio in SERHA.

Organisational complexity

Financial issues and organisational autonomy were particularly important in all three cases. First, we identified several *financial issues* related to EA initiatives. Three of these issues were particularly prominent: 1) Whose budget would be involved, and who would receive the benefits? 2) The ICT project cost would be difficult to predict due to the complexity. 3) There were prior large investments in legacy systems. The following statement from a section manager in the NAV is illustrative: '[Legacy systems] make it difficult to manage these systems across departments because the money follows the department'. This view was cor-

roborated by a chief executive officer (CEO) of an HT, who commented, '[…] we should have been committed to working systematically, guided by standardised processes that realise benefits, […] and we should be measured on this. The central authority [HCS] needs to rearrange the way the cost is distributed since it is very demanding to take money from the daily operations related to the treatment of the patients when the cost rises and is unpredictable'. An enterprise architect in SERHA noted, 'Portfolio management wants a complete programme and project budget allocated for the whole delivery lifecycle'. Another enterprise architect complained about this situation and said, '[…] we don't know everything up front, so it is hard to estimate the costs'.

Second, in all three cases, *autonomous units* exercised control over their own decisions and how they organised themselves, and they had their own budgets. This autonomy hampered the initiative for increased cooperation. For example, even if an HT was owned by an RHA, the HT would not be legally committed to following the RHA's recommendations. Under certain conditions, an HT could also refuse to use a new IS or to set aside resources for developing an IS. Several of the informants from the UUC noted the disagreement between the Ministry of Education and Research and the institutions about which entity should be assigned the responsibility for the EA work and how the costs should be allocated.

A project manager in SERHA explained, 'Each HT is an autonomous unit, so it is difficult if some do not want to participate—there are few incentives'. An enterprise architect clarified the relationship between the NICT and the RHAs: 'NICT, in general, cannot require an RHA to do certain things, but recommendations from the Board of NICT, where the CIOs from the regions attend, will be followed up […]'. Nevertheless, another enterprise architect noted that the recommendations from the NICT were not always taken into account. 'It is a possibility that the governance model and economic incentives are not adjusted to the goals'.

The departments worked independently in the NAV, without much interaction. An enterprise architect noted, 'NAV is a strong line-driven organisation, [with] very little matrix focus. A [horizontal perspective] has very little authority and power in practice, and the hierarchy in government organisations reinforces this'. This statement is corroborated by the following quote from a section manager: 'When it comes to architectural governance, you move in different structures than you do in the line structure. So sometimes, the management structures are a bit incompatible'.

The architectural principles that had been proposed for the UUCs were only advisory in nature. One of the informants stated, 'Now it is based on a voluntary principle if one views the sector in its entirety'. One of the causes of this lack of collaboration was the competition among the UUC units to increase their student enrolment and obtain research funding.

Additionally, *silo thinking* was a significant issue in SERHA and the NAV. Decision makers felt comfortable with the way that things worked in their silos and did not see the need to contribute to common coordination, and thus, they did not see the need for EA.

Competency

The *understanding of EA* was particularly important in all cases. We found that people working with IT management had an adequate understanding of EA, but there was less understanding among the other stakeholders. The following statement from an enterprise architect in NICT is illustrative: 'NICT consists of people with good knowledge of EA; […] out in the RHAs and in the HTs, people think of EA more like technical IT architecture than how to design and build an organisation'. Another enterprise architect from the HP asserted, '[…] outside the circle of architects in the eHealth directorate, NICT and SERHA, EA is not very well understood, and top managers in SERHA do not […] understand the value of EA'. An enterprise architect in SERHA alleged, '[It is important to] convince the enterprise leaders that there is a need to involve architecture as a discipline when assessing the changes [that] one should invest in'. The consequences of the limited understanding of EA were that the enterprise architects were introduced too late in the projects and not involved in high-level planning. One informant from the UUC noted that even if enterprise architects were involved, project managers could choose not to investigate whether work processes should be changed. The informant added, 'And then you lose some of the intentions behind EA'. Furthermore, the lack of general *IT knowledge* among managers was experienced as problematic, likewise with the insufficient knowledge of *EA methodology* and the limited understanding of the enterprise architect role.

It was a significant problem to obtain the 'right' *resources* and staff the project team with people who had authority and legitimacy, but again, this was intertwined with the other categories. *Domain knowledge* among IT personnel and enterprise architects was also an issue, and it was associated with a *continuity* problem. In SERHA, maintaining the knowledge about the projects was perceived as a challenge due to insufficient documentation, people being transferred to other projects or people quitting. In SERHA, they used re-

sources from the HP in the RCS programme, and approximately 50% of the architects were external consultants; this practice was disputed since they then invested in the core competencies of people who worked there on a short-term basis. Nevertheless, a manager in SERHA stated, 'external consultants can be a boost in the beginning, related to the use of EA methodology'. In the NAV, external EA consultants had made plans that were not aligned with the NAV business. However, an architect from the NAV explained that the management had realised that 'we need our own employees to be the ones who ensure continuity and for example, ensure proper documentation'.

Organisational issues

We highlight some of the major challenges in this category. *EA governance* is about structures supporting a decision setup with mechanisms for sufficient impacts on the process, such as authoritative architectural boards, formal guidelines, how they are organised (e.g., staffing projects) and their effect on the relationship between *EA and project management*. In the UUC, we discovered a disagreement on where the responsibility for architecture should be placed, and in the spring of 2015, no architectural board had been established. In SERHA and the NAV, the misalignment between EA and project management, meaning that the project managers' use of architectural methodology was optional, had negative implications for the progress of the EA initiatives. However, by mid-2017, architecture had become a distinctive point in the project methodology for SERHA.

5 Discussion

EA is viewed as a prerequisite to the digitalisation of the public sector, but it turns out to be very challenging to manage the EA projects in practice (Bernus, et al., 2016; Dang and Pekkola, 2016; Banaeianjahromi, 2018b). Our findings from three different public sectors in Norway demonstrate the multifarious challenges in implementing EA. In this section, we first argue for a common pattern for the evolution of the EA initiatives in the three cases. We then discuss major challenges to the EA initiative, and present four lessons learned.

In all the three cases, we witness the same story unfold regarding the progress of the EA initiatives. First, there is a strategic move to adopt EA as a means for the digital transformation of the sectors, in line with national recommendations and similar to other European countries (Królikowska, 2011). Second, the introduction of the EA approach meets organisational resistance, rooted in organisational and technical complexities (Banaeianjahromi and Smolander, 2016; Dang and Pekkola, 2016), e.g. hindering local innovation (Bygstad, 2017). When the concept is additionally difficult to grasp (Seppänen, Penttinen and Pulkkinen, 2018), and it is challenging to demonstrate immediate benefits (Gong and Janssen, 2019), the initiatives lose momentum and top management commitment, with the subsequent withdrawal of support (Venkatesh, et al., 2007). There are many examples of leaders initially backing strategic EA initiatives, only to withdraw their support when there is no immediate return on investment (Venkatesh, et al., 2007). Third, when the EA approach encounters struggles, it can gain new momentum if the top management is sufficiently pressured by external stakeholders, such as the Ministry, to improve the current situation and facilitate the necessary arrangements to make the initiative flourish (Janssen and Kuk, 2006; Venkatesh, et al., 2007; Bui, 2015; Bakar and Selamat, 2016). We suggest that encompassing an initiative such as EA, which involves major upheavals for an organisation, may progress through the phases of optimism, resistance, decline and finally, reconsolidation for the most persistent ones. The organisations eventually realise that the absence of EA is not an option, and thus, they muster executive commitment and determination. We propose that the pattern we have observed is what other organisations can anticipate when embarking on an EA journey if they lack a firm mandate from the start. We find that this EA progress is similar to the Gartner Hype Cycle for emerging technologies (see Figure 2).

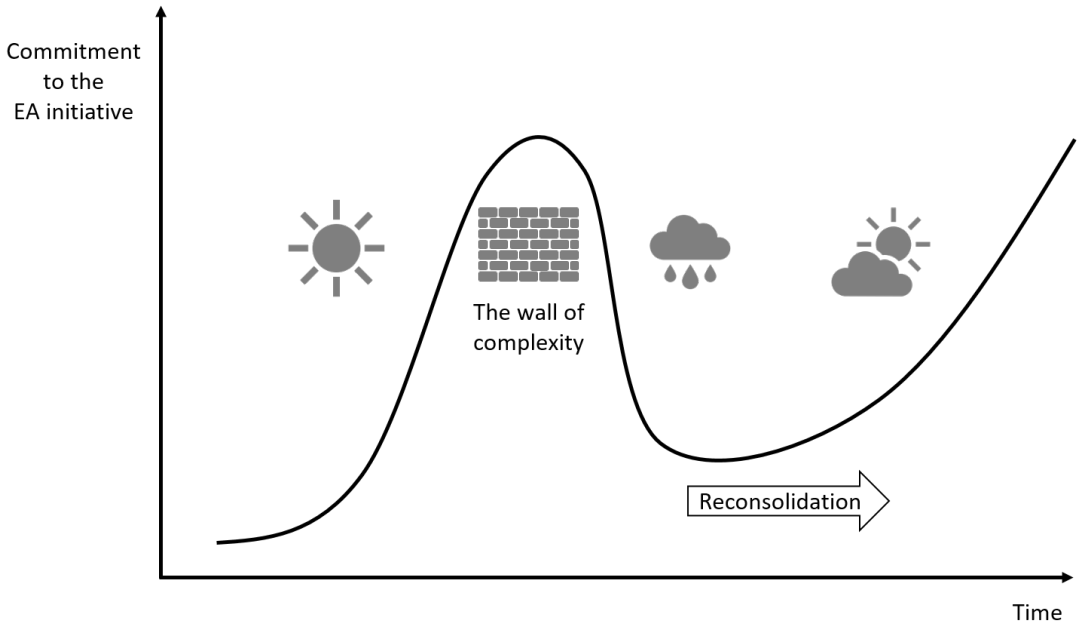


Figure 2. The EA process cycle

We witnessed that organisational and technical complexities, together with competency and governance mechanisms were significant barriers that derailed the EA efforts. The organisational complexity shaped by autonomous units, financial issues and silo thinking, leading to coordination and collaboration challenges. Coordination and collaboration challenges related to EA initiatives across sub-organisations are well-known phenomena in the public sector (Ross, Weill and Robertson, 2006; Janssen and Hjort-Madsen, 2007; Dang and Pekkola, 2016; Banaeianjahromi and Hekkala, 2019). The situation becomes tougher the more autonomous the sub-organisations are (Boh and Yellin, 2006); hence, it is important to address autonomy to maintain coherence in an organisation (Zadeh, et al., 2014). The consequence of autonomy is that a sector's units can make decisions that complicate coordination (Dang and Pekkola, 2016), and ultimately, the business lines have the strongest voice (Martin, 2012; Bakar and Selamat, 2016).

The complex organisational structures lead to challenges in EA planning (Dang and Pekkola, 2016). EA planning is imperative to achieve the goals outlined in an organisation's strategy (Schmidt and Buxmann, 2011; Jusuf and Kurnia, 2017). Even if the target is clear, the units can disagree about the outlined process (Currie and Guah, 2007). Additionally, UUCs are competitors on student recruitment and funding; thus, there can be forces working against conformity, which also can happen when the EA project set jobs at risk (Banaeianjahromi, 2018b). An EA project opens up an organisation to others, which is perceived as risky by leaders (Valtonen, et al., 2011). Moreover, from a financial perspective, the organisational measurements are not aligned with the EA initiative. The classical problem, where the cost is covered by another unit, not the ones that gain the benefits (Flak, Nielsen and Henriksen, 2012), is also valid for EA projects (Drews and Schirmer, 2014). Hjort-Madsen and Burkard (2006) conclude that the lack of economic incentives is one of the reasons for interoperability challenges in the government, and Banaeianjahromi (2018b) found limited budget provision to cause delays for EA projects.

Since the enterprise architects also have problems with visualising the benefits, the decision makers are not convinced to participate in change projects applying a new methodology (Chakravarti and Varma, 2008). If a value is not demonstrated from the EA initiative, its dismissal is understandable since changing work processes is a challenging organisational operation, related to both budget allocation and organisational resistance (Chakravarti and Varma, 2008; Drews and Schirmer, 2014). Even if the top management agrees on the EA target, the organisation may be unwilling to free up its key personnel to work on national or regional EA projects (Ulriksen, Pedersen and Ellingsen, 2017). Taking key personnel out of the daily operations makes the unit suffer in terms of both productivity and revenue. Additionally, the willingness to use and participate in EA initiatives is impeded if there are conflicts related to benefits (Van Der Raadt, Schouten and Van Vliet, 2008; Dang and Pekkola, 2016). Moreover, the uncertainty about when the EA benefits will be realised (Schmidt and Buxmann, 2011) may sway top managers to prioritise short-term needs instead (Bygstad, 2017). Altogether, there are several sources for top managers to use their power of autonomy and

not commit to the EA initiative. In line with prior research that suggests an incremental approach as appropriate in developing EA (Kaushik and Raman, 2015; Rolland, Ghinea and Grønli, 2015; Jusuf and Kurnia, 2017), we propose *lesson learned #1: It is advisable to take small steps; 'eat the elephant in small pieces'*. This exerts less pressure on the organisations' resources, leads to useful results along the way and provides better opportunities for agility and innovation, and builds trust to the EA approach.

We found the lack of understanding of the EA concept as one of the major challenges to gaining the momentum and the necessary support for the EA initiatives, this is consistent with findings from (Banaeianjahromi, 2018a). In all three cases, the need for EA was not sufficiently understood by the management, which is crucial 'in order for organisations to justify investment in EA programs and benefit from its value' (Bernus, et al., 2016, p.97). The management has the possibility to make organisations capable of using a new methodology, and building internal competency is important in this sense (Rouhani, et al., 2019). Forming an EA team is one of the imperative tasks for building an organisation's EA service capability and achieving benefits from EA at a later stage (Shanks, et al., 2018). The extensive use of external consultants in the NAV and SERHA undermined the organisational learning that was needed to build the capability. The use of external consultants makes it challenging to develop knowledge for both the specific professional domains and the different architectural domains. The situation demands the project organisation's strong focus on maintaining the skills of their personnel and undertaking review processes to ensure project conformance to EA plans and principles. The problems, continuity and compliance with the rules related to the use of external consultants have not been explicitly addressed by other researchers, but have been found to be ineffective, inflexible and scarcely helpful in creating innovation (Banaeianjahromi, 2018a). However, it can be beneficial to bring in external consultants (Ross, Weill and Robertson, 2006; Niemi and Pekkola, 2013). EA professionals need a comprehensive understanding of an organisation's business (Niemi and Pekkola, 2013; Shanks, et al., 2018); we conjecture that this is primarily an issue related to internal employees. This leads us to *lesson learned #2: The use of external consultants should be carefully considered*.

Anchoring the EA initiative is problematic in the cases. The three sectors' management and staff indicated awareness and acceptance of the concept, but we argue that the challenges in facilitating the necessary governance structures are evidence of poor understanding of EA among the top management, since this is an imperative task for them (Lee, Oh and Nam, 2016). This finding is consistent with that of a Finnish public agency: 'The executive group has understood that EA is an important concept. Unfortunately, it seems that they do not understand the meaning and purpose of it' (Saarelainen and Hotti, 2011, p.15). The importance of governance, with formal structures and boards, is a CSF in all five success models reviewed by Nikpay, et al. (2013), and a significant factor for EA performance in the public sector (Lee, Oh and Nam, 2016). Furthermore, a governance structure is 'required to manage EA consistently even without permanent top management attention' (Winter and Schelp, 2008, p.551), and the lack of such a structure makes it challenging to govern the EA (Banaeianjahromi, 2018b). The unclear setup of EA governance is identified as a possible reason for the failure of EA implementation in Denmark and the Netherlands (Janssen and Hjort-Madsen, 2007) and is found to be a key issue in two Finnish government agencies (Seppänen, Heikkilä and Liimatainen, 2009). This leads us to *lesson learned #3: Formal architectural governance mechanisms are important for legitimacy and enforced use*. An architectural board is one such mechanism; principles, guidelines, clear roles and formal authority are others.

Altogether, the data shows that executive commitment and resolution are imperative to keep the EA efforts on track, which many forces threaten to derail. Executive understanding of architectural thinking is a prerequisite for the sustainability of the EA efforts. The creation of new organisational structures that support an EA initiative can only be decided and managed at the executive level. This leads us to *lesson learned #4: Executive commitment and understanding of EA are crucial for achieving a sustainable EA initiative*.

We have studied EA implementation in three Norwegian public sectors, which together account for a major proportion of the public sector as a whole. Not accounting for the public sector as a whole is a limitation of our study since we have not investigated other significant segments of the public sector, most notably municipalities, primary healthcare and primary education. Further research should address these contexts and would yield a more complete understanding of the EA implementation issues and challenges in e-government. Despite the limitations in the generalisability of the findings, these should serve to enlighten government enterprises about the challenges related to EA implementation.

6 Conclusion

In this study, we have analysed how EA initiatives in the Norwegian public sector have progressed and the main challenges to the initiatives. We find that the EA initiatives have progressed through the phases of optimism, resistance, decline and finally, reconsolidation of the most persistent ones. Regarding the main challenges encountered by the EA initiatives, we have identified seven categories with 28 associated challenges. We find that organisational and technical complexities are significant obstacles to EA initiatives; the autonomy of the organisations and the lack of an appropriate financial model are especially challenging. The other major challenges are the lack of understanding of EA and the absence of formal EA governance mechanisms.

Our study contributes to the EA literature in four ways. First, its rich description, based on empirical data, shows that the public sector has the same problems related to EAM organisational anchoring as Lange, Mendling and Recker (2016) find in the private sector; mirrored by the CSFs: EAM top management commitment, EAM awareness and EAM understanding. Our findings also suggest that organisational and technical complexities are severe obstacles to digital transformation in public sector organisations. These problems again lead to challenges in building the organisations' EA service capabilities. The CSFs described in the literature are often deduced from a mix of private and public sector enterprises. It is therefore important to verify that the CSFs also apply to EA implementation in the public sector. Second, the results of our study in a developed country are similar to the findings in the public sector in developing countries (Bakar and Selamat, 2016; Dang and Pekkola, 2016; Banaeianjahromi, 2018b). The third contribution is the suggestion that EA initiatives may progress through the phases of optimism, resistance, decline and finally, reconsolidation for the most persistent ones. The final contribution comprises the four lessons learned that can be useful in planning and implementing an EA initiative.

The implications for practice are that organisations must raise their competency level at the top management, and boards should have the hiring authority of executive level. The different ministries should also be involved in training managers, and the units need to educate a larger number of their employees and develop in-house EA skills and knowledge. We argue in particular that the need for organisational changes related to EA is under-communicated.

References

Aier, S., Gleichauf, B. and Winter, R., 2011. Understanding enterprise architecture management design-an empirical analysis. In: *10th International Conference on Wirtschaftsinformatik*. Zurich, Switzerland, 16-18 Feb. 2011. alexandria.unisg.ch.

AlSoufi, A., 2014. Bahrain National Enterprise Architecture Framework: a Platform towards a GCC EA Initiative. *GSTF Journal on Computing*, 2(1), pp.73-80.

Armour, F.J., Kaisler, S.H. and Liu, S.Y., 1999. A big-picture look at enterprise architectures. *IT professional*, 1(1), pp.35-42.

Bakar, N.A.A. and Selamat, H., 2016. Investigating Enterprise Architecture implementation in public sector organisation: A case study of Ministry of Health Malaysia. In: *3rd International Conference on Computer and Information Sciences*, Kuala Lumpur, Malaysia, 15-17 Aug. 2016. IEEE.

Banaeianjahromi, N., 2018a. The Role of Top Management Commitment in Enterprise Architecture Development in Governmental Organizations. *Complex Systems Informatics and Modeling Quarterly*, 17, pp.95-113.

Banaeianjahromi, N., 2018b. Where enterprise architecture development fails. In: *12th International Conference on Research Challenges in Information Science*, Nantes, France, 29-31 May. IEEE.

Banaeianjahromi, N. and Hekkala, R., 2019. Factors Influencing Communication and Collaboration in Enterprise Architecture Development. In: *52nd Hawaii International Conference on System Sciences*, HI, USA, 8-11 Jan. 2019.

Banaeianjahromi, N. and Smolander, K., 2016. Understanding Obstacles in Enterprise Architecture Development. In: *24th European Conference on Information Systems*. Istanbul, Turkey, 12-15 June 2016. AISeL.

Bernard, S.A., 2012. *An introduction to enterprise architecture.* 3rd ed. Bloomington IN, United States: AuthorHouse.

Bernus, P., Goranson, T., Gøtze, J., Jensen-Waud, A., Kandjani, H., Molina, A., Noran, O., Rabelo, R.J., Romero, D., Saha, P. and Turner, P., 2016. Enterprise engineering and management at the crossroads. *Computers in industry*, 79, pp.87-102.

Boh, W.F. and Yellin, D., 2006. Using enterprise architecture standards in managing information technology. *Journal of Management Information Systems*, 23(3), pp.163-207.

Buckl, S., Ernst, E.M., Lankes, J., Matthes, F. and Schweda, C.M., 2009. *State of the art in enterprise architecture management* . München: Technische Universität München.

Bui, Q., 2015. Increasing the Relevance of Enterprise Architecture through "Crisitunities" in US State Governments. *MIS Quarterly Executive*, 14(4), pp.169-79.

Bygstad, B., 2017. Generative innovation: a comparison of lightweight and heavyweight IT. *Journal Of Information Technology*, 32(2), pp.180-93.

Carota, S., Corradini, F. and Re, B., 2010. The role of applicative cooperation in the Marche Region Enterprise Architecture. In: *eChallenges e2010*. Warsaw, Poland, 27 - 29 Oct. 2010. IEEE.

Chakravarti, B. and Varma, V., 2008. An enterprise architecture framework for building service oriented e-governance portal. In: *IEEE Region 10 Conference*. University of Hyderabad, Hyderabad, India, 19-21 Nov. 2008. IEEE.

Currie, W.L. and Guah, M.W., 2007. Conflicting institutional logics: A national programme for IT in the organisational field of healthcare. *Journal Of Information Technology*, 22(3), pp.235-47.

Dale, M. and Scheepers, H., 2019. Enterprise architecture implementation as interpersonal connection: Building support and commitment. *Information Systems Journal*.

Dang, D.D. and Pekkola, S., 2016. Root Causes of Enterprise Architecture Problems in the Public Sector. In: *20th Pacific Asian Conference on Information Systems*. Chiayi, Taiwan, 27 June-1 July 2016. AISeL.

Dang, D.D. and Pekkola, S., 2017. Systematic Literature Review on Enterprise Architecture in the Public Sector. *The Electronic Journal of e-Government*, 15(2), pp.132-54.

Denert-Stiftungslehrstuhl, E., 2015. *IT Architecture Standardization Survey*, . München: Technische Universität München.

Difi, 2012. *Overordnede IT arkitekturprinsipper for offentlig sektor*. [pdf] Agency for Public Management and eGovernment Available at: <http://www.difi.no/sites/difino/files/arkitekturprinsipper-2.1.pdf> [Accessed 28 May 2015].

Difi, 2017. *Årsrapport 2016*. [online]. Available at: <https://www.difi.no/sites/difino/files/arsrapport_difi_2016.pdf> [Accessed 24 Oct. 2017].

Drews, P. and Schirmer, I., 2014. From enterprise architecture to business ecosystem architecture. In: *18th International Enterprise Distributed Object Computing Conference Workshops and Demonstrations*, Ulm University, Germany, 1-5 Sept. 2014.

Fallmyr, T. and Bygstad, B., 2014. Enterprise Architecture Practice and Organizational Agility: An Exploratory Study. In: *47th Hawaii International Conference on System Sciences*. HI, USA, 6-9 Jan. 2014. IEEE.

Flak, L.S., Nielsen, P.A. and Henriksen, J.H.R. 2012. Gevinstrealisering i e-forvaltningsprosjekter. God teknologiledelse i praksis. In: LS Flak (ed.), *Gevinstrealisering og offentlige IKT-investeringer*, Universitetsforlaget, Oslo, Norway, pp. 18-36.

Fountain, J.E., 2004. *Building the virtual state: Information technology and institutional change.* Brookings Institution Press.

Gong, Y. and Janssen, M., 2019. The value of and myths about enterprise architecture. *International Journal of Information Management*, 46, pp.1-9.

Hjort-Madsen, K., 2006. Enterprise architecture implementation and management: A case study on interoperability. In: *39th Annual Hawaii International Conference on System Sciences*. Kauai, HI.

Hjort-Madsen, K. and Burkard, J., 2006. When enterprise architecture meets government: An institutional case study analysis. *Journal of Enterprise Architecture*, 2(1), pp.11-25.

Hjort-Madsen, K. and Pries-Heje, J., 2009. Enterprise architecture in government: Fad or future? In: *42nd Annual Hawaii International Conference on System Sciences*. Waikoloa, HI, USA, 5-8 Jan. 2009. IEEE.

Hosiaisluoma, E., Penttinen, K., Mustonen, J. and Heikkilä, J., 2018. Lean Enterprise Architecture Method for Value Chain Based Development in Public Sector. In: *18th European Conference on Digital Government*, Santiago de Compostela, Spain, 25-26 Oct. 2018.

Janssen, M. and Hjort-Madsen, K., 2007. Analyzing enterprise architecture in national governments: The cases of Denmark and the Netherlands. In: *40th Hawaii International Conference on System Sciences* Hawaii, USA, 3-6 Jan. 2007. IEEE.

Janssen, M. and Kuk, G., 2006. A complex adaptive system perspective of enterprise architecture in electronic government. In: *39th Annual Hawaii International Conference on System Sciences*. Kauai, HI, USA, 4-7 Jan. 2006.

Jonkers, H., Lankhorst, M.M., ter Doest, H.W., Arbab, F., Bosma, H. and Wieringa, R.J., 2006. Enterprise architecture: Management tool and blueprint for the organisation. *Information Systems Frontiers*, 8(2), pp.63-6.

Jusuf, M.B. and Kurnia, S., 2017. Understanding the Benefits and Success Factors of Enterprise Architecture. In: *50th Hawaii International Conference on System Sciences*. HI, USA, 4-7 Jan. 2017.

Kaushik, A. and Raman, A., 2015. The new data-driven enterprise architecture for e-healthcare: Lessons from the indian public sector. *Government Information Quarterly*, 32(1), pp.63-74.

Klein, H.K. and Myers, M.D., 1999. A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly*, pp.67-93.

Kotusev, S., Singh, M. and Storey, I., 2015. Consolidating enterprise architecture management research. In: *48th Hawaii International Conference on System Sciences*, HI, USA, 5-8 Jan. 2019. IEEE.

Królikowska, B., 2011. Selected Problems of Enterprise Architecture in Public Administration. *Studies & Proceedings Polish Association for Knowledge Management*, 42, pp.89-98.

Lange, M., Mendling, J. and Recker, J., 2016. An empirical analysis of the factors and measures of Enterprise Architecture Management success. *European Journal of Information Systems*, 25(5), pp.411-31.

Lee, S., Oh, S.W. and Nam, K., 2016. Transformational and Transactional Factors for the Successful Implementation of Enterprise Architecture in Public Sector. *Sustainability*, 8(5), p.456.

Lucke, C., Krell, S. and Lechner, U., 2010. Critical issues in enterprise architecting–a literature review. In: *Americas Conference on Information Systems*. Lima, Peru, 12-15 Aug. 2010. AISeL.

Löhe, J. and Legner, C., 2014. Overcoming implementation challenges in enterprise architecture management: a design theory for architecture-driven IT Management (ADRIMA). *Information Systems and e-Business Management*, 12(1), pp.101-37.

Martin, A., 2012. Enterprise IT Architecture in Large Federated Organizations: The Art of the Possible. *Information Systems Management*, 29(2), pp.137-47.

Mezzanotte, D.M. and Dehlinger, J., Developing and building a quality management system based on stakeholder behavior for enterprise architecture. In: *Software Engineering, Artificial Intelligence, Networking and Parallel/Distributed Computing, 2014 15th IEEE/ACIS International Conference on*. IEEE.

Miles, M.B., Huberman, A.M. and Saldaña, J., 2014. *Qualitative data analysis: A methods sourcebook.* 3rd ed. Thousand Oaks, California, USA: Sage Publications.

Ministry-of-Finance, 2016. *Annual budget for 2017*. [pdf]. Available at: <https://www.statsbudsjettet.no/upload/Statsbudsjett_2017/dokumenter/pdf/stm.pdf> [Accessed 24 Oct. 2017].

Ministry-of-Health-and-Care-Services, 2009. *Samhandlingsreformen: Rett behandling – på rett sted – til rett tid*. [pdf] regjeringen.no. Available at: <https://www.regjeringen.no/contentassets/d4f0e16ad32e4bbd8d8ab5c21445a5dc/no/pdfs/stm200820090047000dddpdfs.pdf> [Accessed 03 June 2015].

Ministry-of-Local-Government-and-Modernisation, 2009. *St.meld. nr. 19 - Ei forvaltning for demokrati og fellesskap*. [pdf] regjeringen.no. Available at: <https://www.regjeringen.no/contentassets/307c7a3832184bbba25b75f4b6c5a40e/no/pdfs/stm200820090019000dddpdfs.pdf> [Accessed 29 May 2015].

Ministry-of-Local-Government-and-Modernisation, 2011. *Digitaliseringsrundskrivet*. [online]. Available at: <https://www.regjeringen.no/no/dokumenter/digitaliseringsrundskrivet/id2569983/> [Accessed 10 April 2017].

Moreno, L.M.M., Páez, J.O.T., Parra, A. and Campos, D., 2014. The Colombian Government Enterprise Architecture Framework. In: *1st International Conference on Electronic Governance and Open Society: Challenges in Eurasia*. St. Petersburg, Russian Federation, 18-20 Nov. 2014. ACM.

NAV, 2016. *Virksomhetsarkitektur i NAV*. [pdf] Norwegian Labour and Welfare Administration. Available at: <https://www.difi.no/sites/difino/files/virksomhetsarkitektur_i_nav_v100.pdf> [Accessed 06 June 2017].

NICT, 2008. *Tjenesteorientert arkitektur i spesialisthelsetjenesten*. [pdf] National ICT. Available at: <https://nasjonalikt.no/Documents/Prosjekter/Avsluttede%20prosjekter/Tiltak%2012%20Tjenesteorientert%20arkitektur%20sluttrapport.pdf> [Accessed 4 Oct. 2016].

Niemi, E. and Pekkola, S., 2013. Enterprise architecture quality attributes: A case study. In: *46th Hawaii International Conference on System Sciences*, 7-10 Jan. 2013. IEEE.

Nikpay, F., Selamat, H., Rouhani, B.D. and Nikfard, P., 2013. A Review of Critical Success Factors of Enterprise Architecture Implementation. In: *International Conference on Informatics and Creative Multimedia*. Kuala Lumpur, Malaysia, 4-6 Sept. 2013. IEEE.

Oates, B.J., 2006. *Researching information systems and computing.* London: Sage Publications.

OECD, 2017. *Digital Government Review of Norway*, OECD Publishing.

Ojo, A., Janowski, T. and Estevez, E., 2012. Improving Government Enterprise Architecture Practice-Maturity Factor Analysis. In: *45th Hawaii International Conference on System Science*. Hawaii, USA, 4-7 Jan. 2012. IEEE.

Rahimi, F., Gøtze, J. and Møller, C., 2017. Enterprise architecture management: Toward a taxonomy of applications. *Communications of the Association for Information Systems*, 40(1), p.7.

Regjeringen.no, 2005. *Plattform for regjeringssamarbeidet mellom Arbeiderpartiet, Sosialistisk Venstreparti og Senterpartiet 2005-09*. [pdf] regjeringen.no. Available at: <https://www.regjeringen.no/globalassets/upload/smk/vedlegg/2005/regjeringsplatform_soriamoria.pdf > [Accessed 24 Oct. 2017].

Rolland, K.H., Ghinea, G. and Grønli, T.M., 2015. Ambidextrous enterprise architecting: Betting on the future and hacking path-dependencies. In: *23rd European Conference on Information Systems*. Münster, Germany, 26-29 May, 2015. AISeL.

Ross, J.W., Weill, P. and Robertson, D., 2006. *Enterprise architecture as strategy: Creating a foundation for business execution.* Boston, MA, United States: Harvard Business Review Press.

Rouhani, B.D., Ahmad, R.B., Nikpay, F. and Mohamaddoust, R., 2019. Critical Success Factor Model for Enterprise Architecture Implementation. *Malaysian Journal of Computer Science*, 32(2), pp.133-48.

Saarelainen, M.-M. and Hotti, V., 2011. Does enterprise architecture form the ground for group decisions in egovernment programme? In: *15th IEEE International Enterprise Distributed Object Computing Conference Workshops*. Helsinki, Finland, 29 Aug. - 2 Sept. 2011. IEEE.

Schilling, R.D., Haki, K. and Aier, S., 2018. Dynamics of Control Mechanisms in Enterprise Architecture Management: A Sensemaking Perspective. In: *39th International Conference on Information Systems*. San Francisco, USA, 13-16 Dec. 2018. AISeL.

Schmidt, C. and Buxmann, P., 2011. Outcomes and success factors of enterprise IT architecture management: empirical insight from the international financial services industry. *European Journal of Information Systems*, 20(2), pp.168-85.

Schöenherr, M., Towards a common terminology in the discipline of enterprise architecture. In: *International Conference on Service-Oriented Computing*. Springer.

Seppänen, V., Heikkilä, J. and Liimatainen, K., 2009. Key issues in EA-implementation: case study of two Finnish government agencies. In: *Conference on Commerce and Enterprise Computing*. Vienna, Austria, 20-23 July 2009. IEEE.

Seppänen, V., Penttinen, K. and Pulkkinen, M., 2018. Key Issues in Enterprise Architecture Adoption in the Public Sector. *Electronic Journal of e-Government*, 16(1), pp.46-58.

Shanks, G., Gloet, M., Someh, I.A., Frampton, K. and Tamm, T., 2018. Achieving benefits with enterprise architecture. *The Journal of Strategic Information Systems*, 27(2), pp.139-56.

Simon, D., Fischbach, K. and Schoder, D., 2013. An exploration of enterprise architecture research. *Communications of the Association for Information Systems*, 32, pp.1-72.

Ulriksen, G.-H., Pedersen, R. and Ellingsen, G., 2017. Infrastructuring in healthcare through the openEHR architecture. *Computer Supported Cooperative Work*, 26(1-2), pp.33-69.

Valtonen, K., Mäntynen, S., Leppänen, M. and Pulkkinen, M., 2011. Enterprise Architecture Descriptions for Enhancing Local Government Transformation and Coherency Management: Case Study. In: *15th IEEE International Enterprise Distributed Object Computing Conference Workshops*. Helsinki, Finland, 29 Aug. - 2 Sept. 2011. IEEE.

Van Der Raadt, B., Schouten, S. and Van Vliet, H., Stakeholder perception of enterprise architecture. In: *European Conference on Software Architecture*. Springer.

Venkatesh, V., Bala, H., Venkatraman, S. and Bates, J., 2007. Enterprise Architecture Maturity: the Story of the Veterans Health Administration. *MIS Quarterly Executive*, 6(2), pp.79-90.

Walsham, G., 1995. Interpretive case studies in IS research: nature and method. *European Journal of Information Systems*, 4(2), pp.74-81.

Weiß, K.S., 2015. *Institutionalizing Architectural Coordination in Organizations*. University of St. Gallen.

Winter, R. and Schelp, J., 2008. Enterprise architecture governance: the need for a business-to-IT approach. In: *ACM Symposium on Applied Computing*. Fortaleza, Ceara, Brazil, March 16-20 Mar. 2008. ACM.

Zachman, J.A., 1987. A framework for information systems architecture. *IBM systems journal*, 26(3), pp.276-92.

Zadeh, M.E., Lewis, E., Millar, G., Yang, Y. and Thorne, C., 2014. The use of viable system model to develop guidelines for generating enterprise architecture principles. In: *IEEE International Conference on Systems, Man and Cybernetics*. San Diego, California, USA, 5-8 Oct. 2014. IEEE.

Øvrelid, E., Bygstad, B. and Hanseth, O., 2017. Discursive formations and shifting strategies in eHealth programmes. In: *25th European Conference on Information Systems*. Guimarães, Portugal, 5-10 June 2017.

Enterprise Architecture and Institutional Pluralism: the case of the Norwegian hospital sector

Abstract. To address the complexity of information system (IS) landscapes, practitioners and researchers have advocated Enterprise Architecture (EA) as a systematic way of designing, planning, and implementing process and technology changes. Using EA, organizations can map their current state, define a desirable target architecture, and implement concrete projects toward the target. We report a case study on the dynamics of operationalizing EA in the Norwegian hospital sector by exploring the trajectories of concrete projects. Our empirical context is an institutionally complex setting where multiple logics coexist. Decision making related to EA projects brings to the surface tensions between existing logics and EA principles and assumptions. We show that the distinct logic of EA is added to the institutional context and we develop a model that shows how coexisting logics maintain their distinct character while allowing local resolutions that shape EA operationalization. We argue that in institutionally complex settings, the coexisting logics are not always associated with one-to-one relationships with specific categories of actors. Institutional pluralism emerges as actors relate to multiple logics to achieve different goals. We contribute to the under-researched EA operationalization topic by showing that EA can become institutionalized and invoked as a distinct logic along with other coexisting logics. We advance extant IS research by introducing a nuanced understanding of practice repertoires, showing that logic multiplicity can be the basis for action taking as actors activate different logics selectively. We provide implications for practice, showing that the different logics can work together in a state of institutional pluralism.

1 Introduction

Hospitals typically employ numerous information technology (IT) applications sourced from a variety of vendors and advanced digital equipment, including sensors, diagnostic facilities, and medical automation. Ensuring smooth information flows across such a complex and continuously shifting system landscape is pivotal for healthcare delivery but also very challenging (Gandhi, 2016; Romanow, Cho, & Straub, 2012). To address the complexity of information system landscapes, practitioners and researchers have advocated Enterprise Architecture (EA) as a systematic way of designing, planning, and implementing process and technology changes (Bradley, Pratt, Byrd, Outlay, & Wynn Jr, 2012; Venkatesh, Bala, Venkatraman, & Bates, 2007). The EA approach has become an increasingly important subject in Information Systems (IS) research; studies on EA implementation and adoption, EA management (EAM), and related topics comprise a growing field (Dale & Scheepers, 2019; Hylving & Bygstad, 2019; Shanks, Gloet, Someh, Frampton, & Tamm, 2018). EA is an organizational-technical approach that seeks to coordinate, integrate, and align the multiplicity of business and IT initiatives in organizations. EA may require comprehensive changes in the workflows, in the ways of structuring and organizing operations, as well as in the actors' behaviors and attitudes. Essentially, it requires a holistic view of the mission, operations, information, people and technology of the organization (Ross, Weill, & Robertson, 2006). Because of EA's wide organizational and technical scope, it is more demanding to implement changes through an EA approach compared to implementing confined projects for IT systems and related processes.

Norwegian hospitals initiated the use of EA for designing and governing technology and processes more than a decade ago. Despite the potential benefits and the governmental mandate on EA introduction, significant delays and implementation challenges have been experienced. Healthcare is a multifaceted organizational field where multiple competing institutional logics coexist (Currie & Guah, 2007; Reay & Hinings, 2009; van den Broek, Boselie, & Paauwe, 2014). Institutional logics are bases for action (Friedland & Alford, 1991), and different logics are invoked in hospitals during action taking. In our research, we acknowledge institutional heterogeneity, building on prior research that has found that EA implementation is influenced by tensions and interactions among actors in its institutional context (Hjort-Madsen & Pries-Heje, 2009; Janssen, 2012). We employ the lens of institutional logics to capture the dynamics of EA in hospitals, while providing an explanation for the mixed outcomes and the implementation delays.

Prior research has shown that the introduction of EA is far from straightforward and has pointed to the positive influence of a supportive social environment and an adaptive culture (Aier, 2014; Niemi & Pekkola, 2016; Weiss, Aier, & Winter, 2013). Nevertheless, very little research has investigated the EA operationalization stage when architecture visions move toward realization through concrete projects (Banaeianjahromi & Smolander, 2019). Although some prior studies have focused explicitly on interpersonal interactions and dynamics (Dale & Scheepers, 2019; Smolander & Rossi, 2008), they have not addressed institutional complexity during action taking. EA operationalization in the hospital context entails introducing principles and assumptions that may collide with existing institutional logics of traditional professions and local practices. In this paper, we investigate the dynamics of operationalizing EA in the Norwegian hospital sector by studying action-taking for concrete projects. Our empirical context is a long-standing, institutionally complex setting where medical, managerial, and IT logics coexist. We research the complex interactions in this context to answer two questions: (1) *What kinds of tensions emerge in the relationship between EA and managerial, medical, and IT logics? (2) How can the tensions be dealt with?*

Empirically, we investigate the activities of the actors participating in different project teams involved in a variety of EA-driven initiatives. Through interviews and secondary material, we gain an understanding of the dynamics of EA operationalization and the role of the enterprise architect in this setting. Analyzing our empirical material, we show that the distinct logic of EA is added to the institutional context and we show how coexisting logics maintain their distinct character while allowing local resolutions that shape EA outcomes. We argue that in institutionally complex settings, the coexisting logics are not always associated through one-to-one relationships with specific categories of actors and that phenomena of institutional pluralism emerge as actors relate to multiple logics simultaneously to achieve different goals. Our study contributes to EA research by focusing on the under-researched operationalization stage and showing that EA can itself become institutionalized and invoked as a distinct logic along other coexisting logics. Furthermore, we advance extant IS research by introducing a more nuanced understanding of practice repertoires, showing that logic multiplicity can be the basis for action taking as actors activate different logics selectively. Therefore, we position our research as contributing to IS studies on EA implementation by explicitly examining EA operationalization. Our research responds to the call for better theorization of EA implementation (Dale & Scheepers, 2019). Furthermore, by utilizing the lens of institutional logics, we respond to calls for research on the practical interplay among distinct logics in a field with a wide range of logics (Hansen & Baroody, 2019) and especially on the impact of different logics on the development of concrete functionalities (Berente, Lyytinen, Yoo, & Maurer, 2019).

We structured the rest of this paper as follows. First, we present the theoretical foundation of our research. Second, we describe the empirical setting and explain our research method. Third, we provide the findings. Finally, we discuss the findings and their implications for theory and practice and conclude the paper by pointing out the limitations of our research and avenues for future work.

2 Institutional logics in healthcare and Enterprise Architecture

2.1 Healthcare as a site of institutional pluralism

An institution can be defined as "shared rules and typifications that identify categories of social actors and their appropriate activities or relationships" (Barley & Tolbert, 1997, p. 96). Social actors can be individuals, groups, organizations, or even larger assemblages. Institutional theory "highlights cultural influences on decision making and formal structures. It holds that organizations, and the individuals who populate them, are suspended in a web of values, norms, rules, beliefs, and taken-for-granted assumptions, that are at least partially of their own making" (Barley & Tolbert, 1997, p. 93). The institutional logics' perspective represents a stream within institutional research that emphasizes social actors and their belief systems in maintaining and changing organizations and institutions (Scott, 2014; Thornton & Ocasio, 2008). For our study, we adopt Thornton and Ocasio's (1999, p. 804) definition of institutional logics as "the socially constructed, historical patterns of material practices, assumptions, values, beliefs, and rules by which individuals produce and reproduce their material subsistence, organize time and space, and provide meaning to their social reality."

Prior research has recognized the increasing prevalence of multiple logics within organizations (Besharov & Smith, 2014; Smets, Jarzabkowski, Burke, & Spee, 2015). This phenomenon is called *institutional pluralism* (Kraatz & Block, 2008); it occurs when organizations are sites where multiple logics are active and no single belief system can perpetuate its dominance. For instance, in universities, the logics of teaching and research are simultaneously active, and although the two can be mutually facilitative, tensions abide (Kraatz & Block, 2008). Multiple and sometimes conflicting logics also exist in healthcare, where tensions typically emerge between medical professionalism and managerialism (Reay & Hinings, 2009; Scott, 2000). In hospitals, medical professionalism is oriented toward the quality of care, while managerialism is mainly occupied with efficiency.

The landscape of IS in healthcare has been shaped by the institutional pluralism of the domain. The institutional complexity poses challenges for healthcare IS adoption and use, and prior research has shown how system adaptations and workarounds can be traced back to the multiplicity of logics at play (Jensen, Kjærgaard, & Svejvig, 2009; Plumb et al., 2017). Hansen and Baroody (2019) studied the adoption and use of electronic health record systems in hospitals and identified four prominent logics: medical professionalism, private sector managerialism, technical design, and regulatory oversight. Currie and Guah (2007) found that medical professionalism and managerial and market logics shaped the implementation of the IT program for the national healthcare system in the UK. Heeks (2006) identified technical, managerial, and medical types as the three rationalities that shaped health IS. Extending Heeks' work, Boonstra and colleagues (2018) elaborated on the IT professionals' logic, which expressed technical rationality as specifically related to IT in hospital contexts. Table 1 provides an overview of healthcare institutional logics identified in prior research. The logics are described along three different

dimensions (principles, assumptions, and sources of legitimacy) that are adapted from the works of Hansen and Baroody (2019) and Berente and colleagues (2019). Assumptions are established beliefs about the nature of reality and means-ends relationships. Principles are the foundations for action taking related to goals and values. Sources of legitimacy are bases on which actions are deemed desirable and appropriate.

Table 1. Multiple institutional logics in healthcare information systems.

	Medical Professionalism	**Health Managerialism**	**IT Professionalism**
	Healthcare provision for helping people.	Hospital management to ensure efficiency.	Hospital support with technical excellence.
Assumptions	The best decisions are made closest to the point of care (Hansen & Baroody, 2019).	Health information systems improve efficiency and reduce costs (Hansen & Baroody, 2019).	Health information systems improve medical care (Hansen & Baroody, 2019).
Principles	Medical Autonomy, patient focus, quality of healthcare (Boonstra, Eseryel, et al., 2018; Hansen & Baroody, 2019).	Efficiency, cost control, work optimization including quality (Boonstra, Eseryel, et al., 2018; Hansen & Baroody, 2019; Jensen et al., 2009).	IT quality such as technical excellence, security, data quality, maintainability (Boonstra, Eseryel, et al., 2018; Hansen & Baroody, 2019).
Sources of legitimacy	Expert knowledge, evidence-based knowledge, professional experience (Boonstra, Eseryel, et al., 2018; Currie & Guah, 2007; Hansen & Baroody, 2019; Plumb et al., 2017).	Financial outcomes, policy, span of control (Boonstra, Eseryel, et al., 2018; Hansen & Baroody, 2019; Reay & Hinings, 2009).	IT goals determined by strategy, standards and expert knowledge, professional experience (Boonstra, Eseryel, et al., 2018; Hansen & Baroody, 2019).

Prior IS research generally associates specific logics with specific types of actors (e.g., Berente & Yoo, 2012; Boonstra, Eseryel, et al., 2018). Actors with different functions and professional backgrounds are assumed to invoke different logics due to the differences in their work, education, and overall socialization patterns (Boonstra, Eseryel, et al., 2018). Nevertheless, empirical institutional research has shown that in everyday practices, actors do not always adhere to the logics of their professional groups but may invoke a mix of logics (Martin, Currie, Weaver, Finn, & McDonald, 2017; McPherson & Sauder, 2013; Waldorff, Reay, & Goodrick, 2013). Actors exercise discretion in their everyday use of the logics available in a domain, deciding which logics to adopt and for what purposes. In institutionally complex settings, actors may appear to relate to multiple logics simultaneously. Consequently, available logics are like tools that can be creatively employed by actors to achieve individual and organizational goals (McPherson & Sauder, 2013). For instance, management research in healthcare has shown how managers, project leaders, and nurses invoke both care and business-like logics when discussing healthcare practice innovation (van den Broek et al., 2014). These findings echo the conceptualization of institutional logics laid out by Thornton, Ocasio, and Lounsbury (2012), who posit that individuals learn multiple institutional logics that may be activated, depending on their applicability in specific situations. Extant IS research has tended to assume that coexisting logics are inherently competing and associated through one-to-one relationships with specific categories of actors. However, logic multiplicity can be the basis for broader practice repertoires than generally assumed, but this has remained a blind spot in related IS research.

2.2 Working with multiple perspectives and Enterprise Architecture

Over the last decades, the IT landscape has vastly changed. The IS portfolios in organizations are more complex and heterogeneous than ever, and the interdependencies between systems and

organizational processes are becoming tighter. To navigate this complexity, practitioners and researchers have advocated EA as a systematic way of designing, planning, and implementing process and technology changes (Bradley et al., 2012; Venkatesh et al., 2007). EA describes the processes, their supporting data and applications, as well as all related information and communication technology (ICT) arrangements (Bernard, 2012). Using EA, organizations can map their current state, define a desirable future for their processes and systems (target architecture), plot the path to achieving the target, and implement concrete projects toward the target (Tamm, Seddon, Shanks, & Reynolds, 2011). Overall, EA is a holistic, long-term and top-down approach (Bernard, 2012; Jonkers et al., 2006; Ross et al., 2006).

Extant literature highlights the potential benefits of EA, but only limited empirical research has assessed EA benefit realization (e.g. Kappelman, McGinnis, Pettite, & Sidorova, 2008; Schmidt & Buxmann, 2011), and it is not easy to find a successfully developed EA in an organization (Banaeianjahromi & Smolander, 2019). Overall, demonstrating the business value of EA has proven elusive (Shanks et al., 2018). To complicate matters further, the perceptions about EA benefits vary significantly between executive- and operational actors (Lange, Mendling, & Recker, 2016). Tamm and colleagues (2011) distinguish between benefits that can directly flow from EA and benefits that can be obtained from the implementation of the EA plans. For instance, benefits gained from a common database or standardization can only be reaped after the projects are implemented. However, EA can have direct communicational value by facilitating communication between business and IT (Armour, Kaisler, & Liu, 1999; Gong & Janssen, 2019; Valorinta, 2011). Benefits can directly flow from EA before the completion of projects if used to encourage cooperation rather than conflict (Pereira & Sousa, 2004; Richardson, Jackson, & Dickson, 1990). When enterprise architects prioritize engagement with business and technology viewpoints and concerns, boundaries between different communities within the organizations become permeable, enabling knowledge sharing and comprehensive negotiations (Dale & Scheepers, 2019).

EA implementation is influenced by tensions and interactions among actors in its institutional context (Hjort-Madsen & Pries-Heje, 2009; Janssen, 2012). Investigating the direct role of EA within pluralistic organizations entails studying concrete action taking during EA operationalization. Very little research has investigated the operationalization stage in which organizations start the projects that are needed to reach the target situation (Banaeianjahromi & Smolander, 2019). This is probably related to the scarcity of such EA operationalization projects. When starting EA initiatives, most organizations already have multiple IT systems in place, and important architectural decisions for these systems have typically been made in the past (Hylving & Bygstad, 2019); thus, developing detailed EA blueprints can be a tedious and lengthy process. Research has shown that a significant proportion of EA initiatives document only the current state of operations (Winter, Buckl, Matthes, & Schweda, 2010) and that many organizations fail to progress beyond documentation, which often leads to EA initiatives dying out (Lange et al., 2016). Furthermore, the few researchers who have studied EA operationalization projects tend to focus on the technical and the social conditions associated with EA success or failure and, to a lesser extent, on the interpersonal interactions and dynamics during action taking (Dale & Scheepers, 2019; Smolander & Rossi, 2008).

3 Research setting and method

3.1 Study context

This study was conducted in the Norwegian hospital sector (Figure 1). In Norway, most hospitals are public and organized in hospital trusts. One trust can include several local hospitals. The trusts are allocated to four independent regional health authorities (RHAs) under the jurisdiction of the Ministry of Health and Care Services. The four RHAs collectively own a specialized organization for the strategic coordination, prioritization, and consolidation of hospital ICT across all regions. This organization is called the National ICT (NICT). Among the four RHAs, the South Eastern Region (SERHA) is the largest one. SHERA manages 9 hospital trusts that include 30 hospitals with 78,000 employees and annual turnover of 82 billion NOK (i.e. approximately 9 billion USD). SERHA is supported by its wholly-owned ICT service provider (the HospitalPartner). The Norwegian government promotes the use of technology for reaching health policy objectives for effective and efficient services, quality improvement and patient security. Two of the most important government directives that guide the development of digital health services are "The healthcare coordination reform" (Norwegian Ministry of Health and Care Services, 2009) and "One citizen – one record" (Norwegian Ministry of Health and Care Services, 2012). The first one addresses collaboration, while the second sets the overall vision for information management.

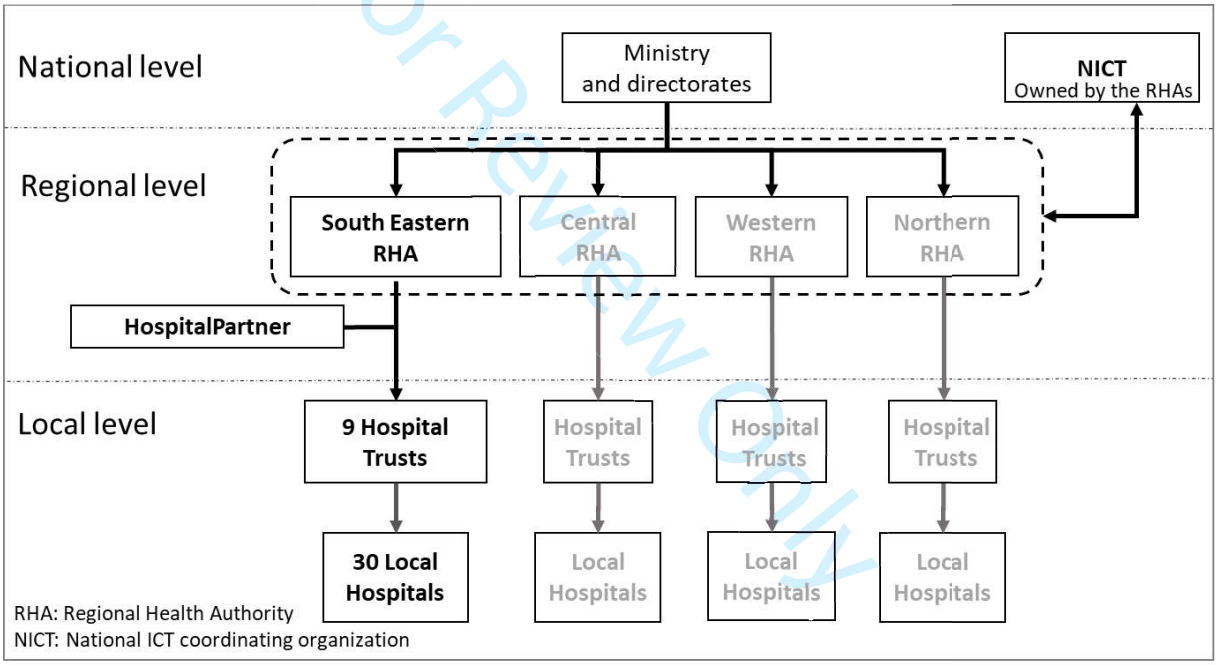


Figure 1. The Norwegian hospital sector (units covered by interviews noted in bold text).

Overall, the hospital ICT landscape is complex and fragmented. The hospitals in SERHA use approximately 1,250 different applications for clinical and medical services (South-Eastern-RHA, 2015). The Norwegian authorities are concerned with the increasing complexity and promote the adoption of EA to facilitate the alignment between visions, applications and processes. Specifically, NICT's strategy plan for 2013–2016, included the goal to "establish EA as a strategic tool in hospital services" (NICT, 2012, p. 6). The rationale for establishing EA is explained in NICT's special report entitled "Practice of Enterprise Architecture in National ICT, Initiative 42.2" where it is stated that "the Enterprise Architecture's contribution is to ensure that the healthcare and healthcare sector's strategies, tools and change processes are viewed in conjunction to achieve desired results" (NICT, 2014, p. 5). Furthermore, the report defines TOGAF Architecture

Development Method as the preferred method and clarifies that "the methodological descriptions shall be required for the National ICT's architecture function and projects and guide the regional architecture function and projects" (NICT, 2014, p. 41).

In 2013, SERHA started a large-scale portfolio of initiatives for developing shared regional solutions for clinical and administrative hospital services (the Digital Renewal portfolio). The budget allocation for this is 6585 MNOK over seven years ((i.e. approximately 725 million USD). The portfolio includes three programs. One of them is the Regional Clinical Solution (RCS) program for which an EA approach was decided in 2015. RCS includes several large projects consolidating electronic patient record systems and implementing regional solutions for laboratory and radiology support. It is governed by a board that is responsible for organizing and staffing the various RCS projects aiming to ensure broad involvement of subject matter experts from the health trusts. Enterprise architects participate in all projects. Out of the approximately 400 RCS project participants, 200 come from the hospitals. The hospital participants are rarely full-time in the projects, but the principle is to have a minimum of 30 % of their time allocated for project work. The RCS board acknowledges the multifaceted character of the projects and is promoting a three-party project management structure covering clinical, managerial, and technical aspects (Figure 2). Specifically, the typical project management team includes a project manager with a clinical background (coming from one of the hospital trusts), an assistant project manager specializing in management (coming from the HospitalPartner), and an assistant project manager specializing in IT (coming from a vendor).

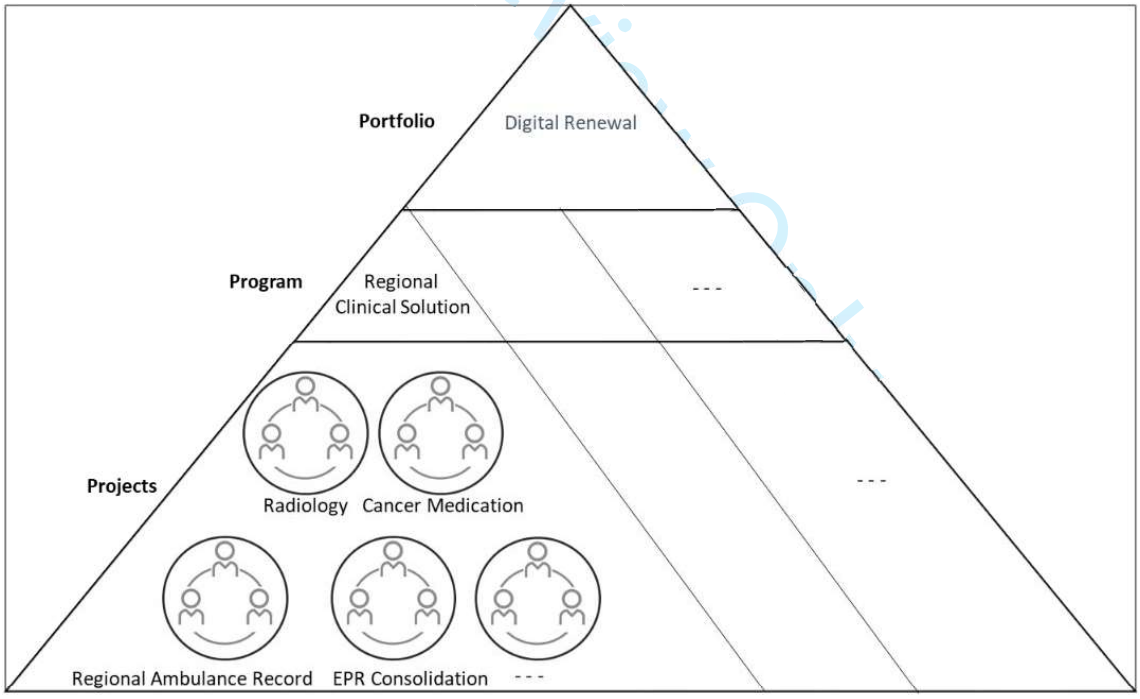


Figure 2. Three-party project leadership within the Regional Clinical Solution (RCS) projects.

3.2 Research approach, data collection, and analysis

Our research is designed as an interpretive case study (Klein & Myers, 1999; Walsham, 1995) on the introduction of EA in the Norwegian hospital sector. In our study, we investigated the views,

tactics, and approaches of different actors engaged in concrete EA-driven initiatives in Norwegian hospitals. Prior research has shown that EA initiatives are influenced by tensions and interactions among actors (Hjort-Madsen & Pries-Heje, 2009; Janssen, 2012). Nevertheless, there is a notable paucity of studies focusing specifically on EA operationalization and the relevant theoretical development is limited. Therefore, we decided to focus our study on EA operationalization, in other words, the move from abstract principles and architectural schemas for processes and IT, to concrete system designs and procedure specifications. By conducting an interpretive case study, we sought to gain an in-depth understanding of EA operationalization in a real-life setting (Walsham, 1993).

The context of our study was chosen for its institutional complexity. Healthcare is a multifaceted organizational field where multiple competing institutional logics coexist (Currie & Guah, 2007; Reay & Hinings, 2009; van den Broek et al., 2014). We were interested in exploring the tensions that emerge when the holistic EA approach is enacted by actors that use different logics while seeking to achieve project goals. After performing initial exploratory interviews, we narrowed down the study to the projects within the RCS program. This focus allowed us to gather empirical data on ongoing projects for which an EA approach was decided. The data were collected from November 2016 to the end of January 2019. The empirical data were collected via unstructured and semi-structured interviews and reviews of a large number of documents.

In total, 30 in-depth interviews with 29 interviewees were conducted (Table 2). Three of the participants were interviewed twice, and on two occasions, two persons participated in each interview. The interviews were conducted in Norwegian and recorded and transcribed verbatim. The quotes included in this paper are translated into English from the Norwegian transcripts. We applied the snowballing technique by asking the initial interviewees to help us identify other participants who could provide rich information regarding the introduction of EA and the ongoing projects (Coleman, 1958; Heckathorn, 1997). In addition, we identified relevant participants in SEHRA's websites. We started the data collection by interviewing mostly enterprise architects and senior managers and expanded to the project management teams, including the clinical specialists with managerial roles and the participants with a more technical orientation. Many of the interviewees had educational backgrounds that combine IT, management and/or, medical education. Specifically, the 29 interviewees had the following backgrounds: 12 purely IT, 3 purely clinical, 7 clinical with additional management and/or IT education, 2 purely managerial, and 5 mixed IT and managerial. Surprisingly, nearly half of the participants had mixed backgrounds, indicating that the domain's complexity was accounted for in staffing decisions. The interviews were conducted across multiple levels, including the national coordinating body (NICT), the South Eastern Region (SERHA and HospitalPartner), and three hospital trusts. The deployment of EA initiatives in organizations is typically based on a top-down strategy (Hylving & Bygstad, 2019). Therefore, we decided to collect data across levels. During the interviews, we avoided leading questions or questions that might yield stylized answers. This way, the interview transcripts became rich with lengthy statements, amenable to the analysis of the interviewees' perspectives. The interviews were largely dialogue based (Myers & Newman, 2007), and a narrative approach was adopted in several of them to explore specific stories from projects experienced by the interviewees. These stories became central to understanding the tensions caused by the different logics at play. The interviews included topics on EA practices, the role of enterprise architects, and issues about national coordination and collaboration in hospital IS. Furthermore, the interviews covered project-specific topics about the development, use, and value of EA artifacts; the involvement of different actors; and the progress of actual project work.

Table 2. Overview of the interviewees in the study.

# interviewee	Role	IT Background	Management Background	Clinical Background
1	Enterprise architect (5 from NICT, 7 from SERHA/ HospitalPartner, 3 from Health Trusts)	v	v	
2		v		
3		v	v	v
4		v	v	
5		v	v	
6		v		
7		v		
8		v		
9		v	v	
10		v		
11		v		
12				v
13		v		v
14		v		
15		v		
16	Senior manager (4 from SERHA/ HospitalPartner, 2 from Trusts)	v		
17		v		
18		v	v	
19		v	v	v
20		v		
21			v	v
22	Project manager/assistant project manager	v		
23			v	
24			v	v
25			v	
26			v	v
27				v
28				v
29			v	v

A large number of documents related to the projects, the introduction of EA in the hospital sector, and the overall strategy and policies for hospital IS in Norway were reviewed. The documents were used to gain an overall contextual understanding and to obtain detailed information about specific aspects of the projects. The significant volume of the documents indicates the heavily regulated hospital IS, the well-documented projects, and at the political level, the strong interest in modernizing healthcare information infrastructures over the last decade. The reviewed documents included policy papers and reports issued by the parliament, the Ministry of Health and Care Services, the directorates, NICT, and SERHA. In total, over 300 documents were collected and reviewed; out of those, 187 were issued by SERHA. The documents also contributed to the preparation of the interviews as they provided background information about project participants, project methods, and applied frameworks.

The flexibility of the interpretive approach allowed us to gradually obtain a sophisticated picture of the EA operationalization efforts. We approached the data by first identifying key tensions reported by the interviewees or documented in the analyzed documents. We followed a "pattern-inducing" approach (Reay & Jones, 2016), which involved an interpretivist analysis of the beliefs expressed in verbal or written discourse and the norms observed in behaviors and activities. The approach was inductive, and text segments from the interview data and documents were categorized to reveal patterns. The analysis comprised a bottom-up process to identify the patterns of the logics invoked by different interviewees during conversations and explanations. These were compared and contrasted with the key aspects of logics (medical, managerial, and IT professionalism) documented in the extant literature. Principles and assumptions related to EA were also coded and consolidated to outline the EA logic which was identified as a separate pattern.

In interpretive research, the researcher is part of the context, aiming to understand phenomena through the meanings that people assign to them (Orlikowski & Baroudi, 1991). Understanding is participative, conversational, and produced in a dialogue, not something reproduced by an interpreter through an analysis that seeks to "make sense" of a social action (Bernstein, 1986; Gadamer, 2000). As the data were analyzed to a large extent during the same period as the data collection, we had a lot of opportunities to discuss and develop the emergent understanding, together with the interviewees. To ensure validity, member validation (a recommended practice in interpretive research) was performed by sharing manuscript drafts with the interviewees for their reflection and feedback (Silverman, 2005). Member validation can enrich the case narrative, increase the findings' relevance, and strengthen a study's internal and external validity (Bygstad & Munkvold, 2011).

The coding of our empirical material followed the principles of first- and second-cycle coding (Miles, Huberman, & Saldaña, 2014). By utilizing the software NVivo, the outcomes of the first cycle were further analyzed, grouped, and transferred into Excel forms. In the second cycle, the data were discussed, organized, and compared iteratively to identify emerging patterns. The empirical material was further systematized, with the data visualized and reduced (Miles & Huberman, 1994). Selected long statements were condensed to shorter sentences to grasp the essence of the texts and to generate themes by taking into account the overall sequences in the texts (Kvale & Brinkmann, 2009). Overall, we followed a hermeneutical process of data collection, literature studies, and iterative analysis. In this process of sensemaking, the concept of institutional logics was used as an analytical lens, and the principle of dialogical reasoning (Klein & Myers, 1999) supported the development of theoretical insights. We revealed the EA operationalization dynamics, the multiple logics at play, and the enterprise architect's role under these circumstances.

4 Findings

Early in the research process, we identified the coexistence of multiple logics in the studied hospital settings. This finding resonates with prior research results (presented in Section 2) and was also indicated by the practice of establishing multiparty leadership teams for hospital projects. One of the interviewed managers explained how multiparty leadership was applied: *"We have a philosophy with a three-party project management, where we have a top project manager, who will have a clinical background and will be supported by a professional project manager from HospitalPartner and a project manager from the vendor. Thus, we go into a 'three harness' model"* (senior manager). Furthermore, the different project teams were purposefully staffed with

members from different backgrounds. The same interviewee remarked, "*It is important to get the right dynamics in the working groups*." In the next section, we show that the different participants appear to share the same reasoning for EA adoption (Section 4.1: Reasoning about EA adoption). However, diverging ideas arise when concrete design decisions are needed (Section 4.2: Operationalizing EA in functionality decisions). In other words, the different logics are invoked when EA has to be operationalized. The shaping of system functionality for the hospitals is ridden by tensions that are rooted in different logics (Section 4.3: Tensions between the EA perspective and established logics).

4.1 Reasoning about EA adoption

While interviewing the participants, we discussed the reasons for introducing EA. The different interviewees provided similar reasons for adopting an EA approach for hospital IT and processes. EA was expected to facilitate fundamentals, such as interoperability, standardization, coordination, process support, and data management. The interviewees expressed similar views, irrespective of their backgrounds and roles. Table 3 summarizes these findings under seven categories. The *standardization, data management,* and *interoperability and integration* categories are system-related. The *process support* category, along with *coordination and collaboration*, can be linked to healthcare delivery-related aims. Additionally, the participants also pointed to the potential of EA to facilitate managerial planning by mapping *as-is* and *to-be* states and *looking beyond* (local needs). Overall, every participant, irrespectively of background and role, referred to a mix of system, healthcare and managerial planning aims. This reasoning echoes the argumentation found in official documents for the introduction of EA in the hospitals.

Table 3. Reasoning for introducing EA, expressed in interviews.

Category
Standardization: to follow technical guidelines, best practices and architectural principles.
Data management: to control data handling and flow, especially the master data.
Interoperability and integration: to facilitate exchange and reuse of data.
Process support: to ensure that information systems support the work processes (e.g. for patient safety).
Coordination and collaboration. *Coordination* denotes assessing and adapting several relationships in relation to the whole. *Collaboration* is about actors working together toward a common aim.
Future (to-be) and Current State (as-is) mapping: to support the organization's strategy, suggest solutions and plan, while having an overview of the existing systems, the integrations in place, the interfaces, and dependencies.
Looking beyond: to understand that other units and actors are influenced by locally used systems.

Although we found that the interviewees shared similar views on high-level EA aims, controversies were revealed when discussing how EA moved from the strategic level toward operationalization. The empirical data showed that the high-level objectives were not always followed in concrete project decisions and that tensions emerged. One of the architects explained that it was not easy to make the practical decisions needed: *"I felt that the management only pointed to ICT strategy for consolidation and standardization without going into nuances and what to actually standardize, while the clinicians fought against [standardization]."* Despite the difficulties, the enterprise architects' contribution to the projects was acknowledged. A project manager with a clinical background explained, *"Architects in the project have been very valuable to me as a project manager; [they helped me] to be able to communicate to others about what the project delivers and how it is connected logically [to other projects]."*

4.2 Operationalizing EA in functionality decisions

Vignette 1: Functionality decisions for the regional ambulance record project

The regional ambulance record project is part of the RCS program. The project objective is to develop and introduce an Electronic Health Record (EHR) system for ambulances (A-EHR). It started in November 2017, and the plan is to complete the project by the end of 2020. A member of the project management team explained, *"Our goal is to ensure that the information registered by the communication center about time, address, type of incident, name, and other details collected over the phone is automatically sent to the A-EHR in the ambulance. Then the record will be pre-filled, and time will be saved. […] Before, you had to write with a pen, sometimes when the car was in motion, name, address, where you picked up and where you delivered, when you arrived and when you delivered. […] You will now avoid duplication, and as names have slight differences in this country, it will be easier to get things correctly."* The Open Group Architecture Framework (TOGAF) Architecture Development Method is used in the project, and the EA tool Sparx supports system design and business process modeling.

The RCS program board asked the project team to investigate the possibility of integrating the A-EHR with the hospital's EHR. The A-EHR information should be transferred to the hospital when the patient is delivered. Ensuring the digital flow of information between the ambulance and the hospital systems can eliminate the need for new data entry in the hospitals. Nevertheless, after some deliberations, the project team decided that the output for the hospitals will simply be a PDF file. The project team decided not to include integrations in the A-EHR scope to avoid the complexity of interfacing the new system with different existing hospital EHRs. The ambulance personnel involved in the project wanted to focus the effort on capturing information correctly and ensuring that the information would follow the patient in an efficient way. However, the desire for such a limited focus was not shared by all project participants. *"Enterprise architects, security architects, and others are soon requesting to bring in other things, […] it grows into a very large 'grey elephant', and it gets prohibitive"* (a member of the project management team). After several deliberations, it was decided that the core functionality should be prioritized and that integrations may be part of further development at a later stage. This decision resonates with medical professionalism principles related to patient focus and healthcare quality.

The project team endorses the programmatic aims for standardization and integration and recognizes the value of a holistic approach through EA. Nevertheless, when concrete decisions about functionality are needed, tensions surface. In the A-EHR project, we observe the tensions between the overarching EA aim for "one citizen – one record" and the perspective that prioritizes immediate clinical utility and service quality improvement. The members of the managerial team were involved in deliberations invoking the managerial logic that values efficiency, the IT logic that values secure and automated data flows across functional areas and the medical professionalism logic that values clinical utility. The tensions were settled by suppressing EA and relegating its visions to the future.

Vignette 2: Functionality decisions for the pharmaceutical management project

The uniform pharmaceutical management project is also under the RCS umbrella. It aims to coordinate drug information across multiple applications within hospitals. For instance, the information about drugs needs to be shared among the hospital EHR, the Critical Care system, and the Cancer Medication system. Today, the information is scattered across systems, and clinicians lack an overview of each patient's drug use. Work processes across disciplines are fragmented, and the lack of information sharing requires manual duplication of drug information. SEHRA

started work on this project in late 2017, but the official start was in March 2018. The project is very challenging due to the fragmentation of the systems and the processes that it aims to address. A member of the project management team referred to the disputes that occurred when EA was discussed: *"Each of the applications wants control, e.g., the Critical Care system asks for full control, and they do not like to allow drugs to be managed in the other systems. […] medication management is different in the different systems; […] e.g., there are different key identifiers for the drugs. [Furthermore,] it is hard to get a common architecture because one is constrained by different vendor solutions."*

Although standardization and uniform medication handling across the different solutions are the project's aims, these are far from straightforward, not only because of technical issues, but also because of singularities in clinical practices. For instance, the system used in maternity clinics allows midwives to manage medications, but this is not allowed in the Critical Care system. Furthermore, the Cancer Medication system covers not only drugs but also different types of support treatments (e.g., non-pharmaceutical support for nausea). The medical professionalism perspective on these issues is that the singularities of clinical practices should be preserved. From an IT perspective, these singularities impede standardization and complicate coordination with the different vendors. Furthermore, local tailoring of systems and procedures complicates managerial control across clinics and throughout hospitals. Due to these complications, the project has been put partly on hold.

Vignette 3: Functionality decisions for the cancer medication project

The cancer medication project is also under the RCS program. The project aims to introduce a system to support medication requisition, preparation, administration, and documentation throughout the course of cancer treatment. The project started in spring 2013 and is scheduled to be completed by the end of 2019. The project is introducing a digital system in an area that has only been supported by paper documentation until now. The paper-based arrangements have allowed substantial variations in the different hospitals, and the project now needs to grapple with the consequences. The national goal for equal treatment (through standardization of processes) is a project driver. A member of the project management team explained, *"There are differences in how different health trusts work; there are manual routines and no standardized regional procedures. So, it was a bit pragmatic, […] an example of this is the possibility for the pharmacy to prepare drugs in advance; we allowed this only for the inexpensive medication."*

It was challenging to reach an agreement about how things should be because *"everyone wanted it in their own way, and they wanted a product that supported how they worked today"* (a member of the project management team). The same interviewee provided an interesting example: *"[At one hospital,] it was common for doctors to request a treatment regimen and set up several cycles of the same treatment. Then, nurses approved the second iteration of the treatment and continued up to a certain number. This was a manual requisition; the doctor filled out a paper form; up to six treatments could be requested on the same form. The doctor set the entire course of treatment by entering the dates, indicating the medication, and signing at the bottom of one column. [...] when coming to treatment number 2, if the patient was in good shape, it was sufficient that a nurse signed on column 2. [..]. Then the nurse was the requester, and it was a somewhat problematic situation in relation to how one must interpret the legality of this. […] There was a slightly different legal interpretation compared to other hospitals where nurses were not allowed to be the requester of such a treatment. [...] In the application, when a nurse had approved, it would seem that the*

nurse was a doctor requesting it, and that would not be correct. So, it required changes in practice: doctors had to order each and every treatment separately. […] This was extra work for the doctors; they were very happy to get an electronic solution, but they were not aware that it would require such a major shift in their way of working. And it was just forced through the application."

These two examples illustrated that in this project, medical professionalism prevailed when there were minor managerial implications. For instance, for medications that were not too expensive, some hospital trusts were able to implement local variations of the processes, allowing hospital pharmacies to prepare drugs in advance. However, when variations in clinical practices entailed regulatory risks (as in the case of nurses' involvement in medication requisition), strict standardization was followed.

4.3 Tensions between the EA perspective and established logics

The project vignettes show how EA-driven design decisions may be controversial and debated. Furthermore, during the interviews, different participants pointed out several tensions related to EA operationalization. We classify the identified tensions into three main categories and map them to the incongruences between the EA perspective and the dominant logics in healthcare (medical professionalism, managerialism, and IT professionalism).

The first tension is related to operationalizing the holistic thinking of EA. Although EA initiatives are not temporary endeavors with a limited scope, they are realized through bounded projects with specific timeframes and commitments. For instance, in the regional ambulance record project (Vignette 1), the project team decided to deliver a stand-alone solution that did not fit the vision for "one citizen–one record". This decision was made to avoid the complexity and the uncertainty of interfacing with different existing hospital EHRs. In general, working with a holistic view of the organization makes it difficult to have everything specified upfront to calculate costs and budget resources. Having everything budgeted in advanced is part of the traditional managerial approach that is now challenged. One of the enterprise architects explained, *"It is a fundamental difference […] you have to think that not everything has to be specified upfront; something can actually be specified along the way. […] Assuming you do not know everything in advance, [it is hard to estimate] how much money this will cost."* The holistic character of EA also differs from the traditional technical approach of solving problems in a piecemeal manner, where a system is broken down into pieces, and the focus is on different modules. Another enterprise architect explained that this difference is also reflected in the tools used. *"Having documented your architecture in such a way that it supports decision-making processes is different [from] the system architecture approach of HospitalPartner, where one must conduct modeling of different areas in order to produce a solution. […] it requires [a] different functionality in an EA tool."* Enterprise architects hold a holistic view and need to have an outline ("as is") of the interdependencies across the organization. In contrast, IT professionals and managers pay more attention to each project at hand. Similarly, medical professionals are confined to their specializations, following clinical protocols to address specific clinical needs. They are not used to open-ended strategic efforts. One interviewee pointed out the entrenched healthcare attitudes. *"It is part of the culture of healthcare to be ad-hoc organized to save lives. The focus is not on strategic development, neither for clinicians nor for IT people."* Furthermore, one of the enterprise architects explained, *"A lot of the people we work with—they work in small areas and look very little beyond the area they work with. It's our job, actually lifting our heads and looking around."*

The second tension is related to realizing the aspiration for top-down standardization through EA. In the case of the pharmaceutical management project (Vignette 2), standardizing information

management across multiple applications was proven to be so challenging that the project was halted. In the case of the cancer medication project (Vignette 3), standardization is advancing, but some local variations are tolerated (e.g., the advanced preparation of medications in some hospitals). The hospital sector has a long tradition of decentralized and autonomous entities. This setup is in contrast to an EA approach, which builds on principles of centralized control in decision-making. One of the interviewed enterprise architects said, *"The hospital directors are the ones who decide, and they say that the EHR is the first priority."* Another enterprise architect elaborated further, *"At least, some [hospital trusts] will actually have their [own] local systems and not have the hassle of regional ICT services. Because then, they [will] have complete control over their own ICT needs, to support the work processes they have, without interference."* The findings indicate a tension between top-down standardization initiated from the region and the local work practices in each hospital. The tension is not only related to local managerial concerns but also to the role of medical professionals. One of the enterprise architects clearly referred to this issue. *"That's what it's all about, the desire to be able to keep the control. There are doctors who have had control over the years, and now they are increasingly losing it, and they are not completely satisfied [with the situation]."* Introducing an EA approach challenges the established routines for ad-hoc improvements and additions. Nevertheless, although EA is essentially a top-down approach, enterprise architects acknowledge the value of bottom-up information flows. One of the interviewed enterprise architects said, *"The biggest challenge is to maintain local understanding […]. It should be taken from patients to clinicians and upwards, not top-down."* Another enterprise architect explained the difficulty in introducing regional-level solutions. *"There are many examples [of requirements] that are known for a few years, [which] could have led to the establishment of a regional solution. Instead, every trust takes efforts to make its own, leading to multiple systems and different ways of reporting."* Many hospitals are specialized and ask for decentralized control. One of the enterprise architects said, "*Different hospitals have different work practices and routines. One of the hospitals is a volume producer to a large extent, while two other hospitals in the same region are national centers working on complicated diseases. They work in completely different ways."* Local solutions are in some cases implemented, without taking top-down standardization into account.

The third tension pertains to the time perspective. It is difficult to prioritize long-term activities over supporting the hospitals' urgent needs. For instance, in the regional ambulance record project (Vignette 1), the decision was to aim for immediate utility instead of the long-term vision. One of the interviewed enterprise architects explained, *"There are many pressing initiatives that have to be done; thus, the 'long-term' picture is a bit difficult."* Another enterprise architect further elaborated, *"It is hard to get people in a busy operating organization to use a lot of time on IT without having short-term benefits. Sometimes, the benefits come to others or are diffused to many, but it takes some time."* An interviewee with a clinical background stated, *"Our work is very much based on a short-term approach in the hospital sector. [The EA approach] creates an opportunity to become more long-term oriented. But our mindset is very short-term oriented."* Furthermore, IT professionals tend to orient themselves toward solving known practical problems. A senior manager with an IT background explained, *"We are far behind, we have a lot of technical debt, we face many challenges. And so, it is that enterprise architects and others, they think it is exciting to look ahead—so the distance between the realities and what they like to talk about and relate to, of great systems coming or whatever it is, is so huge that it is hard to see that they have a good agenda."* The tension we observe here is between EA emphasizing a long-term view, and the logics of healthcare managerialism, medical professionalism, and IT professionalism that are

predominantly oriented toward satisfying pressing needs. Table 4 provides an overview of the identified tensions, linking them to logic incongruences.

The coexistence of IT professionalism, medical professionalism, and managerialism in hospitals orients IT and process design toward fractional initiatives, localizations, and short-/medium-term outlooks. However, EA introduces a holistic, long-term, and top-down approach. Inevitably, tensions emerge when project decisions need to be made. The enterprise architects' role is to support the EA perspective. Nevertheless, in practice, they search for moderations or tension resolutions through a mix of approaches. On one hand, they promote collaborative approaches through dynamic balancing; on the other hand, they lobby for having some EA aspects mandated (Table 4, third column). Overall, the moderation of the tensions is likely, as EA practices mature, and evidence of EA usefulness accumulates. For instance, one of the enterprise architects said*, "The increased focus on security leads to paying closer attention to architectural design. A security focus does require improved documentation. In addition, you must recognize that comprehensive projects require good planning. In this sense, an EA approach is supportive."* For the time being, EA operationalization is continuously negotiated in the projects and is shaped through case-by-case tension settlements. In some settlements, the EA principles may be suppressed (as in the case of the regional ambulance record project); in others, they may be foregrounded (as in the case of abolishing the nurses' requisition rights), or a blend may be agreed (as in the case of hospital pharmacies retaining the discretion to prepare medications in advance).

Table 4. Overview of tensions between the Enterprise Architecture logic and the prevailing logics in hospitals, and the enterprise architects' moderating role

Tensions related to operationalizing EA	Logic incongruences	Architects' moderating role
T1: Fractional versus holistic orientation		
Breaking down systems into components versus relating parts to the whole	IT professionalism versus EA	Dynamic balancing: Work toward reducing the use of stage-gate methods in system development and promote iterative and agile principles in system projects. Mandate: Ensure a common way of documentation and use specific EA tools.
Controlling endeavors with a definite scope versus stimulating ongoing transformation	Managerialism versus EA	
Specializing in a defined group of patients, condition, or treatment stage versus providing an all-inclusive strategic view	Medical professionalism versus EA	
T2: Bottom-up localization versus top-down standardization		
Local process support versus global standards	IT professionalism versus EA	Dynamic balancing: Support local innovations to become pilots for a whole region. Mandate: Establish an architecture and design committee for regional programs.
Organizational unit view versus health system-wide view	Managerialism versus EA	
Systems inscribing clinical knowledge versus innovation from the top	Medical professionalism versus EA	
T3: Short-/medium-term versus long-term outlook		
Immediate functional needs versus long-term visions	IT professionalism versus EA	Dynamic balancing: Enhance EA understanding, knowledge, and competencies. Mandate: Establish mandatory checkpoints in project roadmaps to ensure that EA values (oriented to the long term) are included.
Resources for immediate return versus future improvement	Managerialism versus EA	
Hands-on clinical work versus design activities	Medical professionalism versus EA	

Based on the analysis and drawing from the interview transcripts and the collected documents, we identified key assumptions, principles, and sources of legitimacy related to EA. Practically, we find that EA is added to the institutional context as a distinct logic. Table 5 provides an overview. The empirical data show also the difficulty in prioritizing the EA logic in concrete project decisions. To resolve the tensions, the project participants explore the possibilities for and the constraints to action. Enterprise architects aim to settle the tensions through a dialectic approach of dynamic balancing by seeking accommodation rather than trying to stifle the differences and a mandating approach, aiming to foreground EA principles. Furthermore, we find that although the EA logic becomes available alongside other logics when introduced at the strategy level, tensions actually emerge when the logic is activated during projects. These tensions may be settled or may persist remaining unsettled. Unsettled tensions can halt projects as in the case of the pharmaceutical management project in vignette 2. When tensions are settled, decisions can be taken about design options allowing the project to evolve. The decisions may foreground, blend or suppress the EA logic. Regardless of the type of settlement, as the project evolves more tensions are bound to emerge creating the need for new settlements. Coexisting logics can continually exist in a state of dynamic tension as EA becomes operationalized through projects. The operationalization of EA in practice is presented graphically in the model shown in Figure 3.

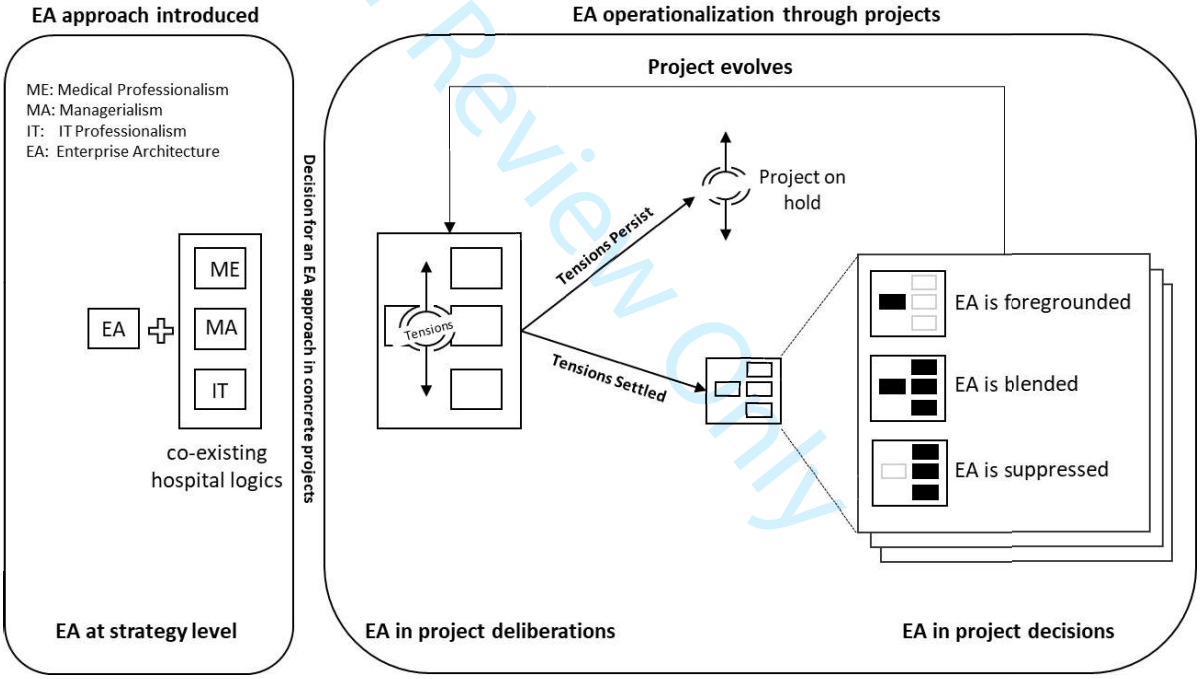


Figure 3. EA operationalization model

The graphical model is descriptive and illustrates how coexisting logics maintain their distinct character while allowing settlements that shape EA operationalization. The model also depicts a set of scenarios for tension settlement in project decisions. In these scenarios, EA is foregrounded, blended with other available logics, or suppressed. After each decision the projects continue to evolve and during further project deliberations new tensions emerge. The model outlines several possible paths: a) the EA visions will be ingrained in systems and processes if the logic of EA gets foregrounded or blended with the other logics, b) the influence of EA visions on systems and processes will be insignificant if many decisions suppress EA, c) projects may be halted at any point if tensions remain unsettled.

Table 5. Elements of the Enterprise Architecture logic.

	Representative Extract from Documents	Interview Quote
Assumption: Competitiveness through higher digital maturity.	"EA will contribute to a greater degree of goal achievement through a structured approach focused on holistic thinking and change capability and will provide common guidelines for the development of architecture and ICT solutions in the hospital service" (NICT, 2014, p. 3). "EA's contribution is to ensure that healthcare and healthcare sector's strategies, tools and processes are viewed in conjunction to achieve desired results. There is an ever-increasing need for collaboration and mutual adaptation to other players in the sector and public administration in general. This is reinforced by new demands from patients and the public, these players must be involved to a completely different degree than before" (NICT, 2014, p. 5).	"I think [the EA approach] is an improvement; you are able to visualize and concretize the processes and the effects of the measures that are implemented, and what you expect to happen. [...] You see it more concretely, which means we make sure we talk about the same thing, and you make sure you are a little more aware of the consequences of what you do, so it's an awareness" (project manager and clinician). "The more we build up documentation and processes, the better reuse it will give in the future" (senior manager – IT background).
Principles: Holistic orientation, Top-down planning for Standardization and Integration, Long-term thinking.	"EA is about how an enterprise is organized, how work processes are put together and how IT solutions are utilized. […] The purpose of a well-described and unified EA is, inter alia, to realize individual solutions in a holistic context, not separately. The purpose is to ensure a good connection between work processes and IT solutions and to avoid the establishment of information systems that do not talk together, so-called silos" (Difi, 2012, p. 3). "One vision for architecture practice in the hospitals to use EA in strategic work, in organizational and process development, in portfolio management, and in programs and projects. […] The architecture practice provides ICT solutions that support holistic processes in the hospitals and in the health sector in general. The architecture practice ensures standardization and collaboration across health regions and the sector" (NICT, 2014, p. 6).	"[EA] is valuable because you get an idea of the complexity - and that work is actually important because you have so many elements. In such a box, there are so many lines you should relate to. […] It forces me to think that you have to do this so carefully; how else should one control the information?" (project manager and clinician). "It is about seeing things in context and prioritizing. […] For example, in implementing new systems and in relation to standards, reference models, and application platforms, - trying to associate this with stakeholders and users, everything must be connected in a way, - interactions between meta-models, building blocks, charts and stakeholders, everything must be seen in a context. TOGAF helps us and is a possible approach to seeing these relationships in the enterprise" (enterprise architect).
Sources of legitimacy: Executive endorsement and Best practices.	"The method to be used in National ICT projects will be based on TOGAF ADM, adapted to the hospital service and the needs of each project" (NICT, 2014, p. 41). "The development of models and frameworks based on EA will be fundamental for systematically developing the region's decision basis, regional prioritization and implementation ability" (SERHA, 2015, p. 33). "It is nationally and regionally recommended that TOGAF shall be used as an architecture methodology" (RCS Guidelines presentation, 2017).	"There is an architecture forum established where all architecture documents are approved. Within the forum, there are responsible architects for different domains, for instance, a security domain, an infrastructure domain etc. […] The idea is that the domain architects should talk with each other to ensure comprehensiveness when we make architecture changes and each domain architect is responsible for developing the domain properly" (senior manager – IT background). "Getting it [mandatory use of EA approach] into the project guideline is a confirmation that this is a valuable area, and this is a requirement" (project manager and clinician).

5 Discussion and implications

5.1 Key findings and contributions

This study's findings provide insights about EA operationalization, which is an under-researched topic in extant IS studies. Our empirical context is a long-standing, institutionally complex setting where medical, managerial, and technological logics coexist. Drawing on the case analysis, our paper makes three contributions. First, we show that logic multiplicity can be the basis for broad practice repertoires as actors relate to multiple logics simultaneously. Actors that seek to achieve project goals activate different logics selectively. This observation advances extant IS research that has tended to assume that coexisting logics are inherently associated via one-to-one relationships with specific categories of actors. Second, in contrast to most EA studies that investigate the early stages of EA introduction before EA becomes part of the institutional context, the focus on EA operationalization enables us to show that EA can itself become institutionalized and invoked as a distinct logic along other coexisting logics. Third, we synthesize the empirical findings in a graphical model. The model acknowledges that coexisting logics can continually exist in a state of dynamic tension that maintains institutional pluralism. We elaborate on these findings and their implications for theory and practice in the following sections.

5.2 Theoretical implications

Our study calls for disassociating institutional logics from specific types of actors in IS research by acknowledging that in everyday practices, actors do not always adhere to the logics of their professional groups. Additionally, we suggest conceptualizing EA as a distinct logic that becomes part of the institutional context during EA operationalization. Finally, we point to institutional pluralism as a specific way of settling tensions. We discuss each of these theoretical implications below.

First, by showing that actors may activate several different logics selectively, we highlight the importance of considering actors' discretion in their everyday use of the logics available in a domain. Prior IS research generally assumes that actors adhere to the logics of their professional role due to the differences in their work, education, and overall socialization patterns (Boonstra, Eseryel, et al., 2018). This simplification reduces action taking to a few given patterns that hardly change. We question whether this one-to-one mapping between logics and actor roles is an accurate reflection of the empirical reality. We find that in IS research, most empirical studies that use the concept of institutional logics as a theoretical lens are quite disconnected from the social science formulations of institutional logics as tools that can be creatively employed by actors to achieve individual and organizational goals (Martin et al., 2017; McPherson & Sauder, 2013). Disassociating logics from specific types of actors allows conceptualizing broader practice repertoires than generally assumed in related IS research (for instance, Berente & Yoo, 2012). Our study offers a nuanced understanding of the impact of institutional logics on everyday action taking.

Second, we suggest that EA can be conceptualized as a distinct logic. As EA becomes part of the institutional context, its logic becomes part of the resources that actors can draw on in their everyday interactions. Nevertheless, there are points of friction and incongruences between the EA logic and the other established logics in healthcare. The established logics are ingrained in the customary ways of working and the established power structures, as identified in prior research on IS in hospital contexts (Boonstra, Eseryel, et al., 2018; Boonstra, van Offenbeek, & Vos, 2017; Heeks, 2006). In the case studied, although the reasoning for the introduction of EA is clear and

the high-level aims are universally accepted, differences between the EA logic and the other dominant logics emerge during action taking. These differences lead to tensions that have to be resolved. The empirical data show that prioritizing the EA logic is difficult in hospitals despite executive-level support. The key tensions relate to a) operationalizing the holistic thinking of EA through bounded projects with specific timeframes, b) realizing top-down standardization in a sector that has a long tradition of hospital autonomy, and c) prioritizing long-term activities over supporting the hospitals' urgent needs. Obviously, contextual particularities, including differences in the established institutional logics, will likely lead to different tensions during EA operationalization in organizations beyond healthcare.

Third, our work suggests a model that shows how coexisting logics maintain their distinct character while allowing local resolutions that shape EA operationalization. The model demonstrates that the logics are invoked during project deliberations generating a state of dynamic tension. Prior empirical research in hospitals has demonstrated how different coexisting logics may be enacted by polarizing, compromising, or synthesizing work practices across different sociocultural identities of the organizations (Boonstra, Yeliz Eseryel, & van Offenbeek, 2018). The suggested model demonstrates how EA becomes part of project practices to a greater or lesser extent depending on different local resolutions to controversies during action taking. Reay and Hinings (2009) study on the interaction between the logics of medical professionalism and managerialism in healthcare is often cited as an exemplary study on how multiple logics may coexist at the micro level. Nevertheless, their seminal paper does not elaborate on actor interactions and justifications. By providing empirical descriptions of such interactions, our work extends prior research on settling tensions in contexts of institutional complexity (Kraatz & Block, 2008; Pache & Santos, 2010; Reay & Hinings, 2009). Our analysis shows that the resolutions of different tensions can vary on the basis of project-level realities.

5.3 Practical implications

Hospitals are complex environments in terms of technology and processes. EA aims to provide support for addressing long-standing healthcare problems related to fragmented IT portfolios, immature IT infrastructures, and silo-structured organizing (Ross et al., 2006). Our study provides practical insights for working with EA at the concrete project level. Therefore, it complements prior research that has mostly explored EA initiatives at the executive level identifying overarching challenges and enablers (for instance Banaeianjahromi & Smolander, 2016; Dang & Pekkola, 2019; Iyamu & Mphahlele, 2014). Our findings show that project participants operationalize EA by settling the tensions that emerge as multiple different logics come into play. Hence, EA operationalization is the outcome of adaptations produced through the encounters of the EA logic with other established logics in institutionally complex settings.

Tensions and adaptations were only found during project deliberations about design decisions. At the strategic level, the different project participants were found to share a common reasoning for EA introduction and there were no divergent opinions regarding the overall aspirations for EA (Table 3). Interestingly, although previous research has identified that EA initiatives tend to focus on documenting current architectures, with only a few organizations developing a "to-be" architecture (Winter et al., 2010), this does not seem to be the case in Norwegian hospitals, where there is a strong interest in introducing EA to facilitate a "to-be" architecture. Nevertheless, although the reasoning for EA introduction is common, when specific system and process design decisions need to be taken, controversies emerge making it challenging to operationalize EA. The analysis of the empirical findings provides three key implications for practice.

First, our findings indicate that the introduction of EA in hospitals requires some level of adaptation of EA principles and methodological premises. For instance, the top-down orientation of EA initiatives needs to be adjusted by taking into account key aspects of the sociocultural climate including the established culture of democratic processes, autonomy, flexibility, and demand for locally adapted systems. Prior research has identified that actual EA practices often differ substantially from the original EA methodologies (Kotusev, 2018a), and, that real-world EA practices can work even when an organization does not adopt all the elements that are typically considered essential for EA (Kotusev, 2018b). The operationalization of EA in hospitals is essentially an adaptation process that comes out of the interplay of different logics.

Second, our case analysis shows the pivotal role of diversity in team composition and leadership. Prior research has shown the importance of a supportive social environment and an adaptive culture for EA projects (Aier, 2014; Niemi & Pekkola, 2016; Weiss et al., 2013). Our findings show how such a supportive social environment and an adaptive culture shape EA projects in practice through the settlement of tensions. In the realm of practice, multiple perspectives in decision-making (such as in the SERHA "three harness" project leadership model) allow tensions to surface and get settled through broad discussions.

Third, enterprise architects play an important role in projects as moderators that can facilitate the settlement of tensions. Enterprise architects have the required knowledge for prioritizing EA aspects that really matter and compromising in less significant aspects. This way, they can prevent projects from coming to a halt due to diverging views and tensions that remain unsettled. Furthermore, enterprise architects do lobby for EA-specific measures ensuring the implementation of EA fundamentals. Enterprise architects often play different roles, requiring multiple skills (Gøtze, 2013) as they aim to align technology with business objectives, manage the complex set of interdependencies in their organization, and implement the strategic direction (Strano & Rehmani, 2007) and have been recognized as boundary spanners (Dale & Scheepers, 2019) or as change agents and communicators (Ylinen & Pekkola, 2018). Our findings show that the enterprise architects can be receptive to the ideas of other actors while accepting responsibility for improving joint action. This way, they perform an important role in the dialectic processes among different logics, helping participants interact more effectively. In a recent study, Dale and Scheepers (2019) have found that enterprise architects can create an inter-community structure by bridging boundaries between themselves and different professional communities.

6 Conclusion and directions for future research

Our study has demonstrated how EA gets operationalized in an institutionally complex setting. EA in itself does not provide value, but is an instrument enabling the creation of value (Gong & Janssen, 2019). It is the interplay between EA methodologies, organizational and social factors that produces particular outcomes. By providing a theoretical model and empirical evidence for the dynamics of EA operationalization we show how EA can become institutionalized and invoked to varying degrees as a distinct logic along other coexisting logics. Furthermore, we advance extant IS research by introducing a more nuanced understanding of practice repertoires, showing that logic multiplicity can be the basis for action taking as actors activate different logics selectively.

This study has limitations and provides opportunities for future research. Although we believe that this analysis provides a valuable exploration of EA operationalization in Norwegian hospitals, we also recognize the influence of the specific characteristics of the empirical context in our

findings. This study is conducted in a Scandinavian context which is well-known for a work culture with low power distance, encouraging bottom-up approaches and democratic processes (Gregory, 2003). Norwegian healthcare has a tradition of developing clinical systems by involving clinical personnel in the design process (Bjerknes & Bratteteig, 1985; Bjerknes & Bratteteig, 1995), and in general, participatory processes involving users are strong in Scandinavian organizations. Such a setting can stimulate institutional pluralism. Further research can explore the dynamics of EA operationalization in a different cultural context. Furthermore, our research is based on data related to ongoing initiatives that continue evolving. Future research may extend this work by following the trajectory of the RCN program. Finally, this research is focused only on the project dynamics during design and not on the further adaptations that occur when new systems and processes are introduced to practice. For this reason, we have only included the perspectives of employees directly involved in the EA projects under investigation which is consistent to most EA research. We have not included employees that are simply users (e.g. clinicians). Future studies may consider including end-users to examine the dynamics of EA-driven interventions after deployment in actual work settings.

References

Aier, S. (2014). The role of organizational culture for grounding, management, guidance and effectiveness of enterprise architecture principles. *Information Systems and e-Business Management, 12*(1), 43-70. https://doi.org/10.1007/s10257-012-0206-8

Armour, F. J., Kaisler, S. H., & Liu, S. Y. (1999). A big-picture look at Enterprise Architectures. *IT professional, 1*(1), 35-42. https://doi.org/10.1109/6294.774792

Banaeianjahromi, N., & Smolander, K. (2016, 12 - 15 June). *Understanding obstacles in Enterprise Architecture development.* Paper presented at the Twenty-Fourth European Conference on Information Systems (ECIS) Istanbul, Turkey. https://aisel.aisnet.org/ecis2016_rp/7

Banaeianjahromi, N., & Smolander, K. (2019). Lack of communication and collaboration in enterprise architecture development. *Information Systems Frontiers, 21*(4), 877-908. https://doi.org/10.1007/s10796-017-9779-6

Barley, S. R., & Tolbert, P. S. (1997). Institutionalization and structuration: Studying the links between action and institution. *Organization Studies, 18*(1), 93-117. https://doi.org/10.1177/017084069701800106

Berente, N., Lyytinen, K., Yoo, Y., & Maurer, C. (2019). Institutional logics and pluralistic responses to enterprise system implementation: A qualitative meta-analysis. *MIS Quarterly: Management Information Systems, 43*(3), 873-902. https://doi.org/10.25300/MISQ/2019/14214

Berente, N., & Yoo, Y. (2012). Institutional contradictions and loose coupling: Postimplementation of NASA's enterprise information system. *Information Systems Research, 23*(2), 376-396. https://doi.org/10.1287/isre.1110.0373

Bernard, S. A. (2012). *An introduction to Enterprise Architecture* (3rd Edition ed.). Bloomington IN: AuthorHouse.

Bernstein, R. J. (1986). *Beyond objectivism and relativism: Science, hermeneutics, and praxis.* Philadelphia: University of Pennsylvania Press.

Besharov, M. L., & Smith, W. K. (2014). Multiple institutional logics in organizations: Explaining their varied nature and implications. *Academy of Management Review, 39*(3), 364-381. https://doi.org/10.5465/amr.2011.0431

Bjerknes, G., & Bratteteig, T. (1985). *Florence in wonderland*. Paper presented at the Conference on Development and Use of Computer-Based Systems and Tools, Arhus, Denmark.

Bjerknes, G., & Bratteteig, T. (1995). User participation and democracy: A discussion of Scandinavian research on system development. *Scandinavian Journal of Information Systems, 7*(1), 73-98. http://aisel.aisnet.org/sjis/vol7/iss1/1

Boonstra, A., van Offenbeek, M. A., & Vos, J. F. (2017). Tension awareness of stakeholders in large technology projects: A duality perspective. *Project Management Journal*, *48*(1), 19-36. https://doi.org/10.1177/875697281704800102

Boonstra, A., Yeliz Eseryel, U., & van Offenbeek, M. A. (2018). Stakeholders' enactment of competing logics in IT governance: polarization, compromise or synthesis? *European Journal of Information Systems, 27*(4), 415-433. https://doi.org/10.1057/s41303-017-0055-0

Bradley, R. V., Pratt, R. M. E., Byrd, T. A., Outlay, C. N., & Wynn Jr, D. E. (2012). Enterprise architecture, IT effectiveness and the mediating role of IT alignment in US hospitals. *Information Systems Journal, 22*(2), 97-127. https://doi.org//10.1111/j.1365-2575.2011.00379.x

Bygstad, B., & Munkvold, B. E. (2011). Exploring the role of informants in interpretive case study research in IS. *Journal of Information Technology, 26*(1), 32-45. https://doi.org/10.1057/jit.2010.15

Coleman, J., S. (1958). Relational analysis: The study of social organization with survey methods. *Human Organization, 17*, 28-36.

Currie, W. L., & Guah, M. W. (2007). Conflicting institutional logics: A national programme for IT in the organisational field of healthcare. *Journal of Information Technology, 22*(3), 235-247. https://doi.org/10.1057/palgrave.jit.2000102

Dale, M., & Scheepers, H. (2019). Enterprise Architecture implementation as interpersonal connection: Building support and commitment. *Information Systems Journal,* (July, early view), 1-35. https://doi.org/10.1111/isj.12255

Dang, D., & Pekkola, S. (2019). Institutional perspectives on the process of Enterprise Architecture adoption. *Information Systems Frontiers*. https://doi.org/10.1007/s10796-019-09944-8

Difi. (2012). *Overordnede IT arkitekturprinsipper for offentlig sektor*. Retrieved from http://www.difi.no/sites/difino/files/arkitekturprinsipper-2.1.pdf

Friedland, R., & Alford, R. R. (1991). Bringing society back in: Symbols, practices and institutional contradictions. In W. W. Powell & P. J. DiMaggio (Eds.) *The New Institutionalism in Organizational Analysis:* University of Chicago Press, 232-263.

Gadamer, H.-G. (2000). *Truth and method* (Second revised ed.). New York: The Continuum Publishing Company.

Gandhi, P. K., S ; Ramaswamy, S. (2016). Which industries are the most digital (and why)? Retrieved from https://hbr.org/2016/04/a-chart-that-shows-which-industries-are-the-most-digital-and-why

Gong, Y., & Janssen, M. (2019). The value of and myths about Enterprise Architecture. *International Journal of Information Management, 46*, 1-9. https://doi.org/10.1016/j.ijinfomgt.2018.11.006.

Gregory, J. (2003). Scandinavian approaches to participatory design. *International Journal of Engineering Education, 19*(1), 62-74.

Gøtze, J. (2013). *The changing role of the enterprise architect.* Paper presented at the 17th IEEE International Enterprise Distributed Object Computing Conference Workshop, Vancouver, Canada.

Hansen, S., & Baroody, A. J. (2019). Electronic health records and the logics of care: Complementarity and conflict in the U.S. Healthcare System. *Information Systems Research*, (August, early view), 1-19. https://doi.org/10.1287/isre.2019.0875

Heckathorn, D., D. (1997). Respondent-driven sampling: A new approach to the study of hidden populations. *Social problems, 44*(2), 174-199. https://doi.org/10.2307/3096941

Heeks, R. (2006). Health information systems: Failure, success and improvisation. *International Journal of Medical Informatics, 75*(2), 125-137. https://doi.org/10.1016/j.ijmedinf.2005.07.024

Hjort-Madsen, K., & Pries-Heje, J. (2009). *Enterprise architecture in government: Fad or future?* Paper presented at the 42nd Annual Hawaii International Conference on System Sciences (HICSS 2009), Waikoloa, Hawaii, USA. https://doi.org/10.1109/HICSS.2009.194

Hylving, L., & Bygstad, B. (2019). Nuanced reponses to Enterprise Architecture Management: Loyalty, voice, and exit. *Journal of Management Information Systems, 36*(1), 14-36. https://doi.org/10.1080/07421222.2018.1550549

Iyamu, T., & Mphahlele, L. (2014). The impact of organisational structure on Enterprise Architecture deployment. *Journal of Systems and Information Technology, 16*(1), 2-19.

Janssen, M. (2012). Sociopolitical aspects of interoperability and enterprise architecture in e-government. *Social Science Computer Review, 30*(1), 24-36. https://doi.org/10.1177/0894439310392187

Jensen, T. B., Kjærgaard, A., & Svejvig, P. (2009). Using institutional theory with sensemaking theory: A case study of information system implementation in healthcare. *Journal of Information Technology, 24*(4), 343-353. https://doi.org/10.1057/jit.2009.11

Jonkers, H., Lankhorst, M. M., ter Doest, H. W., Arbab, F., Bosma, H., & Wieringa, R. J. (2006). Enterprise Architecture: Management tool and blueprint for the organisation. *Information Systems Frontiers, 8*(2), 63-66. https://doi.org/10.1007/s10796-006-7970-2

Kappelman, L., McGinnis, T., Pettite, A., & Sidorova, A. (2008). *Enterprise Architecture: Charting the territory for academic research*. Paper presented at the fourteen American Conference in Information Systems (AMCIS 2008), Toronto, Canada.

Klein, H. K., & Myers, M. D. (1999). A set of principles for conducting and evaluating interpretive field studies in information systems. *MIS Quarterly, 23*(1), 67-93. https://doi.org/10.2307/249410

Kotusev, S. (2018a). Enterprise Architecture: A reconceptualization is needed. *Pacific Asia Journal of the Association for Information Systems, 10*(4), 1-36. doi:10.17705/1PAIS.10401

Kotusev, S. (2018b). TOGAF-based Enterprise Architecture practice: An exploratory case study. *Communications of the Association for Information Systems, 43*(1), 321-359. https://aisel.aisnet.org/cais/vol43/iss1/20

Kraatz, M. S., & Block, E. S. (2008). Organizational implications of institutional pluralism. In Greenwood R. Oliver C., Suddaby R. & Sahlin-Andersson K. (Eds.) *The Sage handbook of organizational institutionalism, 840:* UK: Sage Publications Ltd., 243-275.

Kvale, S., & Brinkmann, S. (2009). *Interviews: Learning the craft of qualitative research interviewing*. Los Angeles, Calif.: Sage.

Lange, M., Mendling, J., & Recker, J. (2016). An empirical analysis of the factors and measures of Enterprise Architecture Management success. *European Journal of Information Systems, 25*(5), 411-431. https://doi.org/10.1057/ejis.2014.39

Martin, G., Currie, G., Weaver, S., Finn, R., & McDonald, R. (2017). Institutional complexity and individual responses: Delineating the boundaries of partial autonomy. *Organization Studies, 38*(1), 103-127. https://doi.org/10.1177/0170840616663241

McPherson, C. M., & Sauder, M. (2013). Logics in action: Managing institutional complexity in a drug court. *Administrative Science Quarterly, 58*(2), 165-196. https://doi.org/10.1177/0001839213486447

Miles, M. B., & Huberman, A. M. (1994). *Qualitative data analysis: An expanded sourcebook*. Thousand Oaks, California, USA: Sage Publications.

Miles, M. B., Huberman, A. M., & Saldaña, J. (2014). *Qualitative data analysis: A methods sourcebook* (3rd Edition ed.). Thousand Oaks, California, USA: Sage Publications.

Myers, M. D., & Newman, M. (2007). The qualitative interview in IS research: Examining the craft. *Information and Organization, 17*(1), 2-26. https://doi.org/10.1016/j.infoandorg.2006.11.001

NICT. (2012). *Nasjonal IKT strategiplan for 2013-2016*. Retrieved from nasjonalikt.no/Documents/NIKT FA/Praksis for virksomhetsarkitektur i Nasjonal IKT - Tiltak 42.2.pdf

NICT. (2014). *Tiltak 42.2 Praksis for virksomhetsarkitektur i Nasjonal IKT*. Retrieved from nasjonalikt.no/Documents/NIKT FA/Praksis for virksomhetsarkitektur i Nasjonal IKT - Tiltak 42.2.pdf

Niemi, E. I., & Pekkola, S. (2016). Enterprise Architecture benefit realization: Review of the models and a case study of a public organization. *ACM SIGMIS Database: the DATABASE for Advances in Information Systems, 47*(3), 55-80. https://doi.org/10.1145/2980783.2980787

Norwegian Ministry of Health and Care Services. (2009). *The coordination reform, proper treatment – at the right place and right time (Summary in English)*. Retrieved from https://www.regjeringen.no/upload/HOD/Samhandling engelsk_PDFS.pdf

Norwegian Ministry of Health and Care Services. (2012). *Stortingsmelding nr. 9: Én innbygger – én journal. Digitale tjenester i helse- og omsorgssektoren.*Retrieved from: https://www.regjeringen.no/no/dokumenter/meld-st-9-20122013/id708609/

Orlikowski, W. J., & Baroudi, J. J. (1991). Studying information technology in organizations: Research approaches and assumptions. *Information Systems Research, 2*(1), 1-28. https://doi.org/10.1287/isre.2.1.1

Pache, A.-C., & Santos, F. (2010). When worlds collide: The internal dynamics of organizational responses to conflicting institutional demands. *Academy of Management Review, 35*(3), 455-476. https://doi.org/10.5465/amr.35.3.zok455

Pereira, C. M., & Sousa, P. (2004). *A method to define an Enterprise Architecture using the Zachman Framework.* Paper presented at the ACM Symposium on Applied Computing (ASAC 2004), Quebec City, Canada.

Plumb, J. J., Hains, I., Parr, M. J., Milliss, D., Herkes, R., & Westbrook, J. I. (2017). Technology meets tradition: The perceived impact of the introduction of information and communication technology on ward rounds in the intensive care unit. *International Journal of Medical Informatics, 105*, 49-58. https://doi.org/10.1016/j.ijmedinf.2017.04.004

Reay, T., & Hinings, C. R. (2009). Managing the rivalry of competing institutional logics. *Organization studies, 30*(6), 629-652. https://doi.org/10.1177/0170840609104803

Reay, T., & Jones, C. (2016). Qualitatively capturing institutional logics. *Strategic Organization, 14*(4), 441-454. https://doi.org/10.1177/1476127015589981

Richardson, G. L., Jackson, B. M., & Dickson, G. W. (1990). A principles-based Enterprise Architecture: Lessons from Texaco and Star Enterprise. *MIS Quarterly, 14*(4), 385-403. https://doi.org/10.2307/249787

Romanow, D., Cho, S., & Straub, D. (2012). Editor's comments: Riding the wave: Past trends and future directions for health IT research. *MIS Quarterly, 36*(3), iii-x. https://doi.org/10.2307/41703474

Ross, J., Weill, P., & Robertson, D. (2006). *Enterprise Architecture as strategy: Creating a foundation for business execution*. Boston, MA: Harvard Business Review Press.

Schmidt, C., & Buxmann, P. (2011). Outcomes and success factors of enterprise IT architecture management: Empirical insight from the international financial services industry. *European Journal of Information Systems, 20*(2), 168-185. https://doi.org/10.1057/ejis.2010.68

Scott, W. R. (2000). *Institutional change and healthcare organizations: From professional dominance to managed care*: USA: University of Chicago Press.

Scott, W. R. (2014). *Institutions and Organizations: Ideas, Interests, and Identities* (4th Edition). Thousand Oaks, California, USA: Sage Publications.

Shanks, G., Gloet, M., Someh, I. A., Frampton, K., & Tamm, T. (2018). Achieving benefits with Enterprise Architecture. *The Journal of Strategic Information Systems, 27*(2), 139-156. doi:10.1016/j.jsis.2018.03.001

Silverman, D. (2005). *Doing qualitative research* (2 ed.). London: Sage Publications.

Smets, M., Jarzabkowski, P., Burke, G. T., & Spee, P. (2015). Reinsurance trading in Lloyd's of London: Balancing conflicting-yet-complementary logics in practice. *Academy of management journal, 58*(3), 932-970. https://doi.org/10.5465/amj.2012.0638

Smolander, K., & Rossi, M. (2008). Conflicts, compromises and political decisions: Methodological challenges of enterprise-wide e-business architecture. *Journal of Database Management (JDM), 19*(1), 19-40. https://doi.org/10.4018/jdm.2008010102

South-Eastern-RHA. (2015). *IKT-strategi - Standardisering av teknologiske løsninger og arbeidsprosesser*. Retrieved from www.helse-sorost.no/Documents/Digital fornying/086-2015 Vedlegg 1 - IKT-strategi.pdf

Strano, C., & Rehmani, Q. (2007). The role of the enterprise architect. *Information Systems and e-Business Management, 5*(4), 379-396. https://doi.org/10.1007/s10257-007-0053-1

Tamm, T., Seddon, P. B., Shanks, G., & Reynolds, P. (2011). How does enterprise architecture add value to organisations? *Communications of the Association for Information Systems, 28*(1), 141-168. https://doi.org/10.17705/1CAIS.02810

Thornton, P. H., & Ocasio, W. (1999). Institutional logics and the historical contingency of power in organizations: Executive succession in the higher education publishing industry, 1958–1990. *American Journal of Sociology, 105*(3), 801-843. https://doi.org/10.1086/210361

Thornton, P. H., & Ocasio, W. (2008). Institutional logics. In Greenwood R. Oliver C., Suddaby R. & Sahlin-Andersson K. (Eds.) *The Sage handbook of organizational institutionalism, 840:* UK: Sage Publications Ltd. 99-129.

Thornton, P. H., Ocasio, W., & Lounsbury, M. (2012). *The institutional logics perspective: A new approach to culture, structure, and process*: USA: Oxford University Press.

Valorinta, M. (2011). IT alignment and the boundaries of the IT function. *Journal of Information Technology, 26*(1), 46-59. https://doi.org/10.1057/jit.2010.28

van den Broek, J., Boselie, P., & Paauwe, J. (2014). Multiple institutional logics in health care: 'Productive ward: Releasing time to care'. *Public Management Review, 16*(1), 1-20. https://doi.org/10.1080/14719037.2013.770059

Venkatesh, V., Bala, H., Venkatraman, S., & Bates, J. (2007). Enterprise Architecture maturity: The story of the Veterans health administration. *MIS Quarterly Executive, 6*(2), 79-90. https://aisel.aisnet.org/misqe/vol6/iss2/5

Waldorff, S. B., Reay, T., & Goodrick, E. (2013). A tale of two countries: How different constellations of logics impact action. In Lounsbury, M. (Eds). *Institutional logics in action, Part A* (*Research in the Sociology of Organizations, Vol. 39 Part A*): Bingley, Emerald Group Publishing Limited, 99-129.

Walsham, G. (1993). *Interpreting Information Systems in Organisations*. Chichester: John Wiley & Sons.

Walsham, G. (1995). Interpretive case studies in IS research: Nature and method. *European Journal of Information Systems, 4*(2), 74-81. https://doi.org/10.1057/ejis.1995.9

Weiss, S., Aier, S., & Winter, R. (2013). *Institutionalization and the effectiveness of enterprise architecture management.* Paper presented at the Thirty Fourth International Conference on Information Systems (ICIS), Milan, Italy. https://aisel.aisnet.org/icis2013/proceedings/GovernanceManagement/9/

Winter, K., Buckl, S., Matthes, F., & Schweda, C. M. (2010). *Investigating the state-of-the-art in enterprise architecture management methods in literature and practice.* Paper presented at the 5th Mediterranean Conference on Information Systems (MCIS), Tel Aviv, Israel. https://aisel.aisnet.org/mcis2010/90

Ylinen, M., & Pekkola, S. (2018). *Looking for a five-legged sheep: Identifying enterprise architects' skills and competencies.* Paper presented at the 19th Annual International Conference on Digital Government Research, Delft, Netherlands.