JYVÄSKYLÄ STUDIES IN COMPUTING
201

Ville Seppänen

From Problems to Critical Success Factors of Enterprise Architecture Adoption

JYVÄSKYLÄN YLIOPISTO

JYVÄSKYLÄ STUDIES IN COMPUTING 201

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From Problems to Critical Success Factors of Enterprise Architecture Adoption

Esitetään Jyväskylän yliopiston informaatioteknologian tiedekunnan suostumuksella
julkisesti tarkastettavaksi yliopiston Agora-rakennuksen Auditoriossa 1
marraskuun 6. päivänä 2014 kello 13.

Academic dissertation to be publicly discussed, by permission of
the Faculty of Information Technology of the University of Jyväskylä,
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UNIVERSITY OF JYVÄSKYLÄ

JYVÄSKYLÄ 2014

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JYVÄSKYLÄ 2014

Editors
Seppo Puuronen
Department of Computer Science and Information Systems, University of Jyväskylä
Pekka Olsbo, Ville Korkiakangas
Publishing Unit, University Library of Jyväskylä

URN:ISBN:978-951-39-5941-8
ISBN 978-951-39-5941-8 (PDF)

ISBN 978-951-39-5940-1 (nid.)
ISSN 1456-5390

Jyväskylä University Printing House, Jyväskylä 2014

ABSTRACT

Seppänen, Ville
From Problems to Critical Success Factors of Enterprise Architecture Adoption
Jyväskylä: University of Jyväskylä, 2014, 249 p.
(Jyväskylä Studies in Computing
ISSN 1456-5390; 201)
ISBN 978-951-39-5940-1 (nid.)
ISBN 978-951-39-5941-8 (PDF)
Finnish Summary
Diss.

Information and communication technologies (ICT) are one of the key vehicles in enabling the reform of public administration. Public organizations have introduced enterprise architecture (EA) methods to manage their ICT assets and to improve the quality, efficiency and interoperability of public services. In Finland, the Act on Information Management Governance in Public Administration, making the use of EA mandatory for the central and local government institutions, was enacted in late 2011. For the present, however, concrete results from EA efforts are moderate. Most of the public organizations are still struggling with the adoption of this new policy. Not many studies of the problems, or the critical success factors (CSF) of EA adoption process can be found, even though this understanding is essential in enabling any later stages of the EA life cycle. The goal of our research was first, to identify the problems that organizations encounter while adopting EA and then, by analyzing these problems, to develop a model of CSFs of EA introduction for public organizations. Qualitative and quantitative data were collected over the span of several years, using different techniques in a triangulation setting. Grounded theory (GT) was used as an approach for the data collection and analysis. GT allowed us to inductively develop an empirically grounded theoretical model about this substantive area that lacks previous studies. The result, the proposed "3D" model characterizes the critical problems in relation to the classes of CSFs. This raises the argument that the CSFs of EA adoption must be of dynamic nature. The detailed content of the CSF are specific to an organizational environment. They are also interrelated, and a strong CSF can be exploited to reinforce the weaker ones. The research contributes to the theoretical bodies of knowledge of EA and CSFs of organizational change invoked by ICT developments. It also suggests how the current capabilities of an organization can be turned into drivers of successful EA adoption. Therefore, the results are of interest to researchers, as well as practitioners.

Keywords: Enterprise Architecture, Adoption, Problems, Critical Success Factors, Public Organizations, Grounded Theory, Case Study, Survey Study

Author's address

Ville Seppänen
Department of Computer Science and Information Systems
University of Jyväskylä
P.O.BOX 35 (Agora), FIN-40014 University of Jyväskylä
Finland
ville.seppanen@jyu.fi

Supervisors

Mirja Pulkkinen
Department of Computer Science and Information Systems
University of Jyväskylä, Finland

Jukka Heikkilä
Department of Management, Turku School of Economics
University of Turku, Finland

Reviewers

Jarmo Ahonen
School of Computing
University of Eastern Finland, Finland

Samuli Pekkola
Information Management and Logistics
Tampere University of Technology, Finland

Opponent

Robert Winter
School of Management
University of St. Gallen, Switzerland

ACKNOWLEDGEMENTS

I would like to thank my supervisors Prof. Jukka Heikkilä and Dr. Mirja Pulkkinen. Prof. Heikkilä originally introduced me to the enterprise architecture and its application potential in public sector, and provided supervision during the early stages of the research process. To Dr. Mirja Pulkkinen I am grateful for the excellent guidance during the research process as well as for a number of inspiring discussions we have had concerning my research topic.

I am honored to have Prof. Dr. Robert Winter in the role of opponent of my dissertation. His merits in the area of enterprise architecture management research are outstanding. I am thankful to the reviewers of the dissertation, Prof. Jarmo Ahonen and Prof. Samuli Pekkola for their valuable comments regarding the manuscript. I also want to express my gratitude to Prof. Seppo Puuronen for his contribution to the work in the role as the scientific editor. The co-operation of all of these key roles in the final stages of the dissertation process with a demanding schedule is highly appreciated.

I am thankful to Tapani Kella for facilitating my research process in several ways. To Katja Penttinen I am extremely grateful for our shared research activities over the years, and for reading and commenting the draft. Contemplations regarding the practical sides of enterprise architecting with Petri Heinonen and Ari Lehtiö have helped me to understand some of the practical implications of my research work. Of course, I also want to extend my gratitude for all the other colleagues whom I have not mentioned individually.

Finally, I am thankful to my parents Risto and Birgit, my sister Anni, and my grandmother Aili Käyhty for their continuous support.

Jyväskylä 21.10.2014
Ville Seppänen

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CONCEPTS

Table 1 presents the definitions for the concepts that are frequently used throughout this thesis. Caveat 1: The definitions of Architecting and Architecture refer to ISO/IEC 42010 Systems and software engineering – Recommended practice for architectural description of software-intensive systems. These definitions are also commonly referred to in the context of enterprise architecture, in which case an *enterprise* is conceived as a *system*. Caveat 2: TOGAF 9.1 defines the concept of Domain similarly as we define here the concept of Dimension.

Table 1 Definitions of concepts

Concept	**Definition**
1. Architect	Occasionally used as a synonym of Enterprise Architect (5).
2. Architecting	The set of interrelated activities of conceiving, defining, describing, documenting, maintaining, improving, and certifying proper implementation of an architecture (Def. 3) throughout a system's life cycle. (ISO/IEC 42010)
3. Architecture	Occasionally used as a synonym of Enterprise Architecture (6). The fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design and evolution. (ISO/IEC 42010)
4. Enterprise Architect	An individual responsible of performing Enterprise Architecting (5).
5. Enterprise Architecting	A process of Architecting (2) an enterprise or an organization.
6. Enterprise Architecture	A documented description and analysis of the Architecture (3) of an enterprise or an organization. "An enterprise architecture identifies the main components of the organization, its information systems, the ways in which these components work together in order to achieve defined business objectives, and the way in which information systems support the business processes of the organization. The components include staff, business processes, technology, information, financial and other resources, etc." (Kaisler, Armour & Valivullah, 2005)
7. Enterprise Architecture Abstraction Level (or Level of Abstraction)	A conceptual level of Enterprise Architecture (6) that allows the separation of concerns for different Stakeholders (20).

(Continues)

(Table 1 continues)

8. Enterprise Architecture Adoption	The process during which the practices of Enterprise Architecting (5) are first initiated, then deployed, and finally institutionalized in an organization. This includes the deployment of Enterprise Architecture Method (18) and Governance Model (15) as well as at least introductory establishment of processes and structures for Enterprise Architecture Planning (19), Development (11) and Management (16).
9. Enterprise Architecture Artifact	An architectural work product that describes an aspect of the architecture (TOGAF 9.1, Part I: Definitions)
10. Enterprise Architecture Deliverable	Occasionally used as a synonym of Enterprise Architecture Artifact (9).
11. Enterprise Architecture Development	The process of implementing the results (i.e., the plans) of Enterprise Architecture Planning (19).
12. Enterprise Architecture Dimension (Näkökulma, in Finnish Government EA Method[1])	An area of Enterprise Architecture (6) to allow the separation of concerns. Most of the current Enterprise Architecture Methods (18) suggest the dimensions of Business, Information (or Data), Information System (or Application), and Technology.
13. Enterprise Architecture Domain	A designated area that is considered during and is relevant to specific activities of Enterprise Architecting (5). May comprise of, for example, different Enterprise Architecture Dimensions (12), Enterprise Architecture Abstraction Levels (7), organization units, and/or functional areas.
14. Enterprise Architecture Framework	A conceptual structure that presents the relations and associations between Enterprise Architecture Dimensions (12), Enterprise Architecture Abstraction Levels (7), and the related Enterprise Architecture Artifacts (9).
15. Enterprise Architecture Governance Model	A collection of common principles for the orchestration of architecture-guided development (including the responsibilities for different Enterprise Architecture Dimensions (12)), Enterprise Architecture Management (16) (including the guiding of Enterprise Architecture Development (11) and Enterprise Architecture Adoption (8)), and compliance and utilization of Architecture (3) (including life cycle management) (adapted from Finnish Government EA Method).
16. Enterprise Architecture Management	The process of managing Enterprise Architecture Planning (19) and Enterprise Architecture Development (11).

(Continues)

[1] http://www.jhs-suositukset.fi/suomi/jhs179

(Table 1 continues)

17. Enterprise Architecture Meta-model	A model that describes how and with what the Architecture (3) will be described in a structured way (TOGAF 9.1, Part I: Definitions).
18. Enterprise Architecture Method (or Methodology)	A systematic aid of guiding Enterprise Architecture Planning (19) and Enterprise Architecture Development (11). Often also includes Enterprise Architecture Framework (14), Enterprise Architecture Meta-model (17), and a collection of suggested modeling and documentation techniques and templates for Enterprise Architecture Artifacts (9).
19. Enterprise Architecture Planning	The process of defining Architectures (3) for the use of information in support of the business and the plan for implementing those architectures (Spewak, 1992)
20. Enterprise Architecture Stakeholder	An individual, team, or organization (or classes thereof) with interest in, or concerns relative to, the outcome of the architecture. Different stakeholders with different roles will have different concerns. (TOGAF 9.1, Part I: Definitions)
21. Enterprise Architecture Viewpoint (Näkökulma, in Finnish Government EA Method)	Occasionally used as a synonym of Enterprise Architecture Dimension (12).

1 INTRODUCTION

The research at hand delves into the problems that public organizations are facing while they are starting to use the practices of enterprise architecture (EA) and proposes a theoretical model of classes of critical success factors to guide the adoption of these practices. This introduction will first briefly discuss the key drivers that have pushed several public organizations and entire national governments first to attempts to transform their service structures with the use of new service delivery models and later towards the decision to start using the enterprise architecture as a tool to support the overall organizational change and development. Then we will introduce the concept of enterprise architecture and discuss it in the context of Finnish public administration. Finally, at the end of the chapter, we define the scope of our research and propose the specific research questions that this thesis aims at answering.

To be able to respond the changing expectations of their client base, governments and public organizations are going through substantial transformation activities. While doing so, there are several challenges that public organizations are facing. As the key challenges Tarabanis, Peristeras and Fragidis (2001) identified the following: re-inventing government in a client-focus approach, improving performance and quality through measurement, changing the organizational boundaries and structure of public administration, building partnerships with the private sector on a novel basis, delegating decisions and responsibilities to independent agencies, globalization and competition, and creating information technology (IT) enabled services. Currently also the global economic situation requires public administrations to seek more flexible and cost efficient solutions for the services production. Another challenge that public administrations are facing especially in the western countries is the aging population and the resulting high retirement rates. In Finland, for example, of 120 000 state officials 25 000 retired by the year 2012 and 40 000 will retire by the year 2015 (Ministry of Finance, 2009, 32). At the same time, expectations on the quality, efficiency, and availability of public services grow constantly higher. As the citizens become more Internet savvy they ask for seamless services with faster delivery and transparency to the processes (Weerakkody, Janssen & Hjort-Madsen, 2007). Like private companies, public administrations are forced

to react to changing requirements and expectations of their customers in the IT enabled and networked era. The situation that demands organizations to achieve more with lesser resources has forced public administrations to make increased investments on IT to redesign their internal and external processes (Andersen, Grönlund, Moe & Sein, 2005) and the models of services production. To the increasing extent, public agencies are required to share the information, integrate their existing information systems and to redesign processes to cross the organizational boundaries.

For several years, public administrations have been pushing costly and ambitious electronic government (e-government) programs to provide citizens as well as private companies with an electronic access to government services (Peristeras & Tarabanis, 2004). Table 2 summarizes both internal and external benefits that the IT enabled government services are hoped to deliver. However, e-government initiatives have not been able to solve the concerns many public organizations have in utilizing information technology to its fullest strategic extent. The ever-increasing complexity of IT tends to lead to disorganized and unmanageable networks of overlapping and poorly accomplishing information systems and services. According to Flak, Olsen and Wolcott (2005), there are severe difficulties in the practice of e-government. Many early e-government initiatives have been described as chaotic and unmanageable (Layne & Lee, 2001) and their goals are reported to be vague (Muir & Oppenheim, 2002). According to Rabaiah and Vandijck (2009), even though the e-government strategies per se are generally well developed, these strategies lack in frameworks and the problems are related to the implementation of strategies. E-government programs have mainly been pursuing cost reductions and therefore they often fail keeping the promise to actually improve the government services (Flak et al., 2005). Also in Finland, media as well as National Audit Office[2,3,4] have been eager to criticize the success of programs and projects that have tried to implement modern electronic services for the public administration.

Table 2 Benefits of IT-enabled connected government (Saha, 2010)

Internal (To Provider Agencies and Governments)	**External (To Consumer Citizens and Businesses)**
1. Avoidance of duplication 2. Reduction in transaction costs 3. Simplified bureaucratic procedures 4. Greater efficiencies 5. Richer communication and coordination 6. Enhanced transparency 7. Greater information sharing 8. Secure information management	1. Faster service delivery 2. Greater efficacy 3. Increased flexibility of service use 4. Innovation in service delivery 5. Greater participation and inclusion 6. Greater citizen empowerment 7. Greater openness and transparency

[2] https://www.vtv.fi/files/130/1582008_Alueellisten_tietoyhteiskuntahankkeiden_toteutus_NETTI.pdf, in Finnish
[3] https://www.vtv.fi/files/145/161_2008_Tunnistuspalvelut_NETTI.pdf, in Finnish
[4] http://www.e-julkaisu.fi/vtv/valtion_it-palvelukeskukset/pdf/3_2013_Valtion_IT_palvelukeskukset_Netti.pdf, in Finnish

1.1 Enterprise architecture

Following the weakly performed e-government initiatives several public administrations have awoken to consider possibilities that the approach of enterprise architecture could offer. In the context of public administration, enterprise architecture is often seen as a part of a reform paradigm where the IT and information systems are central vehicles in administrative reforms and transformation (Hjort-Madsen, 2007). National government-level EA programs are hoped to improve the quality, efficiency and interoperability of public services. These programs also promise to increase the reuse of existing information assets as well as to reduce their costs and redundancy. Although the potential of EA is widely acknowledged, the governments that have reported success in these attempts are still few.

This section briefly discusses the history of enterprise architecture and the basic concepts behind it. It must be noticed that the term enterprise architecture still lacks the commonly agreed definition (e.g., Schöenherr, 2009; Zink, 2009; Lucke et al., 2010; Lemmetti & Pekkola, 2012; Lucke et al., 2012). Schöenherr (2009) notes that due to the focus and low maturity of the academic enterprise architecture contributions, there is no core topic or a theory in the discipline of enterprise architecture. The literature still lacks the shared vocabulary, and the same terms are used with different meanings and different terms are used with the same meaning (Lapalme, 2012). A recent study that focused on the enterprise architecture in Finnish public sector (Lemmetti & Pekkola, 2012) shows some fundamental confusion that is still related to the understanding of enterprise architecture and the related concepts. Besides the enterprise architecture related terminology, there are different views to which architecture layers, which artifact types and which dependencies should constitute the essence of enterprise architecture in practice (Winter & Fischer, 2007; Schöenherr, 2009). Therefore, during the research, we will not exclusively commit to any given definition of enterprise architecture. However, in the following, we will focus on certain characteristics that are common to most of the definitions.

The term enterprise architecture can either refer to the actual structure of the enterprise or the collection of models and descriptions that depict this structure. According to the former view, an (enterprise) architecture always exists whether it is modeled or not (Zadeh, Lewis & Millar, 2012). We will, however, follow the latter view according to which the enterprise architecture are those artifacts that are created to describe the structural and functional components of an enterprise in order to support their planning, development, and management. As for the compact definition of enterprise architecture, we will adopt the one of Kaisler, Armour, and Valivullah (2005, 1):

> *"An enterprise architecture identifies the main components of the organization, its information systems, the ways in which these components work together in order to achieve defined business objectives, and the way in which information systems support the business processes of the organization. The components include*

staff, business processes, technology, information, financial and other resources, etc."

The above definition raises forward some important remarks upon which the following discussion will be built. First, the enterprise architecture should cover not only the technology but also the functional business components such as operational processes. Second, the aim is to understand how these components are interconnected and how they perform for the business goals. Therefore, as noted by Janssen and Hjort-Madsen (2007), enterprise architecture can be seen as a system of systems (Kaisler & et al., 2005), the 'master plan' or 'city plan' (Rohloff, 2005) that detail policies and standards for the design of infrastructure technologies, databases, and applications (Bernard, 2004; Ross, 2003).

The function that produces the enterprise architecture descriptions is called enterprise architecting. ISO/IEC 42010 standard (International Organization of Standardization, 2007) gives an applicable definition for the term by stating that architecting is the "set of interrelated activities of conceiving, defining, describing, documenting, maintaining, improving, and certifying proper implementation of an architecture throughout a system's life cycle". Although ISO/IEC 42010 primarily concerns the practices of systems and software engineering, this definition also lends itself well to the context of enterprise architecting where an organization can be regarded as a software-intensive system. Enterprise architecting particularly includes "the set of processes, tools, and structures necessary to implement an enterprise-wide coherent and consistent IT architecture for supporting the enterprise's business operations. It takes a holistic view of the enterprise's IT resources rather than an application-by-application view" (Kaisler & et al., 2005, 1).

Enterprise architecture can be seen as a means for pursuing the organizational goals by creating structure in a chaotic environment using systematic approaches (Janssen & Hjort-Madsen, 2005). On a more detailed note this can mean, for example, the design of new business processes and the required interconnections to the related information systems and other resources. At the same time, enterprise architecture is both a management program that provides support for organizational decision making, defines standardized procedures for operations, and helps in resources management and alignment, and a documentation method for supporting aforementioned activities (Bernard, 2004). Also Proper, Verrijn-Stuart and Hoppenbrouwers (2005) argue that the two key purposes of architecture, whether the concept is used to describe an IT environment or an entire enterprise, are to enable the communication between different stakeholders and to support the decision making.

As discussed above, from the functional perspective, enterprise architecture describes how different components of an organization, such as organizational units, business processes, people, and information systems, are related to each other and work as a whole towards the organizational goals (Morganwalp & Sage, 2004). In addition, enterprise architecture artifacts are typically represented on various levels of aggregation. For example, the organizational goals that are defined at a highly aggregated level in a balanced scorecard can be then

decomposed into more specific performance indicators, which results in a multi-layer goal/indicator aggregation hierarchy (Winter & Fischer, 2007).

The enterprise architecture frameworks attempt to provide a way to deal with the complexity (Janssen & Hjort-Madsen, 2005). By trying to answer the ever-increasing complexity and scope of information systems, in his seminal article Zachman (1987) found it necessary to extend the perspective to information systems towards the enterprise-oriented approach that would allow flexibility in managing business changes and coherency in the management of business resources. He suggested the use of logical abstraction, i.e., the architecture, to piece together the complex structure of information systems, business components, and their interconnections. Later, together with Sowa, Zachman refined this idea into a form of the matrix-like framework; nowadays known as the Zachman Framework, that compiles the architectural components of an organization into a single representation (Sowa & Zachman, 1992).

The idea of describing the architectural structure of an organization with a framework model that identifies the relevant areas of interest, or dimensions, with the addition of different levels of abstraction to serve different stakeholders has attained a strongly rooted position in the field of enterprise architecting. Since the early 1990's, IT companies and consultants as well as government organizations have developed their own enterprise architecture methods and frameworks. While modeling the enterprise architecture, Zachman framework's columns urge the organization to answer the questions why, how, what, who, where, and when (Sowa & Zachman, 1992). Most of the more recent matrix-formed enterprise architecture frameworks have simplified the approach of Zachman and Sowa and usually employ the architectural dimensions of business, information (or data), information system (or application) and technology. Like in Zachman Framework, these dimensions are treated at different levels of abstraction or from the viewpoints of different stakeholders. For example, context-independent Integrated Architecture Framework developed by consulting and technology company Capgemini employs the contextual (why), conceptual (what), logical (how), and physical (with what) models (van't Wout, Waage, Hartman, Stahlecker & Hofman, 2010). For a comparison, the enterprise architecture method developed for the Finnish public administration (further discussed in the Section 1.2.1) originally treated the enterprise architecture at the levels of the state administration as a whole, the administrative sectors, and the government agencies as the sub-domains (Ministry of Finance, 2007: 4; Valtonen, Seppänen & Leppänen, 2009) and was later updated to incorporate the conceptual, logical and physical views for the examination of the enterprise architecture within a single organization. The purpose of abstraction levels is to let the different stakeholders view the same subject matter from the point of view that is relevant for their need and the area of responsibility. The enterprise architecture frameworks show the big picture about the complex whole of the organization while at the same time let those who are interested to dig deeper into the detailed technology and data models. For example, by examining the enterprise architecture one can see what the strategic purpose and impact of a certain business process are, what organization unit is responsible for that process, what information is being exchanged between the process participants,

what information systems are used to support the implementation of that process, and which technology platforms are needed in running those systems. Therefore, as Ross, Weill, and Robertson (2009) state, enterprise architecture does not limit itself to a blueprint of systems, data and technology. Rather, it is a business vision that begins at the top with the statement of how an enterprise operates and results in a foundation of IT and business process capabilities on which the enterprise builds its competitiveness (Ross et al. 2009).

One notable limitation of the Zachman's original model is that it did not contain the processes for implementation, maintenance, nor governance of the enterprise architecture (Sowa & Zachman, 1992). Neither does it give recommendations for the architecture models and other deliverables to be created for certain architecture domains. Many of the current enterprise architecture methods are more process-oriented, or at least feature suggestive processes for the purposes of architecture modeling and maintenance. To ensure the commensurability and interoperability of the architecture products, it is also common that enterprise architecture methods give guidelines on how and in which form the deliverables should be created. The Finnish Government EA Method, for example, builds on several standards such as the Open Group's ArchiMate[5] modeling language and the Object Management Group's Business Process Model and Notation[6] (BPMN) both of which are widely supported by several modeling tools.

More importantly, most of the modern enterprise architecture methods have added the time dimension to the enterprise architecture management. In their definition of enterprise architecture, Chief Information Officer Council of United States (2001) points out that enterprise architecture includes a baseline architecture, a target architecture, and a sequencing plan. The baseline architecture (sometimes also called as the current state architecture or the as-is architecture) is the set of artifacts that represent the organization as it is in its current form. As Parker (2009, 164) points out, baseline architecture can be used to reveal organizational and operative challenges (e.g., a burdensome bureaucracy identified through documented business processes), strengths (e.g., technological capabilities identified through technology inventories), deficiencies (e.g., unmet business requirements identified through dissatisfied customers), and opportunities (e.g., untapped capacity identified through performance results). The target state architecture (or the to-be architecture), on the other hand, is the set of artifacts, which represents the state that an organization wants to reach in order to attain the goals set for the predetermined point of time in the future. The transition plan links the baseline architecture and the target architecture together and by highlighting capability gaps it can be translated into an actionable roadmap for the organizational transformation needs (Parker, 2009, 164). Therefore, it can be seen that the modern enterprise architecture comes closer to strategic planning and management tools than mere IT management models. As Bernard and Grasso (2009) note, enterprise architecture combines concerns related to both management and technology and its goals have evolved from

[5] http://www.archimate.org/
[6] http://www.bpmn.org/

improving the use of IT to a holistic approach of managing all dimensions of an enterprise. The Figure 1 adapted from the Finnish Government EA Method shows the positioning and role of the enterprise architecture management within the context of organizational planning and development activities.

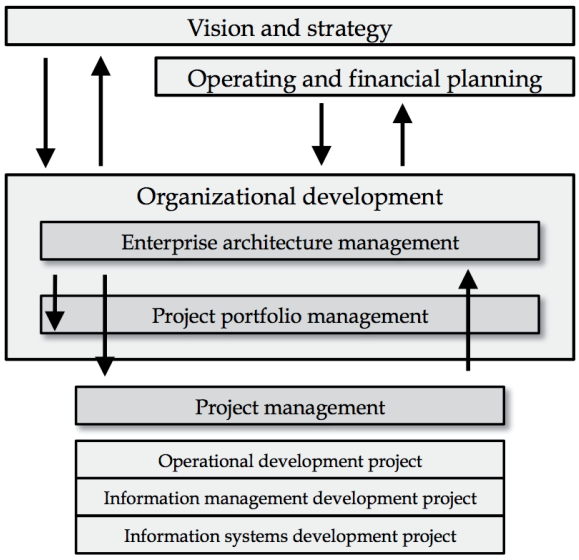

Figure 1 Enterprise architecture as a mechanism of organizational development (adapted from the Finnish Government EA Method)

The enterprise architecture can be used solely as an approach to IT governance but it can also be applied as a more wide-ranged and strategically oriented method to serve a plethora of organizational interests. When the former approach is followed, the enterprise architecture deals with the business architecture artifacts such as business services and processes only to allow the development of IT solutions that are better aligned with those functional components. The latter, on the other hand, puts the emphasis on developing the organization as a whole. This requires more thorough planning on how the practices of enterprise architecting should be integrated with the existing operational and management structures as well as the organizational culture.

Many enterprise architects tend to stress different areas of enterprise architecture according to their professional background. IT oriented architects typically focus on IT artifacts such as platforms, software components, services and applications, as well as IT processes and strategy (Winter & Fischer, 2007). Business related artifacts like organizational goals, products and services, markets, business processes, and performance indicators (Braun & Winter, 2005) can be easily overlooked if the enterprise architecture is driven by the IT department and only utilize modeling techniques from the field of software engineering. However, as noted by Winter and Fischer (2007), activities such as business continuity planning, change impact analysis, risk analysis and compli-

ance can be effectively supported only when the business related artifacts are covered by enterprise architecture, as well.

Despite of whether the enterprise architecture is business driven or IT driven, its core value proposition is roughly the same. The enterprise architecture function can be seen as a middleman that transparently bridges together the business requirements and the IT capabilities by offering a consistent, systematic, and timely model of main components of an organization (Figure 2).

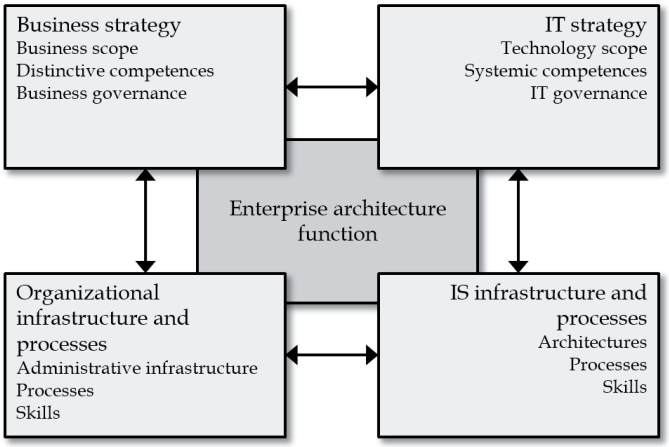

Figure 2 Enterprise architecture function in relation to business and IT (cf., Strategic Alignment Model adapted from Henderson & Venkatraman, 1993)

According to Doucet, Gotze, Saha and Bernard (2009, 33), defining, describing and deploying enterprise architecture should allow enterprises to 1) understand their business operations and uncover deeply embedded business rules; 2) elevate the role of information within the organization and treat it as a core asset; 3) understand gaps between information needs of the business and information provided by IT systems; 4) create synergies between available and stable technologies and emerging technologies; and 5) leverage technologies to discover and take advantage of new business opportunities. In the same vein, Winter and Fischer (2007, 11) propose that enterprise architecture should 1) "support IT-business alignment by providing support for consistent design and evolution of artifacts on different layers and/or in different views; 2) support transformation (business development, process reengineering, information systems engineering) by providing impact analyses, and 3) support maintenance, compliance, risk management etc. by documenting not only structures and direct dependencies, but also allowing the analysis of multi-step dependencies (e.g., server – software service – enterprise service – process deliverable – product revenue)". In order to achieve these goals, Winter and Fischer (2007) argue that enterprise architecture should be 'broad' rather than 'deep'. For the purposes of multi-step dependency analyses and holistic coverage of IT-business alignment it is necessary to cover a large number of artifact types and their dependencies at an aggregate level rather than small number of detailed artifact types.

In order to attain the full capabilities of enterprise architecting, it seems necessary to position the enterprise architecture function in an organization so that it will not be perceived solely as an IT project. In fact, perhaps the enterprise architecture should be differentiated from the IT tradition as well as from the managerial paradigms. The enterprise architecture must not be seen as an application of a systems theory and neither as a managerial strategy. Rather, it is seated between these two areas as a framework that can parse and classify the information assets and help in evaluating, confining and guiding the strategic alignment. (Seppänen, Heikkilä & Liimatainen, 2009)

In the context of this study, we position the enterprise architecture between the business and IT domains and their established practices for designing and developing the related activities (cf., Gregor, Hart & Martin, 2007). The enterprise architecture function should bring together the IT strategy, plans, and documentation and design artifacts with those of the business domain through the centralized repository. In order to do so, the enterprise architecture deliverables must offer a common language that can meaningfully relate to the languages used in both business and IT domains, and can provide relevant and integrated reports for those who are responsible for the organizational development and decision-making. Therefore, it is a requisite that the data about the enterprise architecture are stored in a raw material like form. Unlike static models and diagrams, such information resource can be then used to generate different reports that cover and integrate different architectural domains and are either as detailed or as abstract as the current task at the hand necessitates.

As discussed in the previous section, the definitions of enterprise architecture and the ideas of what enterprise architecture should consist of do vary (e.g., Schöenherr, 2009; Zink, 2009; Lucke et al., 2010; Lemmetti & Pekkola, 2012; Lucke et al., 2012). As the main interests of this research are the critical problems of the enterprise architecture adoption (the lack of commonly accepted definition of enterprise architecture is certainly one of these problems) and that how the adoption process can be supported, we will not commit to any exact definition. Each of the organizations adopting the enterprise architecture may emphasize the components shown in Figure 2 differently. One organization may heavily emphasize the business strategy driven approach or transformational activities whereas another may use enterprise architecture solely as a tool for managing its information systems architecture. We will not try to claim that one approach would be better than another but instead we examine the enterprise architecture by acknowledging and endorsing this diversity.

We can conclude that, in addition to information technology and information systems, enterprise architecture encompasses areas that fall under the disciplines of management science and organization science (cf., Pulkkinen, 2008, 99). However, the studies on enterprise architecture have been almost exclusively published on the field of information systems research. This follows the tradition of hundreds of scholarly articles that have studied strategic alignment by concerning the IT as their primary object of interest (cf., Chan & Reich, 2007). Similarly, although the organizational aspects are equally important to enterprise architecture as those of systems and technology, and practices of enterprise architecting have sometimes been quite justly criticized for emphasiz-

ing IT perspectives at the cost of other relevant requirements (as discussed later in this thesis), the enterprise architecture is treated as an IT-oriented artifact for which an organizational environment provides the context. Therefore, it is the most conceivable to position the studies on enterprise architecture in relation to the concepts of strategic management, alignment, and organizational collaboration (e.g., Martin & Gregor, 2002; Hirvonen & Pulkkinen, 2004; Pereira & Sousa, 2005; Gregor et al., 2007; Pulkkinen, 2008) in addition to those more axiomatic to information systems research.

1.2 Enterprise architecture in Finnish government

By identifying, structuring and categorizing organizational elements, the enterprise architecture can increase the potential for cross-public sector reuse of IT assets, integrate disconnected functional silos, reduce duplication and hence reduce the costs. As part of the public sector modernization plans, governments seek to offer the citizens a seamless service delivery by interconnecting various independently developed systems and applications (Janssen & Kuk 2006). The alignment of the business strategy and the utilization of information technology has been long considered as a critical strategy enabler and a success factor for organizations (Earl, 1989; Henderson & Venkatraman, 1993) as well as one of the key drivers of enterprise architecture (Hirvonen, 2005).

In Finland, the Prime Minister Vanhanen launched the Office of State Chief Information Officer under the Ministry of Finance in 2006 and soon after the office started the Interoperability Development Program (Yhteentoimivuuden kehittämisohjelma, in Finnish). As one of its goals, the program aimed at creating the state-level enterprise architecture to help to steer the development of government functions in tandem with its IT operations. An ongoing goal is to establish and maintain the national target state architecture to support the ongoing structural change throughout all levels of the public administration. This includes sub-goals such as dismantling the administrative silos and increasing cross-sector cooperation and interoperability, reducing redundancy in existing information assets, and cost and headcount reductions via the development of electronic services.

In September 2011, the legislative reform of the government IT governance was put in effect in Finland. The Act on Information Management Governance in Public Administration[7] (Laki julkisen hallinnon tietohallinnon ohjauksesta, in Finnish) can be seen as a continuum to the efforts of the Interoperability Development Program and it strongly focuses on improving the interoperability of the information systems in the public administration. The act also gave the enterprise architecture the statutory position in government IT governance. For example, the Section 7 on the Interoperability of public administration information systems states that "To enable and ensure the interoperability of public

[7] https://www.vm.fi/vm/en/04_publications_and_documents/03_documents/20110902ActonI/Tietohallintolaki_englanniksi.pdf

administration information systems, authorities in public administration must each plan and specify their enterprise architecture and must comply with it once it has been formulated and is maintained, as well as with the system interoperability specifications and definitions required for it, and with the interoperability specifications and definitions for information systems within its field of responsibility." (see Footnote 7) The Section 8 states, "Each ministry must ensure that interoperability specifications and definitions for information systems within its field of responsibility are built and maintained for that field of responsibility." (see Footnote 7) The government authorities are obligated by these requirements when existing information systems are substantially altered and when new information systems or services are purchased. It is also necessitated that the "Authorities in public administration must begin to prepare an enterprise architecture specification in accordance with Section 7 within six months, and must complete this work within three years." (see Footnote 7)

1.2.1 Finnish government enterprise architecture method

As a part of the Interoperability Development Program, an enterprise architecture method loosely based on The Open Group Architecture Framework (TOGAF) and 'EA Management Grid' (Hirvonen & Pulkkinen, 2004; Hirvonen, 2005) was introduced. Unless otherwise mentioned, for the remainder of this thesis, this method is referred to as the EA Method. The EA Method was originally developed during the autumn 2006 and spring 2007. New versions of the EA Method have been released since then and finally in 2011, along with the Act on Information Management Governance in Public Administration, it was given the status of the official Public Administration Recommendation (JHS recommendation).

The EA Method presents a conceptual framework (Figure 3), a process model with stepwise, normative instructions for its use, and an array of description models (Valtonen et al., 2009). The EA Method is aimed for the situational use in all the government organizations and therefore it was crafted with a broad applicability in mind. Thus, the EA Method is generic and it may require extensive customization to fit the specific needs of a target organization. The adaptation process of the EA Method (Valtonen et al., 2009; Valtonen, Korhonen, Rekonen & Leppänen, 2010), however, is out of the scope of this study.

The EA Method adopts a holistic view to the government and recognizes both enterprise and cross-agency perspectives. Originally, the EA Method's framework featured the three levels for modeling the enterprise architecture or, by following the original terminology, the three levels of decision-making. These levels were the public administration, a domain (e.g., a branch of administration or an administrative cluster), and a sub-domain (e.g., a government agency). Hjort-Madsen and Gotze (2004) have recommended a similar structure for government enterprise architecture just with slightly different naming (national level, sector level, and institutional level). However, the later versions of the EA Method use the conceptual, the logical, and the physical levels of abstraction for the modeling the enterprise architecture within a single organization and separate the levels of decision-making for the purposes of the state government en-

terprise architecture management (Figure 4). The architectural viewpoints of the EA Method correspond to the four commonly used sub-architectures: business architecture, information architecture, information systems architecture, and technology architecture.

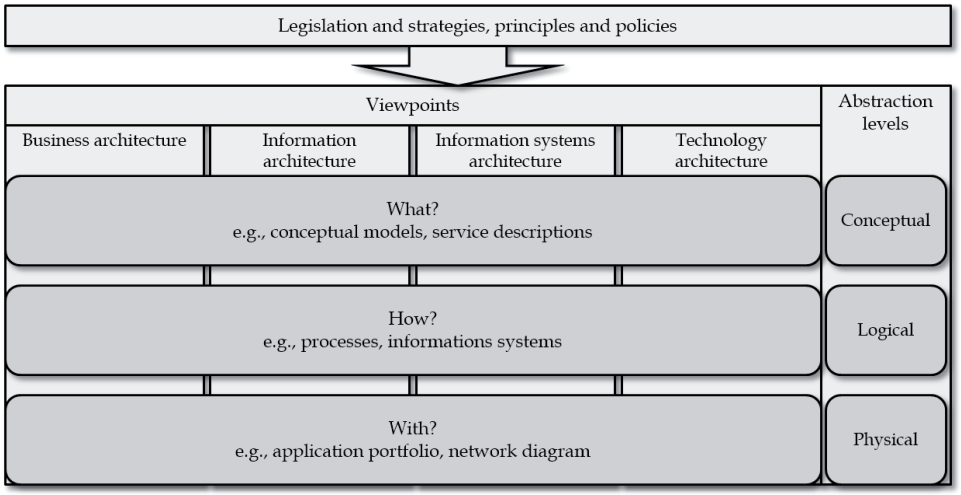

Figure 3 Finnish government EA Method framework (adapted from the Finnish Government EA Method)

As seen in Figure 4, the Finnish government enterprise architecture is managed with the hierarchy of interrelated levels. The level of state administration includes the architecture principles, descriptions, guidelines and standards that are shared throughout all the government organizations. The next level is indented for the administrative sector architectures (e.g., the social affairs and health). This level specifies the architecture descriptions that concern the administrative sector in question. These include, for example, the processes that are common for the sector as well as the sector specific vocabularies, information systems, technology and reference architectures, and sector-level standards. The government agencies and other institutions are treated on the third level. Decisions made on this level are specific to the organization in question but at the same time are required to adhere to the guidelines and decisions originating on the upper levels. The upper levels do not only guide the decision-making on the lower levels but also compile their enterprise architecture descriptions in order to form the big picture of the government enterprise architecture as a whole. For example, as the services portfolio at the agency level describes the services that a certain agency produces, the portfolio for an administrative sector encompasses the comprehensive view to the services of all the agencies operating within the concerned sector. Finally, the services portfolio at the state administration level collects together the services provided by all the administrative sectors and the government service clusters. The Figure 4 illustrates the structure for how the Finnish government enterprise architecture is composed through the different levels of the public administration and how the

architectural decisions made at the upper levels of the hierarchy are taken into account on the lower levels. However, this research will focus on the enterprise architecture adoption at an organizational (e.g., an agency or an office) level.

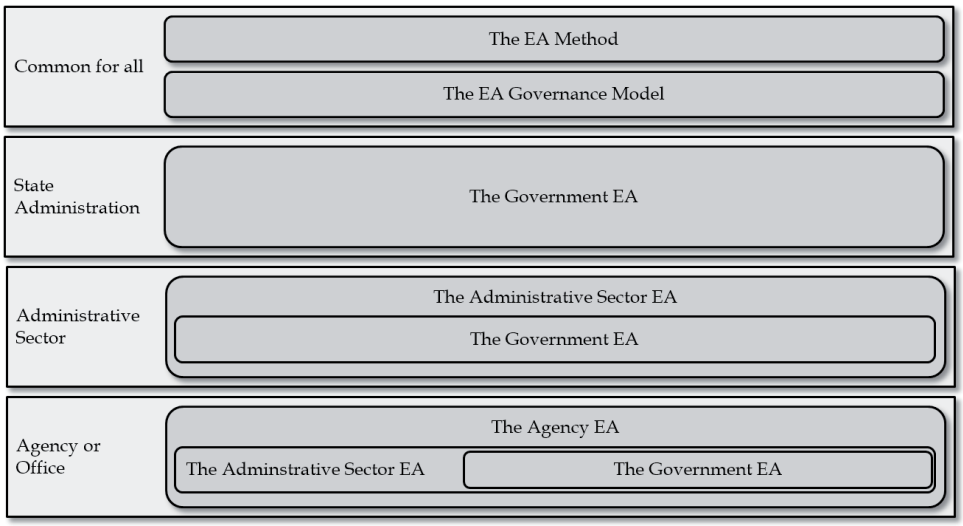

Figure 4 Structure of the Finnish government enterprise architecture (adapted from Ministry of Finance, 2007, 5)

The EA Method strives to implement a centrally governed architecture to allow the utilization of the common procedures and standards throughout the public administration. Such an approach is believed to be integral in facilitating cross-sector interoperability and to cut overlapping functions, information systems, and data reserves. Slightly contrary to the idea of top-down managed enterprise architecture, the actual adoption of the government enterprise architecture in Finland was started at the agency level. Soon after the first version of the EA Method was rolled out, the enterprise architecture pilot projects were launched in the two government agencies. At that time, the guidance for the adaptation of the method was lacking and no government-wide decisions about the enterprise architecture principles and best practices were available. On the other hand, the projects were deliberately chosen for their pilot positions to test the EA Method and to keep a record on their experiences to help the forthcoming enterprise architecture implementation efforts in the government organizations. These pilot projects also serve as the preliminary research cases for this study and will be described in more detail in the Chapter 4.

1.2.2 Finnish government enterprise architecture governance model

Together with the EA Method, the Finnish EA Governance Model (will be referred to as the Governance Model) was introduced. Gill (2002) defines the governance as the processes, structures, and organizational traditions that determine how power is exercised, how stakeholders have their say, how decisions are made and how decision-makers are held accountable. Also Winter and

Schelp (2008) note that in addition to the processes that define the dynamics of governance, the supporting organizational structures are required to anchor these processes to. Therefore, in the context of enterprise architecting, the governance deals with the architecture management and organizational aspects of architecture (van der Raadt, Hoorn & Vliet, 2005). According to Baker and Janiszewski (2005), governance treats the issues such as how an organization makes decisions, sets priorities, allocates resources, designates accountability, and manages its architectural processes.

The purpose of the Governance Model is two-fold. First, it is to guide the internal enterprise architecture development efforts and other activities to ensure that they are in line with the organization's goals and are compatible with the existing structures, processes, and information systems. Second, the Governance Model aims to control and direct the foundation of the government-level enterprise architecture by ensuring the consistency and interoperability across the administrative sectors. The EA governance model is the prime instrument in implementing the successful business-IT alignment and ensuring the orthodox use of the enterprise architecture. Bernard and Grasso (2009) also emphasize this as they mention the EA governance process as the first of the six prerequisites for the successful enterprise architecture. Rehkopf and Wybolt (2003) argue that the effective governance process helps the organization in 1) making better IT decisions (for example, trade off total cost of ownership for return on investment); 2) keeping IT and business accountable for linking technology to business objectives; 3) clarifying who makes decisions and who is accountable; 4) allowing local implementations while keeping a global perspective; and 5) minimizing permutations to drive standardization and cost savings.

The following goals were originally set for the Governance Model (Ministry of Finance, 2007, 10).

- The Governance Model covers the entire public administration to promote the interoperability with regard to government enterprise architecture and IT solutions.
- The Governance Model is suited for all the decision-making levels in the public administration. In addition, the governance processes for the different levels of public administration are created so that it is to improve the control and to mitigate the initialization phase of the enterprise architecture.
- The Governance Model is to enable the cooperation between an organization's core business functions and IT functions through managerial and change management processes.
- The Governance Model ensures that the enterprise architecture is timely and up-to-date. Therefore, the governance model covers the entire lifespan of the architecture and the changes are implemented according to the operative needs.
- The Governance Model pays attention to the different EA maturity levels of the government organizations. The model is suited for the organizations experienced with the enterprise architecting as well as for those just initiating their enterprise architecture adoption.

- The Governance Model taps into the existing planning and governance processes and tries to avoid creating new process structures.
- The Governance Model utilizes the existing government organizations and reinforces the existing structures without establishing new and excessive authorities.

The Governance Model is process-oriented and it proposes a centralized governance structure while having a hierarchically distributed implementation (Figure 5). At the topmost level of the governance hierarchy is the State IT Management Unit, responsible for supervising, coordinating, and maintaining the government enterprise architecture, and administering the related accountabilities. Each administrative branch should employ a steering group responsible for the enterprise architecture management and governance on that administrative domain. With regard to the agencies, each unit is allowed to govern their local architecture as long as the decisions adhere to the policy definitions of the corresponding administrative branch. The organization of the Governance Model also suggests that each administrative branch and agency should appoint the official responsible for the enterprise architecture.

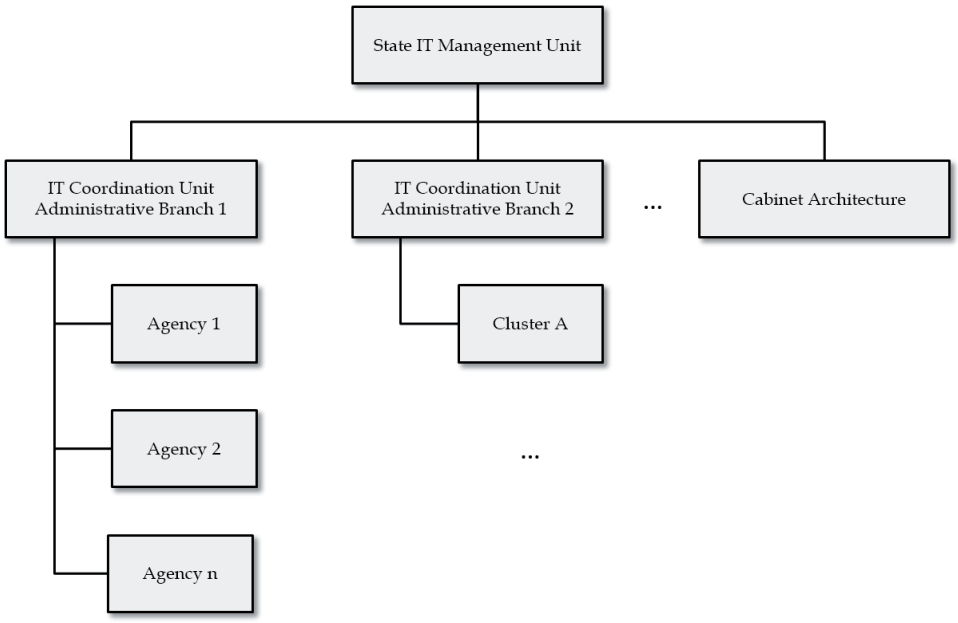

Figure 5 Finnish government EA governance (Ministry of Finance, 2007, 4)

The deployment of the EA Method as well as the Governance Model was initiated through the pilot projects that were carried out in the two government agencies (see Chapter 4 for the case descriptions). The projects took place before any governance processes – let alone the authority positions – were established at the upper levels of the state administration. As the guidance and general directions for the enterprise architecture were lacking at the time, a high degree of autonomy was given to the agencies. This also put a considerable responsibility

and challenge on the external consultancies on which both agencies relied during their projects. However, both project groups as well as the steering groups had the representatives from the State IT Management Unit to establish the link and fluent communication between the projects and the IT strategy of the public administration.

1.2.3 Analysis of Finnish government enterprise architecture

This section will summarize the previous discussion by evaluating the EA Method and the Governance Model from the point of view of Bernard and Grasso's (2009) six essential elements that are required for the enterprise architecture to be effective and authoritative at all levels and dimensions of an enterprise. Bernard and Grasso (2009) emphasize that the enterprise architecture must integrate the strategy, business, and technology aspects of the architecture through a formal and ongoing program. They introduce six requisite elements for a successful enterprise architecture: 1) an EA governance process that integrates with other management processes; 2) a repeatable methodology that supports program implementation and maintenance; 3) a framework to establish the scope of the architecture and the relationship of sub-architectures and other components; 4) a comprehensive and integrated set of documentation artifacts; 5) documentation tools to assist with modeling, and configuration control that uses an online repository for storing the documentation; and 6) associated best practices to guide enterprise architecture documentation and use. Next, we will briefly evaluate the Finnish government enterprise architecture from the perspective of each of the aforementioned elements.

1) An EA governance process that integrates with other management processes. The EA Governance Model was announced simultaneously with the EA Method. It gives suggestions on how the EA governance should be implemented at both the level of public administration and in the individual government agencies. The model includes a proposal for the organization of the EA governance at the government level and how it relates to the State IT Management Unit (see Figure 5) as well as the national IT strategy. The model also presents the governance processes for both government and agency levels, and suggestions how these processes should be integrated with the existing management structures and processes. However, as discussed later, the pilot organizations criticized the Governance Model for making too far-reaching assumptions about the capabilities of the organizations to adapt to these processes. It was pointed out that the deployment of the Governance Model would require excessive changes to the existing organizational structures and management processes.

2) A repeatable methodology that supports the program implementation and maintenance. The EA Method features several models, practices and recommendations that set the contour to and guide the implementation of the organization's enterprise architecture. In addition, the Governance Model explicitly defines the processes for the maintenance and the change management of the enterprise architecture. However, at the time the EA Method was released, the instructions for its use were lacking. The agencies were given a lot of liber-

ties in interpreting the EA Method. This led to that the pilot organizations adapted the method differently (Valtonen et al., 2009) and therefore its repeatability can be questioned.

3) A framework to establish the scope of the architecture and the relationship of sub-architectures and other components. The EA Method's framework (Figure 3) is extensive and well designed. It was based on TOGAF 8 and the 'EA Management Grid' (Hirvonen & Pulkkinen, 2004; Hirvonen, 2005) framework and utilizes commonly acknowledged sub-architectures and viewpoints for business, information, information systems, and technology. Through the adaptation process, the same framework is suited for modeling enterprise architecture for the entire public administration as well as the individual offices.

4) A comprehensive and integrated set of documentation artifacts. In its current form the EA Method provides some templates and examples for the documentation artifacts but completely lacks the metamodel and more rigorous documentation guidelines.

5) Documentation tools to assist with modeling, and configuration control that uses an online repository for storing the documentation. At the time of the pilot projects, no tools or repositories were available for the public administration organizations for the enterprise architecture modeling and documentation purposes. Recently, however, an enterprise architecture modeling tool with an online repository capability to allow the storing and sharing the enterprise architecture models and other documentation was centrally purchased for the use of public organizations.

6) Associated best practices to guide enterprise architecture documentation and use. The main reason the government enterprise architecture adoption in Finland was launched with the pilot projects was to collect the agencies' experiences and to document the best practices. Both organizations also had close relations with the State IT Management Unit's enterprise architecture experts throughout their project work. Currently, Finnish public administration's portal service and the online EA repository provide platforms for sharing experiences, modeling templates and the best practices among the agencies and other government organizations.

1.3 Scope of research

It is often emphasized that the development of enterprise architecture should not be taken as a project but as a continuous operation or a process (Armour, Kaisler & Liu, 1999b; Rhodes, Ross & Nightingale, 2009). However, the initial steps of enterprise architecting, i.e., the adoption, are usually carried out in the form of a project. By definition, a project is a temporary endeavor undertaken to create a unique product, service, or results and it is performed by people, constrained by limited resources, and planned, executed, and controlled (Project Management Institute, 2008). Projects end when their objectives have been reached or the project has been terminated (Schwalbe, 2010). After the initial adoption phase, the goal is that the enterprise architecting is transformed to a

series of ongoing activities and becomes part of the organization's standard operating models.

Figure 7 shows the steps of enterprise architecture development according to Armour et al. (1999b) and Armour and Kaisler (2001). It features somewhat similar phases as the enterprise architecture planning process of the Finnish government EA Method (Figure 6). However, in the following, we will refer to the former model as it brings more explicitly forward certain phases that are especially interesting from the viewpoint of our research. Yet, both models will be referred to as we later present our suggested enterprise architecture adoption process, according to which the survey study data collection was structured (cf., Section 6.1).

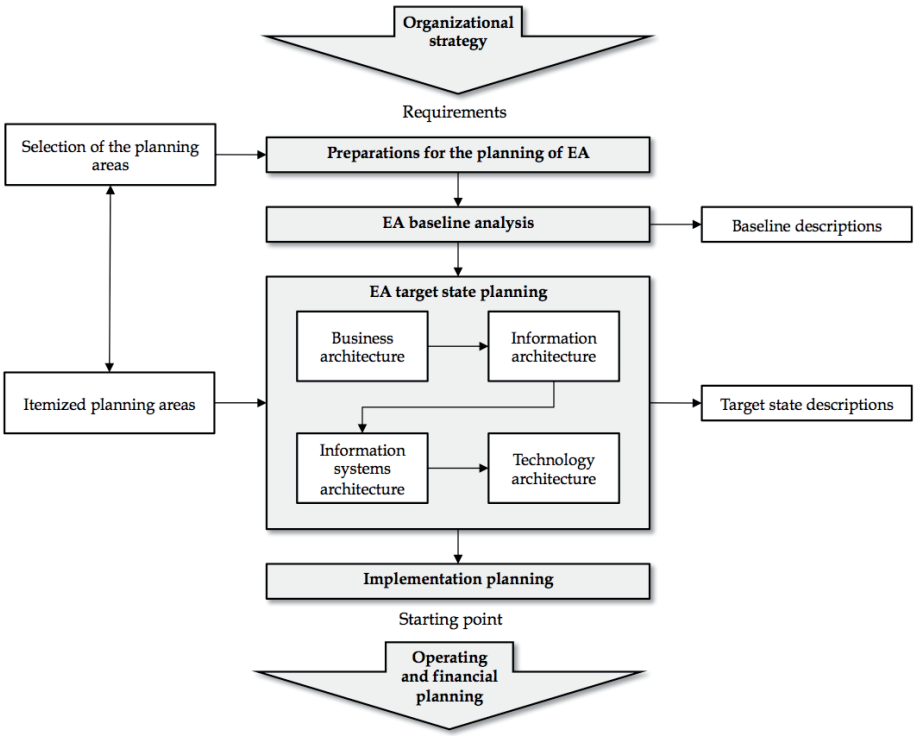

Figure 6 Enterprise architecture planning process according to the Finnish government EA Method

The enterprise architecture development process is launched by scoping and initiating the project (Step 1), and then followed by the characterization of the baseline architecture (Step 2) and the development of the target state architecture (Step 3). In practice, these process steps are supposed to describe the organization's current architectural structure as well as the structure it wants attain in the foreseeable future (Boster, Liu & Thomas, 2000). The transition between these phases is planned next (Step 4) and is then followed by the planning of the actual implementation of the enterprise architecture (Step 5). The transition

planning prioritizes the development efforts and arranges them into the form of phased and incremental groups (Armour et al., 1999b; Armour & Kaisler, 2001). As discussed above (Figure 1 and Figure 6), the definition and prioritization of these groups of activities should be closely related to the organization's strategic goals and priorities.

Boster et al. (2000) have elaborated the above enterprise architecture development process. They present technical as well as business activities that should be considered during the each of the phases of enterprise architecture development. While the technical activities represent actual tasks that need to be taken in order to produce the deliverables in each step of the development process, the business activities are to create favorable conditions for the work. For these activities Boster et al. (2000) heavily emphasize the role of communication plan in overcoming the possible challenges faced during the process. For the Step 1 they recommend following business concerned activities: 1) Create readiness for architecture; 2) Overcome resistance to change; 3) Identify and influence stakeholders; 4) Encourage open participation and involvement; and 5) Reveal discrepancies between current and desired state. The business activities related to the Step 2 include the following: 1) Make it clear to everyone why change is needed; 2) Convey credible expectations; and 3) Communicate valued outcomes. (Boster et al., 2000). From these recommendations it can be concluded that during the early stages of the enterprise architecture adoption, it is critical to establish the organizational readiness as well as the motivated and involved atmosphere.

The main interest of our research lays in the Steps 1, 2 and 3 but it also touches the Steps 4 and 5. More specifically, we focus on the stage that, for the remainder of the thesis, will be referred to as the enterprise architecture adoption. The research data was collected accordingly. The majority of our case organizations (cf., Chapter 4) had just recently launched their enterprise architecture adoption projects and during the projects they mostly worked to develop the baseline descriptions. However, they also performed activities that were related to the planning of target state enterprise architecture and the transition towards it. In addition, some of the goals were related to deciding on how the use of enterprise architecture will be rooted into the organization and integrated with its daily operations. Similarly, a vast majority of the organizations of the survey respondents (cf., Chapter 6) were currently implementing their enterprise architecture adoption projects and therefore were going through the same stages of the adoption process as the organizations of the case studies.

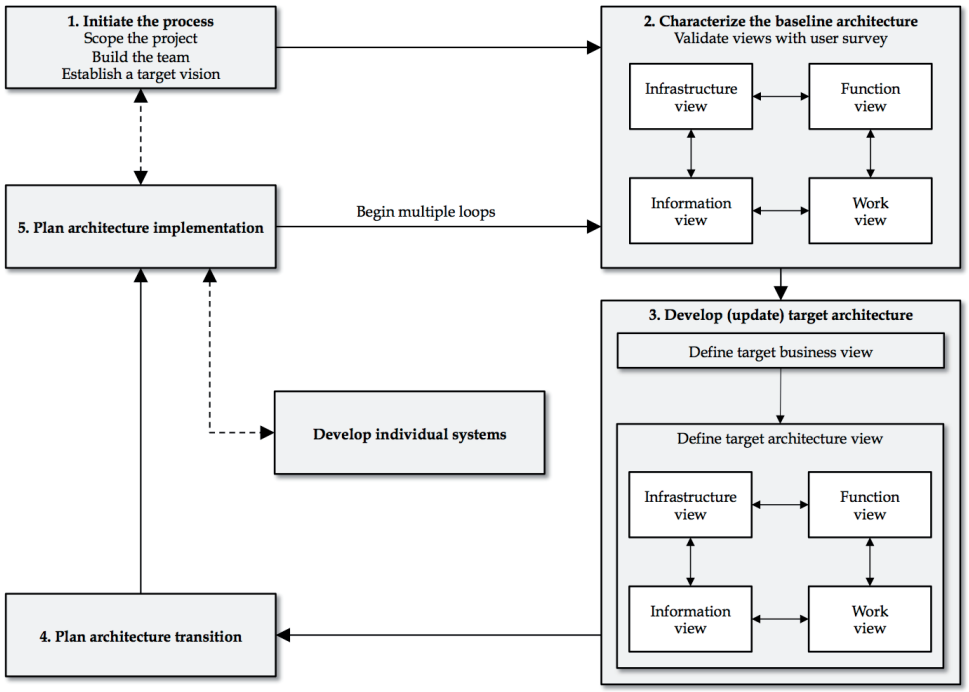

Figure 7 Enterprise architecture development process (adapted from Armour et al., 1999b; Armour & Kaisler, 2001)

Whereas Figure 7 approaches the enterprise architecting from the functionally oriented viewpoint, Figure 8 divides the process to the four more abstract and partially overlapping phases, which are based on the level of establishment and maturity of the enterprise architecture function. The first phase, Initiation, corresponds to the Step 1 (Armour et al., 1999b; Armour & Kaisler, 2001) and is the consequence of an organization's decision to start utilizing the enterprise architecture. The initiation phase is followed by Deployment by which we refer to the phase during which the enterprise architecting is put in practice. This includes, for example, adaptation of the chosen EA method and creation of the first batch of enterprise architecture deliverables according to it. The deliverables can include, depending on the organization's chosen approach, baseline architecture models, target state architecture models, and outlining of the transition plan. This phase also typically includes the introduction of the enterprise architecture modeling and management tools as well as the establishment of the EA modeling repository. During the phase of Institutionalization, the practices of enterprise architecture management become established throughout the organization and the enterprise architecture stabilizes its position among the instruments of management, decision-making, and organizational development.

These three phases constitute the definition of enterprise architecture adoption, as it is approached in this research. This means that in order for an organization to successfully adopt the enterprise architecture, it must be first able to successfully initiate the adoption process, then to successfully deploy the

practices of enterprise architecture and its governance structures, and finally, to successfully institutionalize the position of enterprise architecture in the organization. We are interested in the adoption process itself and therefore the scope of this research does not include, for example, the benefits of enterprise architecting that may or may not be actualized later on in relation to the success of adoption.

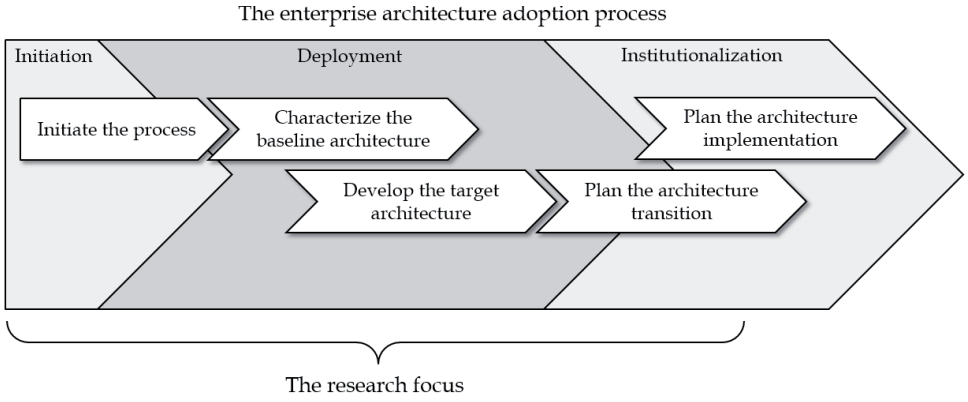

Figure 8 The research focus

It can be noticed that the enterprise architecture adoption bears considerable similarities with the implementation processes of management information systems (Ginzberg, 1981) as well as the organizational change processes (e.g., Kolb & Frohman, 1970; Slevin & Pinto, 1987). We will return to this topic in Chapter 6.

In addition to that this research focuses on the first stages of the enterprise architecture life cycle, including the establishment of at least introductory processes and structures for enterprise architecture planning, development, and management, we narrow down the scope by concentrating on the enterprise architecture that takes place within individual organizations. This means that we are not particularly interested in the issues that relate to the national government's enterprise architecture as a whole, or its management and governance structures (cf., Figure 4 and Figure 5). Neither are we interested per se in the themes that are often associated with the government enterprise architecture work, such as modernization of the public services, e-government programs, and other means of increasing the cross-sector interoperability and collaboration (e.g., Bellman & Rausch, 2004; Janssen & Creswell, 2005; Weerakkody et al., 2007). However, these themes are acknowledged when they directly affect the practice of enterprise architecture adoption at the level of individual organizations.

1.4 Research objectives and research questions

After the straightforward and somewhat idealistic image of the enterprise architecture adoption that was given above, this section presents the problems that this research aims to solve. According to the previous studies on the enterprise architecture as well as our data and the experiences on the field, the successful adoption of enterprise architecture appears to be anything but an easy task. For the present, the concrete results for government organizations that have been gained with the enterprise architecting appear to be modest. Most of the Finnish public organizations are still struggling with the adoption of the new policy and only a few have succeeded in integrating these practices with their operations and organizational structures.

Therefore, the goal of this research is two-fold. At first, we identify the most common and the most challenging problems that public organizations meet while adopting the enterprise architecture. We have collected data by observing several enterprise architecture adoption projects, by interviewing the key informants of the projects, and by conducting a survey study that was targeted to the expert practitioners and the active participants of the enterprise architecture work in Finland. We acknowledge that potential problems of enterprise architecting range from minute issues such as the expediency of EA methods and modeling tools, to allocation of the resources and identification of the necessary capabilities, and finally, to encompassing higher level organizational concerns, such as the readiness and willingness to execute the required tactical and strategic changes and the senior management's support for the change. When initiating the enterprise architecture development program, an organization may need to be willing to undertake some considerable changes to its operating models. The effective enterprise architecture necessitates investments also on organizational infrastructures and culture. Therefore, the problems may not be only technical but can also arise from political and organizational issues and project management (Kaisler et al., 2005). Enterprise architecture is an instrument to initiate, sustain, and continuously refine the organizational transformation, and therefore, to start such an endeavor an organization must be able to "smash down the walls of functional bureaucracy in implementing these changes" (Brown, 2000, 124). To be able to understand the nature and variety of problems that hinder the adoption of enterprise architecture in Finnish public organizations, the first question this research aims at answering is as follows.

1) What are the most common and the most challenging problems of enterprise architecture adoption?

The significance of each identified problem will be evaluated according to their role in the data, the context they appear in, and our observations on the field. Also the consequential relationships between the issues are contemplated in order to formulate the conceptual framework of the boundaries and key challenges to the enterprise architecture adoption. The answer proposed to the first

research question is grounded on the empirical data obtained from the preliminary case studies. This means that the literature review on the problems of enterprise architecting, as presented in Chapter 2, was not carried out until these data were collected and fully analyzed. By this measure, we wanted to avoid the preconceptions on the research topic that could steer or distract the analysis. Such a chronological order of the research process is mainly due to the chosen research method, the grounded theory approach, which is further discussed in Section 3.2. The existing knowledge of the research area was fully involved in the research process only at the time the survey study was designed (Chapter 6) for the purpose of additional data collection.

Second, from the analysis and understanding of the problems of enterprise architecture adoption, we develop a theoretical model that gives organizations a blueprint upon which it is possible to design context-aware plans for a successful enterprise architecture adoption. Therefore, the suggested model must help organizations to identify both the possible pitfalls as well as their strengths that can be used as leverage. We first aim at recognizing the generic critical success factors of enterprise architecture adoption and then examine how they can be used as drivers of different adoption strategies.

2) What are the critical success factors of enterprise architecture adoption?

3) How can the recognized critical success factors be turned into drivers of enterprise architecture adoption?

As discussed above, this research focuses on the enterprise architecture adoption stage and the related problems within individual organizations. Therefore, although the study deals with the government organizations and other public organizations, the overarching themes that relate, for example, to the EA governance of the administrative sectors are mostly out of the scope of this research. Neither does the research commit to the challenges of government-level enterprise architecture programs, where the problems relating to leadership, governance, and coordination have seemed to prevail (e.g., Hjort-Madsen, 2006; Liimatainen, Hoffman & Heikkilä, 2007; Bernard, 2008; Zink, 2009). Naturally, given the context of the study, the themes that are characteristic to the public administration do affect the adoption of enterprise architecture in individual organizations, as well as the form and structure their enterprise architecture must take after the adoption stage. For example, the politics and administrative decisions reflect on the enterprise architecture management in the public organizations but are not, as such, our major concern.

The results of this study present a coherent view on the issues of enterprise architecture adoption. The concluding theoretical model gives organizations guidelines to overcome the problems hindering the adoption process by taking advantage of their existing capabilities. Although the research builds on the data gathered in Finland, the research setting is rooted in findings of academics around the world and contributes to the general body of knowledge of

enterprise architecture. The results are of interest to researchers as well as practitioners.

1.5 Structure of the thesis

In this chapter, we have given an introduction to the research topic and defined the context and the scope for the research. Also, we set the research questions for which the following chapters will seek the answers. The remainder of this thesis is structured as follows.

The next chapter will explore the previous research on problems of enterprise architecting in form of a literature review. Although the literature review in relation to the research process was chronologically conducted after the first set of empirical data was collected and analyzed, the review is presented in this thesis before we move on to the presentation of data analyses. The purpose of this order is to give a reader the footing to be better able to follow and evaluate the analyses and the inference that will follow.

The third chapter motivates and explains the chosen research strategy. It also explains the research process, describes the research methods and data collection techniques that were used throughout the study, as well as commentates on the validity and reliability of the research execution.

The fourth chapter presents the enterprise architecture adoption projects that were studied during the research. The first two research cases (i.e., the preliminary cases) did provide the first patch of the empirical data and the basis for the development of grounded theory, while the following complementary cases were treated with less rigor and were mainly used to attain additional information to strengthen the reasoning, to fill in the possible gaps, and to support the inductive interpretation behind the emerging theoretical concepts.

The fifth chapter presents the first rounds of the data analysis, the open and the axial coding, according to the grounded theory approach. The tentative results presented in this chapter are based on the data obtained from the preliminary case studies.

The sixth chapter motivates and explains the implementation of the second round of data collection, which took the form of a practitioner survey study. The purpose of the survey was to allow the research to reach out of the case organizations in order to improve the generalizability of the results and, on the other hand, to obtain quantitative data to strengthen the analysis with additional measures. This chapter presents the analysis of the survey data.

After combining the data from the survey study into a coherent whole with the previous qualitative data from the case studies, the seventh chapter presents the final stage of the grounded theory research. The process of selective coding will conclude in the core categories that capture the essence of the researched phenomenon, i.e., the critical problems of the enterprise architecture adoption in the Finnish public organizations.

The eighth chapter then presents a theoretical model that combines the previous findings made during the grounded theory research process. The

working hypothesis upon which the conclusive version of the theoretical model will be build on is that the critical problem categories also serve as the classes of critical success factors of the enterprise architecture adoption. The chapter eight elaborates the resulting theoretical model and discusses its theoretical and practical implications.

Finally, the chapter nine will present the conclusions of the research. The chapter summarizes the answers to the research questions, further reflects our theoretical and practical contributions, and suggests the topics for the future research.

Figure 9 summarizes the key events of enterprise architecture development in Finnish public administration (as discussed in Section 1.2) in relation to the research activities of our study. Since the Act on Information Management Governance in Public Administration, several public organizations have launched attempts to adopt the practices of enterprise architecture, which is still a work in progress in majority of organizations, as later indicated in Section 6.4. Therefore, this research is very timely.

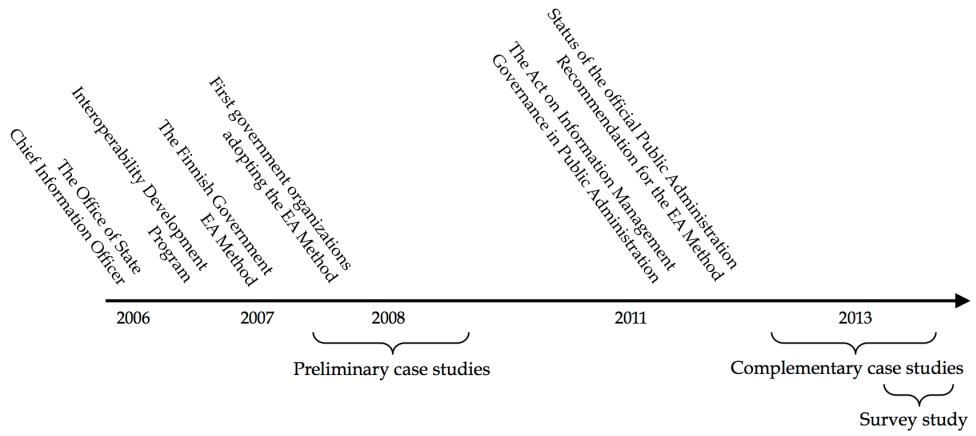

Figure 9 Timeline for the key events of enterprise architecture development in Finnish public administration in relation to our research activities

2 PREVIOUS RESEARCH ON PROBLEMS OF ENTERPRISE ARCHITECTURE

This chapter presents a review of the relevant previous studies on the problems of enterprise architecture. In this chapter, we refer to 45 research reports, most of which have been published in academic journals or conference proceedings between the years 1999 and 2013. Systematic studies that have specifically focused on problems of enterprise architecture have been published only recently. Lucke et al. (2010) conducted such a study in form of a literature review, which resulted in the categorization of problems of enterprise architecting. The proposed categorization was later refined with an empirical investigation (Lucke et al., 2012). However, the expediency of generic and context-independent studies can be questioned. Many issues of enterprise architecting appear to be closely related to the organizational context, let alone that the meaning of concept of enterprise architecture seems to vary case by case (e.g., Bellman & Rausch, 2004; Schöenherr, 2009; Seppänen et al., 2009; Zink, 2009; Lemmetti & Pekkola, 2012). It is quite challenging to establish a coherent understanding about the problems by means of literature reviews that draw from a variety of sources.

Therefore, the purpose of this literature review is two-fold. First, it shows that the studies are lacking on the specific area we are interested in. As our objective is to understand the problems that public organizations meet during the adoption of the enterprise architecture practice, we review the literature from this particular perspective. Table 3 summarizes the reviewed papers according to these criteria. Firstly, the column "EA" indicates that the paper deals with the enterprise architecting. There are a few papers that do not mention enterprise architecture per se but are still included because they contain some relevant information for our research and treat subject matters that are closely related to enterprise architecture, such as IT silos (Bannister, 2001), information systems architectures (Ross, 2003; Dreyfus, 2007), enterprise integration (Lam, 2004), and enterprise information systems (Namba & Iljima, 2004). The column "Adoption" indicates whether the paper focuses on the adoption stage of the enterprise architecture process. It can be seen from Table 3 that the body of knowledge on this viewpoint is lacking the most. As our study will later indicate (Chapter 6), most of the problems of enterprise architecting in Finnish public organizations

actually relate to the very first steps of the process, i.e., how to get it up and running, and how to attain the organization's commitment towards the enterprise architecting. The "Problems" column indicates that the paper discusses problems of enterprise architecture or architecting. The column "Government/Public" denotes that the paper focuses on enterprise architecture of government organizations or other public organizations. Finally, the column "Single organization" specifies whether the viewpoint of the study is on individual organizations instead of national EA programs or cross-sector enterprise architecting.

The black circle indicates that the theme is focal to the paper in terms of, for example, the context or the objectives of the research. The white circle, on the other hand, indicates that a theme is discussed in the paper but is not its central interest. Table 3 should be read as combinations of columns. For example, a paper may focus on problems of enterprise architecting but while doing so it does not necessarily focus on public organizations or the adoption stage.

Table 3 Characterization of the reviewed research reports

Authors: Title	Year	EA	Adoption	Problems	Gov./Public	Single org.
Armour, Kaisler & Liu: A Big-picture Look at Enterprise Architectures	1999	●		○	○	
Armour, Kaisler & Liu: Building an Enterprise Architecture Step by Step	1999	●	○	○		○
Armour & Kaisler: Enterprise Architecture: Agile Transition and Implementation	2001	●	○	○		●
Bannister: Dismantling the silos: extracting new value from IT investments in public administration	2001			●	●	○
Tarabanis, Peristeras & Fragidis: Building an Enterprise Architecture for Public Administration: A High-level Data Model for Strategic Planning	2001	●			●	
Armour, Kaisler, Getter & Pippin: A UML-Driven Enterprise Architecture Case Study	2003	●	○	○	●	●
Ross: Creating a Strategic IT Architecture Competency: Learning in Stages	2003	○		○		●
Bellman & Rausch: Enterprise Architecture for e-Government	2004	●		○	●	
Hjort-Madsen & Gotze: Enterprise Architecture in Government – Towards a Multi-Level Framework for Managing IT in Government	2004	●		○	●	
Lam: Technical Risk Management on Enterprise Integration Projects	2004	○		○		○
Namba & Iljima: City Planning Approach for Enterprise Information Systems: The Move towards a More Effective EIS City Planning Approach	2004	○		○		●
Kaisler, Armour & Valivullah: Enterprise Architecting: Critical Problems	2005	●		●		●
Lapkin: The Seven Fatal Mistakes of Enterprise Architecture	2005	●		○		●
Pulkkinen & Hirvonen: EA Planning, Development and Management Process for Agile Enterprise Development	2005	●		○		●
Hjort-Madsen & Burkard: When Enterprise Architecture Meets Government: An Institutional Case Study Analysis	2006	●			●	○
Hjort-Madsen: Enterprise Architecture Implementation and Management: A Case Study on Interoperability	2006	●		○	●	○
U.S. Government Accountability Office: Leadership Remains Key to Establishing and Leveraging Architectures for Organizational Transformation	2006	●			●	
Ylimäki: Potential Critical Success Factors for Enterprise Architecture	2006	●		○		

(Continues)

(Table 3 continues)

Dreyfus: Information System Architecture: Toward a Distributed Cognition Perspective	2007			○		●
Hjort-Madsen: Institutional Patterns of Enterprise Architecture Adoption in Government	2007	●	●		●	
Janssen & Hjort-Madsen: Analyzing Enterprise Architecture in National Governments: The Cases of Denmark and the Netherlands	2007	●	○	○	●	
Liimatainen, Hoffman & Heikkilä: Overview of Enterprise Architecture Work in 15 Countries	2007	●			●	
Shah & Kourdi: Frameworks for Enterprise Architecture	2007	●				
Bernard: Why Enterprise Architecture Projects Fail	2008	●		●		○
Isomäki & Liimatainen: Challenges of Government Enterprise Architecture Work – Stakeholders' Views	2008	●		●	●	
Seppänen: Interconnections and Differences between EA and SOA in Government ICT Development	2008	●			●	
Wang, Ma & Zhou: Aligning Business and IT Using Enterprise Architecture	2008	●		○		
Asfaw, Bada & Allario: Enablers and Challenges in Using Enterprise Architecture to Drive Transformation: Perspectives from Private Organizations and Federal Government Agencies	2009	●		●	○	○
Bernard & Grasso: A Need for Formalization and Auditing in Enteprrise Architecture Approaches and Programs	2009	●		○		
Boddie: The Criticality of Transformational Leadership to Advancing United States Government Enterprise Architecture Adoption	2009	●	○	○	●	
Buckl, Ernst, Matthes, Schweda: How to Make Your Enterprise Architecture Management Endeavor Fail!	2009	●		●		
Espinosa & Boh: Coordination and Governance in Geographically Distributed Enterprise Architecting: An Empirical Research Design	2009	●		○		
Hjort-Madsen & Pries-Heje: Enterprise Architecture in Government: Fad or Future?	2009	●		○	●	
Schöenherr: Towards a Common Terminology in the Discipline of Enterprise Architecture	2009	●		○		
Seppänen, Heikkilä & Liimatainen: Key Issues in EA Implementation: Case Study of Two Finnish Government Agencies	2009	●	○	●	●	●
Zink: How to Restart an Enterprise Architecture Program After Initial Failure	2009	●	○	●		
Lucke, Krell & Lechner: Critical Issues in Enterprise Architecting – A Literature Review	2010	●		●		○
Saha: Enterprise Architecture as Platform for Connected Government	2010	●		○	●	
Valtonen, Korhonen, Rekonen & Leppänen: EA as a Tool in Change and Coherency Management – a Case of a Local Government	2010	●		○	●	
Larsson: Ambiguities in the Early Stages of Public Sector Enterprise Architecture Implementation: Outlining Complexities of Interoperability	2011	●		●	●	○
Lemmetti & Pekkola: Understanding Enterprise Architecture: Perceptions by the Finnish Public Sector	2012	●		○	●	
Lucke, Bürger, Diefenbach, Freter & Lechner: Categories of Enterprise Architecting Issues – An Empirical Investigation based on Expert Interviews	2012	●		●		○
U.S. Government Accountability Office: Enterprise Architecture Value Needs to Be Measured and Reported	2012	●		○	●	
Hauder, Roth, Schulz & Matthes: Organizational Factors Influencing Enterprise Architecture Management Challenges	2013	●		●		●
Roth, Hauder, Farwick, Breu & Matthes: Enterprise Architecture Documentation: Current Practices and Future Directions	2013	●		○		●

The second purpose for conducting the literature review is that it was used on the side of our empirical data while the survey on the problems of enterprise architecture adoption was designed (Section 6.1). For the survey questionnaire, we preferred the problems that were predominant in our data and were also mentioned in previous studies. Thus, the survey allows us to evaluate whether the problems (present in our case study data, in the previous literature, or, preferably, in the both) we chose to be included in the questionnaire are actually relevant in relation to our research questions and context.

The common goals of the government enterprise architecture programs, such as the more efficient models for service production and the decrease of redundancy in existing information assets, are universally regarded as worth of pursuing. However, it seems that these programs have often ended up in trouble (Liimatainen et al., 2007; Zink, 2009). Problems have been reported to appear both in public as well as private sectors (e.g., Ross, 2003; Hjort-Madsen & Burkard, 2006). According to Zink (2009), Gartner predicted in their analysis in September 2007 that nearly 40 percent of the existing enterprise architecture programs would be canceled due to poor execution and inability to deliver value to the business. The United States are generally considered to have one of the most advanced national enterprise architecture programs. Still, despite of the congressional legislation that mandates the IT enabled solutions to be developed according to the Federal Enterprise Architecture, the guidance provided by Office of Management and Budged, and U.S. Government Accountability Office's recommendations, many government organizations have been reported to struggle in advancing the adoption of enterprise architecture (Boddie, 2009).

According to Bernard and Grasso (2009), enterprise architecture programs have produced varying degrees of value to different stakeholders and have often been light on returns. Also, as pointed out by Bernard and Grasso (2009), programs have been seen as a threat to project-specific or system-specific interests. Bernard (2008) has presented seven core reasons for enterprise architecture project failures. These include 1) lack of understanding of what enterprise architecture is and is not; 2) unclear leadership; 3) insufficient resources; 4) overly large architecture scope; 5) lack of perceived value; 6) lack of use of a developed architecture; and 7) competition with other best practices. The following sections will first discuss these seven themes and then add some additional classes of challenges identified by other researchers. The latter include 8) alignment of business and IT objectives; 9) communication failures; 10) modeling the enterprise architecture and lacking modeling tools; 11) management and maintenance of enterprise architecture; and 12) organizational barriers. Next, the sections through 2.1 to 2.12 will summarize previous studies on the above themes.

2.1 Misconceptions regarding enterprise architecture

Zink (2009) argues that perhaps the greatest challenge to establishing a successful enterprise architecture program is due to misconceptions as to what enterprise architecture actually encompasses. Executives and functional managers as well as IT professionals lack the clear and shared understanding about the purpose, goals and practices of enterprise architecting. A recent study by Lemmetti and Pekkola (2012) concluded that different authorities of Finnish public administration understand enterprise architecture very differently.

According to Bellman and Rausch (2004), e-government driven enterprise architecture undertakings can be roughly divided into two: those that take a narrow view and see enterprise architecture primarily as an IT matter and those that recognize enterprise and cross-agency perspectives. Zink (2009) emphasiz-

es that it is important to understand that enterprise architecture is a business initiative and not a technology project. For a successful enterprise architecture program it is essential that the understanding about what enterprise architecture is and how it can benefit the organization is shared among different stakeholders, including executive sponsors, division heads, and those who would use the architecture as a decision making tool (Zink, 2009). The fundamental lack of uniform and commonly accepted definition for enterprise architecture contributes to this problem (Schöenherr, 2009). In order to ensure that individuals at all levels of organization understand what enterprise architecture entails, Zink (2009) highlights the importance of the communication plan. The communication plan should be written from the business perspective instead of using technical jargon. The topic of communication failures will be further discussed in Section 2.9.

2.2 Unclear leadership and lack of management support

The second problem domain is the unclear leadership (Bernard, 2008; Zink, 2009). This is also, at least partially, due to the lacking understanding regarding the purpose of enterprise architecture and enterprise architecting in general. As the enterprise architecture is often considered as an only IT related activity, it fails to gain the buy-in of the executive sponsors. As a result, enterprise architecture programs are often owned and steered by IT departments. This leads to that the enterprise architecture may be unable to touch the functional areas of an organization and must to operate without a mandate necessary to achieve any real changes in business.

According to U.S. Government Accountability Office's report in 2006 – ten years after the Clinger-Cohen Act was enacted in the U.S. and seven years after the publication of the Federal Enterprise Architecture Framework – getting senior level support for the enterprise architecture program was still seen as a challenge in nearly 50% of all government agencies (GAO, 2006). Recent literature reviews (Lucke et al., 2010; Lucke et al., 2012) indicate that the insufficient management commitment still remains as one of the key problems. Similar observations can also be found on studies that specifically focus on enterprise architecture in central governments (Hjort-Madsen & Pries-Heje, 2009). As a result, enterprise architecture is often truncated to focus on IT issues at the expense of business concerns and as stated by Zink (2009), CIO championed programs contribute to the misconception that enterprise architecture is an 'IT thing'. As a consequence, several enterprise architecture programs have limited themselves to technology standardization efforts. However, as noted by Saha (2010), this may also be due to the fact that CIOs have the best control over technology infrastructure and, on the other hand, it is an area where tangible benefits can be demonstrated fairly quickly.

According to Lucke et al. (2010), insufficient management commitment is directly linked to the limited central architecture authority. Dreyfus (2007, 7) notes, "Central architecture groups have influence, but not control, over deci-

sions that affect the information systems architecture." According to Lucke et al. (2010), this appears as a twofold problem: 1) business managers with immediate objectives can bypass the review boards (Dreyfus, 2007) and decide not to follow the rules of an architecture program (Shah & Kourdi, 2007); and 2) managers may decide not to make the extra investments required to implement a good architecture (Dreyfus, 2007). In addition, a study by Larsson (2011) indicates that enterprise architecture implementations in public sector also suffer from ambiguities in decision-making and coordination between regional and central authorities.

According to Asfaw, Bada and Allario (2009, 22), the key challenge "is getting the right people at the table and agreeing on what you are trying to accomplish and convincing them that doing architecture is a good thing." The other side to this problem is that although enterprise architecture requires a strong managerial support, it should not be carried out as a policing function. Enterprise architecture is likely to fail if it is pushed forward without considering the change management aspects.

2.3 Insufficient resources

The third reason for failing enterprise architecture is insufficient resources that the programs are allocated with. Many organizations fail to remember that enterprise architecture is a corporate asset and as such it must be properly funded. As pointed out by Kaisler et al. (2005), the executives should not expect an immediate reward, as the enterprise architecture is not an operative initiative but rather a strategic concept. Its implementation is not a project that can offer immediate returns but it requires constant and on-going development of the operations (e.g., Seppänen et al., 2009; Hauder et al., 2013). Therefore, enterprise architecture should be treated as a part of the organization's long-term capital planning process. Isomäki and Liimatainen (2008) aptly note that the funding mechanisms of public administration are founded on the fixed-term projects. This is incompatible with requirements of the enterprise architecture driven development approach and it greatly hampers agencies' capability to implement their enterprise architecture successfully.

2.4 Overly large program scope

The fourth reason for unsuccessful enterprise architecture projects is that they fail setting the program scope appropriately (Bernard, 2008; Zink, 2009). In order to acquire the big picture view to the organization and to deliver value, many organizations tend to set the initial architecture scope too large (Armour et al., 1999b; Buckl et al., 2009; Zink, 2009). Overly ambitious programs are likely to die under their own weight and thus fail to deliver any benefits for the organization. Ylimäki (2006) suggests an organization to consider following

questions while scoping their enterprise architecture development: What are the organization's objectives and what objectives are set for the enterprise architecture? What benefits (financial and other) are to be reached via the enterprise architecture? How wide organizationally, how deep and detailed, and how fast the enterprise architecture should be developed?

Armour et al. (1999b) use the term over-scoping to refer to a situation in which the breadth or depth of the architectural effort is set so high that the initial analysis drags on for years. In addition, with over-modeling they refer to a situation where architecture models contain too much detail and too much time is spent in validating them. For the baseline architecture descriptions, Armour et al. (1999b) advice to seek for the level of detail that is sufficient to answer the questions that are relevant in enabling the decision making to move towards the target state architecture.

To help the enterprise architecture program to have some initial successes that can later turn to mature and complete enterprise architecture, it might be initially advisable to treat the enterprise architecture in a manageable segments, that can, for example, reflect the organization structure and different enterprise architecture viewpoints, and to use iterative approaches while doing so. According to Zink (2009), the segmentation of enterprise architecture can take one of two forms by either focusing on all elements necessary to define one line of business or by defining one part of the framework, such as data and information architecture, across all lines of business. Pulkkinen and Hirvonen (2005) have suggested a process model for enterprise architecture implementation that is based on the present situation, including the maturity and existing capabilities, and the specific needs of an organization or a development project. The incremental stages of the process focus on different enterprise architecture viewpoints at different levels of an organization. The enterprise architecture process should allow agile and incremental development and to help to set the project scope per current and the most acute needs. Another alternative for defining the scope for an enterprise architecture project is to initiate the project by executing the maturity evaluation of the organization's current architectural state. The purpose is to find out the areas that are lacking behind the most and need to be improved in order to respond the business needs. There exist several enterprise architecture and capability maturity models that can be used to set the scope for the project.

2.5 Lack of perceived value

Organizations are not always able to understand the value of enterprise architecture. Asfaw et al. (2009) argue that the lack of motivation is a big issue in enterprise architecture implementation especially in the public sector. Their research indicates that without being able to see the benefits of enterprise architecting, the stakeholders are not willing to buy in. According to Zink (2009), enterprise architecture professionals struggle with justifying the expenses of their projects and it is a common presumption that enterprise architecture costs

too much and takes too long to deliver anything of value. Unfortunately, the fact is that in many cases these may be valid arguments. While enterprise architecture can be used to recognize problems in the current architecture, it does not necessarily point towards any solutions (Seppänen, 2008). Zink (2009), therefore, recommends that an organization should identify a few key architectural components that, once completed, will have an immediate impact on the business. This is in line with the above discussion of setting the reasonable scope for the enterprise architecture project. On the other hand, as it is acknowledged that the enterprise architecture should be seen as a strategic instrument – not an operative one with immediate returns – it is equally important to be able to ensure the sustainability and sufficient long-term resources for the work.

Another issue that fosters difficulty of perceiving the value of enterprise architecting is the lack of meaningful metrics (Kaisler et al., 2005). U.S. Government Accountability Office reported in 2012 that of the 27 studied agencies only 5 have fully or partially measured and reported outcomes and benefits of their enterprise architecture (GAO, 2012). The lack of use of metrics and measurement of benefits make it also difficult to establish meaningful value propositions for the enterprise architecture (Lam, 2004; Namba & Iljima, 2004; Kaisler et al., 2005; Bernard & Grasso, 2009; Lucke et al., 2010).

2.6 Lack of use

As a reason for a poor success, Zink (2009) and Bernard (2008) mention the lack of use of developed enterprise architecture. Strong management and governance process is required to help the enterprise architecture transforming into the key information asset that is used in strategic decision-making and kept up-to-date. TOGAF emphasizes the importance of the architecture board consisting of a cross-section of senior level members to set the enterprise architecture principles in line with the organizational strategy and goals (The Open Group, 2013, 553-558). On this ground, it is required that people, processes and technological resources are in compliance with the architecture principles to successfully implement the strategy. At a minimum, compliance programs should address IT initiatives and projects, IT and capital planning and investments, and an enterprise architecture change control process (Zink, 2009). Without the architecture board overseeing and coordinating the implementation of different areas of enterprise architecture, it is difficult to get them well aligned and, therefore, to reach the desired results.

2.7 Competition with other best practices

Enterprise architecture may need to compete on attention with other management approaches and best practices, such as GRC (governance, risk management and compliance), quality management, business process management, Six

Sigma, CobiT, ITIL, and others. An organization may have carried out failed attempts with other best practices before and therefore is rendered reluctant to try out yet another 'trick'. Zink (2009), however, argues that even though each of these best practices can aid an organization, none can deliver all the benefits that a successful enterprise architecture program can.

It is often difficult to question and change the existing work practices in public organizations as they are traditionally organized around the professions (Isomäki & Liimatainen, 2008). Organizations also often show either passive or outright resistance to enterprise-wide architecture planning and changes in general (Armour & Kaisler, 2001). As discussed earlier, enterprise architecture can seldom offer quick results and requires long-term investments and commitment. This combined with the frequent job rotations easily leads to that many managers are unwilling to take a project that is unsure to realize any results within the first few years. Also the progress made in motivating and committing the chain of command can be lost when managers change their positions.

2.8 Lack of business-IT alignment

Many organizations start their enterprise architecture initiatives by standardizing platforms or products at the technology layer. This especially seems to be a common approach in public administrations (e.g., Liimatainen et al., 2007). However, the enterprise architecting should be a process of progressive decomposition that starts with the business strategy and only then moves towards the technology (Lapkin, 2005). Only that way the linkage between the business concepts and the technology solutions can be ensured. Although the business linkage is an elementary success factor (Ylimäki, 2006), according to a literature review by Lucke et al. (2010), poor understanding or even the ignorance of business requirements (Armour, Kaisler & Liu, 1999a; Lam, 2004; Wang, Ma & Zhou, 2008; Seppänen et al., 2009) commonly damages the enterprise architecture development. It is possible, as Armour et al. (1999a, 40) phrase it, to "develop a great architecture for the wrong business."

According to Lapkin (2005), as the business articulates the needs, the IT articulates the solutions that enable achieving the business goals. The enterprise architecture function is supposed to work in the middle and to provide the agreed-on terms and semantics for the dialogue (cf., Figure 2). Lapkin (2005) also emphasizes the importance of that the IT organization understands and rightly interprets the business strategy and its implications. She points out that if the business does not agree with the interpretation, the enterprise architecture will be invalid. Unfortunately, a study by Hauder et al. (2013) indicates that unclear business goals are still one of the major challenge of enterprise architecture.

Hjort-Madsen (2006) argues that economic and political factors are just as important as the technical ones when implementing enterprise architecture. The enterprise architecture programs often seem to be lacking the authoritative power and commonly acknowledged and concrete enough goals that are man-

datory in order to have a control over such a complex ensemble. Based on his observations on a case study, Hjort-Madsen (2006) notes that it was difficult to define the objectives and the scope of the project as the enterprise architecture was a new concept to both chief architects and the top management. According to a interviewee, the primary challenge was to relate the enterprise architecture to the strategic goals of the organization. Hjort-Madsen (2006) also reports the conflicts on goals of the project between the IT management and information system owners. System owners seemed to take their agenda untouchable by the enterprise architecture blueprints that would describe technical and organizational requirements towards the information systems.

2.9 Communication failures

Asfaw et al. (2009) mention failing communications as one of the key challenges for the enterprise architecture teams to tackle in both private organizations and government agencies. Also the literature review by Lucke et al. (2010) identifies the mismatched communications and the lack of shared vocabulary in collaboration between the diverse stakeholder groups as one of the key challenges (Armour et al., 1999b; Shah & Kourdi, 2007; Wang et al., 2008; Espinosa & Boh, 2009; Seppänen et al., 2009). This contradicts Lapkin's (2005) somewhat optimistic view on enterprise architecture's capability to deliver the agreed-on and commonly understood terms and semantics for the dialogue between the business and IT people.

Asfaw et al.(2009) argue that enterprise architecture has an image problem. This is due to that enterprise architecture often takes too long to implement and is presented in technical terms. The traditions of enterprise architecting as well as most of the current enterprise architecture methods are heavily rooted in IT oriented views. As a consequence, projects are typically left for the responsibility of IT departments. Hjort-Madsen's (2007) study on public agencies in U.S. shows that many organizations resist technology as a change factor. By the norm, information technology is seen solely as a technical issue that should just work and stay out of feet of the core operations. As pointed out by Hjort-Madsen (2007), strong institutional forces may reduce the enterprise architecture planning innovation to a purely technical issue. Asfaw et al. (2009, 20-21) refer to their research participants, according to whom "as soon as they use the words enterprise architecture, eyes start to roll". As discussed later in the study, similar problems were familiar in our case organizations, as well. Espinosa and Boh (2009, 7) also point to the lack of common language between the IT and business personnel – both equally important stakeholders to the enterprise architecture development: "IT personnel in EA teams were often too technical in their focus and they lacked the ability to speak the business language."

In practice, it seems that enterprise architecture will not easily solve any communication problems but it rather inflicts them. The absence of commonly understandable representations limits the ability to achieve well-aligned enterprise architecture (Armour, Kaisler, Getter & Pippin, 2003; Dreyfus, 2007; Lucke

et al., 2010; Lucke et al., 2012). Asfaw et al. (2009) advise that, instead of selling the enterprise architecture, by focusing on mission threads type architectures their research participant had reached the best results as this let the team members astute with architecture to see the utility and to get involved.

2.10 Difficulties in modeling

The key premise of an enterprise architecture modeling tool is that it can show the business process owners how their requirements are met across multiple information systems (Kaisler et al., 2005). However, organizations seem to struggle with documenting the enterprise architecture and the modeling process often lacks concrete guidelines (Roth et al., 2013). Many modeling tools are oriented to modeling software architectures and lack in capabilities of higher level of conceptual modeling (Kaisler et al., 2005; Shah & Kourdi, 2007). The enterprise architecture modeling tools are required to represent business operations and processes as well as how these are related to the objects on other architecture domains. Nowadays, there are a number of tools that are starting to address these issues (e.g., Gartner, 2013) but well integrated and accessible solutions are still few. The more comprehensive the modeling tools become the more complex and complicated to command they tend to get (cf., Roth et al., 2013).

The problems related to modeling enterprise architecture also include stakeholders' inability to take advantage of the models. This is due to limited modeling tools and the lack of understanding how the models should be interpreted and used. According to Kaisler et al. (2005), modeling tools fail in representing different perspectives and levels of abstraction, and system dynamics.

On the other hand, Asfaw et al. (2009) argue that too much focus is put on creating the enterprise architecture deliverables but still the promise of supporting the organizational decision-making is not realized, as the deliverables are not answering the questions the users ask. Asfaw et al. (2009) also point out that the development of enterprise architecture requires that the organization can be defined and decomposed according to the expectations that are built in the chosen enterprise architecture method. This is a major challenge in modeling the enterprise architecture, especially in the case of large organizations.

Finally, individual project managers may be capable of managing the changes on local platforms, but according to Kaisler et al. (2005), often do not understand the impact of changes on other platforms. Enterprise architecture modeling tools should help in avoiding the situation that Dreyfus (2007, 7) refers to as "local optimization with global ramifications". Without being able to understand the structure of enterprise architecture due to its scale and complexity, and the relationships between its different components, it is possible that isolated development efforts, no matter how well justified and executed on a single domain, impair the enterprise architecture in its entirety.

2.11 Management and maintenance

Based on their experience and discussions with other architects, Kaisler et al. (2005) point out that challenges of enterprise architecting are rarely technical. Enterprise architecture implementation requires strong program and project management expertise, and robust processes for change management and IT portfolio management. They have also noticed that control and communication between the development projects and enterprise architecture management is often lacking. The project managers do not report to the system architect, which inflicts two issues: it is unclear what oversight authority the system architect has over system development projects; and how the project management decisions are assessed against the enterprise architecture. With this regard, Kaisler et al. (2005) note that the decisions regarding the ownership of enterprise IT resources and the responsibility for managing and integrating new IT resources into the enterprise architecture are issues of the IT governance. Therefore, they argue that IT governance must have support and authority of the organization's executive management. They also point out that the architects need to possess the political and business acumen to know when to promote issues for the consideration (Kaisler, et al., 2005). Overall, the issues relating to the management of enterprise architecture seem to be common problems (Lucke et al., 2012), and they have been identified by a number of researchers (cf., Lucke et al., 2010).

There are also problems that relate to the maintenance of enterprise architecture. Kaisler et al. (2005) alleviate that the architecture must be designed and built to change rapidly in response to changing business requirements (cf., Hauder et al., 2013). Lapkin (2005) points out that an organization should never assume their architecture is "done". Instead, it should be seen as a living entity that needs constant revision to accommodate changes in the business strategy, the markets, the regulatory climate, organizational priorities, and technology. The enterprise architecture can remain relevant only if it is able to reflect these changes.

2.12 Organizational issues

On the public sector, government structure and organizational and cultural barriers (Sumner, 2000; Lam, 2005) between the administrational branches and agencies hinder the enterprise architecture adoption (Hjort-Madsen & Gotze, 2004). According to Ylimäki (2006), organization culture and particularly the organization structure have notable impact on the success of enterprise architecture. If organization units plan and make their enterprise architecture related decisions independently of each other, the perspective is too narrow to accomplish good and sustainable architectural solutions (Ylimäki, 2006).

The government organizations have traditionally operated in silos that, according to Bannister (2001), can evolve for a variety of reasons, including technological, organizational, political and temporal issues. Therefore, it is

found difficult to agree on the common rules and procedures that would fit the particular needs of all the different stakeholders. Administrative silos tend to operate independently of each other and produce overlapping, non-interoperable services on duplicate functional areas (Armour & Kaisler, 2001). In Finland, for example, a dozen of overlapping electronic identification services has been developed with the total cost of over 40 million euro, yet none of them is widely used. If the authorities had combined their efforts and committed to a single authentication service, the results would probably have been much better. The bureaucratic complexity and the vast number of information systems and applications involved in running public administration operations make the issue quite complicated. In Finnish public administration there are approximately 5 000 applications serving the population of 5.4 million. The interoperability and maintenance of these systems are major challenges.

Janssen and Hjort-Madsen (2007) argue that the institutional environment can either facilitate or retard processes of structural and technical change and coordination. The structure of public administration determines the way government EA programs can be designed, disseminated and adopted. Likewise, according to a study by Isomäki and Liimatainen (2008), the complex governance and organizational structures of the government are key challenges and it is essential to take the existing structures into consideration when the enterprise architecture is being implemented. However, it is characteristic for government organizations that they tend to operate in stovepipes both organizationally and from the viewpoint of managing information assets (Bannister, 2001; Tarabanis et al., 2001; Valtonen et al., 2010) and have no history of working together (Armour & Kaisler, 2001). The administrative procedures are also highly complex, their goals are intertwined, and they involve many different stakeholders and interests (Tarabanis et al., 2001). Conflicting stakeholder interests have been reported to be a common challenge of enterprise architecture endeavors in private organizations, as well (Hauder et al., 2013).

This ambiguity of goals is partly due to the requirement of administrative equity. Public organizations are guided by the legislation that requires them to serve all the citizens and private organizations as equals and provide them with the same level of service regardless of their economic status, geographic location and other such issues that in case of profit-making organizations could be a reason to position a certain customer into the uninteresting market segment. For this reason, the decisions required during the government enterprise architecture projects cannot be based only on the goals such as profit margins and cost-effectiveness.

2.13 Summary of the literature review

As discussed earlier, several governments worldwide have launched enterprise architecture programs in order to address the challenges they are facing and to further the administrative reform. The enterprise architecture programs are also often used as a starting point for developing government's electronic services,

to increase agility and transparency of the government operations, and to better align IT with the business needs. Based on the previous studies and the literature, this section discussed challenges of enterprise architecture. Some of the reviewed studies cover enterprise architecting in general, while some of them focus on the public organizations. In the latter case, many of the problems seem to relate to regulatory requirements, bureaucracy, and complexity of operations and structures of public administrations.

From the above literature review we can conclude that several of the problems are interrelated and connected by causal relations. For example, should managers and decision makers lack the understanding of what enterprise architecting is about and for what it can be used, they are unlikely to commit to the projects and are unenthusiastic to allocate the enterprise architecture with necessary resources. If the project scope is vague or too large, it is not able to yield useful results and therefore architecture models and other deliverables are soon to become "shelfware". Therefore, by reviewing the previous studies, it is challenging to estimate the severity of individual problems and to identify the possible root causes of failing enterprise architecting attempts. Although the challenges that organizations face while implementing their enterprise architecture seem to be somewhat recurring and similar observations are reported in several studies, the problems are highly dependent on the organizational context and may manifest themselves differently in different organizations.

The studies that focus on the adoption stage of enterprise architecture are strikingly few (Table 3). As the adoption is the key interests of this study, we will later return to the problems identified in this literature review and evaluate their impact to the enterprise architecture adoption process in Finnish public organizations by observing correspondences as well as possible divergences. This literature review was conducted after the empirical data from the case studies was already collected and analyzed. Therefore, the literature review did not set any preliminary guidelines on how to approach the data nor did it set any expectations with regard to research findings, as it is appropriate for the grounded theory research approach (e.g., Kelle, 1995, 41; Richardson & Kramer, 1996).

3 RESEARCH DESIGN AND METHODS

This chapter discusses the research design and the research methods that were used during this research. Before we describe our research process, we will discuss characteristics, strengths and limitations of the methods, i.e., case study (Section 3.1) and grounded theory (Section 3.2), which were used during the process and motivate their use. Then, Section 3.3 addresses the each step of our research process, including the techniques used for the data collection, and explains how the above-mentioned methods were adapted for our purpose. At the end of this chapter, we will also discuss the reliability and validity of the data collection and analysis, as well as of the research process in its entirety.

According to Carroll and Swatman (2000), while doing qualitative research, the researcher can put the emphasis on either effectiveness or efficiency. Effectiveness requires that the research design only loosely follows a predefined structure and that the researcher tries to minimize the effect of preconceived notions to allow him or her be maximally sensitive to concepts that arise from the data. In the second approach, the efficiency is pursued by focusing the research with the help of pre-conceived notions and by following predefined conceptual structure. (Carroll & Swatman, 2000) The grounded theory method (e.g., Strauss & Corbin, 1990; Strauss & Corbin, 1998), which we used as our primary research method during the research process, requires the researcher to adopt the effective approach.

The data for this research was collected by exploiting techniques of case and survey studies. The first stage of our research process was an exploratory two-case study that utilized several different data collection methods and focused on creating the basis for the forthcoming theory building. After the data from the case studies were collected, the data analysis in form of the grounded theory method's open and axial coding took place. This resulted in a preliminary conceptual framework of the problems of enterprise architecture adoption. The second stage of the research process included a practitioner survey study. The purpose of the survey was to validate and complement our suggestive findings by exposing them to a wider audience, and to gain a more comprehensive understanding about the issues hindering the enterprise architecture adoption. In between the first and the final stages of the research process, we collected

information from several organizations that had either recently started using enterprise architecture or were currently adopting it. These cases served as complementary cases that provided us with supplementary data. None of the complementary cases, however, was treated as equal to our primary research cases and the survey study, as the procedures of data collection and documentation were more loosely followed in their treatment. The final stage of the grounded theory research process took place after all the data (from the preliminary case studies, the complementary case studies, the literature review, and the survey study) were collected and analyzed. During this stage, we conducted the selective coding that resulted in a theoretical model that describes the challenges and critical success factors of enterprise architecture adoption in public organizations.

3.1 Case study

The case study is research approach that can be used to gain an in-depth understanding about a specific phenomenon, such as a program, an event, a process, an institution, or a social group, and meaning for those involved (Merriam, 1988; Laws & McLeod, 2004). Case studies often accommodate different disciplinary perspectives and attempt to get as close to the subject of interest as possible (Laws and McLeod, 2004). Therefore, an applicable method for data collection for a case study is the direct observation in natural settings. The researcher's interest lies rather in the process than outcomes, in context rather than a specific variable, and in discovery rather than confirmation. (Laws & McLeod, 2004) It is typical for the research setting of a case study that the researcher cannot control all the variables of interest. However, according to Merriam (1988), the case study's unique strength is its ability to deal with a full variety of evidence, including documents, artifacts, interviews and observations.

3.1.1 Types of a case study

A case study research can be carried out following several different approaches and it can have different goals with regard to type of information the researcher is seeking to gather. According to Yin (1984), there are at least six types of case studies as summarized in Table 4.

Table 4 Types of case studies according to Yin (1984)

	Single case study	**Multiple case studies**
Exploratory	Type 1	Type 2
Descriptive	Type 3	Type 4
Explanatory	Type 5	Type 6

First, the research can be based either on a single case or on multiple cases. Yin then classifies the case studies as exploratory, descriptive, and explanatory. An exploratory case study aims at defining the questions and hypotheses of a sub-

sequent study or at determining the feasibility of the desired research procedures (Laws & McLeod, 2004) and, therefore, fieldwork and data collection may be undertaken prior to these activities (Tellis, 1997). An explanatory case study presents data that explains how events occurred, reflects cause-and-effect relationships, and is thus suitable for doing causal studies (Tellis, 1997; Laws & McLeod, 2004). A descriptive case study presents a complete description of a phenomenon within its context (Laws & McLeod, 2004). For descriptive cases it is recommended that the researcher begins with a descriptive theory (Tellis, 1997) or bases the work on an existing theoretical model. Case study research itself can also be used for the purpose of theory creation (Eisenhardt, 1989), as it is done in our research.

Cunningham (1998), on the other hand, has identified nine different case study methods, each of which is suitable for a different purpose. Cunningham classifies the methods into the three types: intensive case research, comparative case research, and action research. Table 5 summarizes the different types of case studies, their purpose, the key assumptions behind the approaches, typical research situations for each, and the ways to implement such a research.

Table 5 Types of case studies according to Cunningham (1998)

	Type of case study		
	Intensive cases	**Comparative cases**	**Action research**
Purpose	To develop theory from intensive exploration	To develop concepts based on case comparisons	To develop concepts which help facilitate the process of change
Assumption	Creativity through comparison with existing theories	Comparisons of cases leads to more useful theory	Theory emerges in the process of changing
Situation	Usually evolves out of a researcher's intensive experience with culture or organization	Usually concepts are developed from one case compared with another case	Developing theory to assist practices and future […] science
Types	Narratives Tabulations Explanatory Interpretive	Case comparisons Case survey Interpretative comparisons	Diagnostic action research Experimental action research

Our research falls in between several of the presented categories. Basically, it is an exploratory multi-case study with a focus on theory building. Our preliminary cases (Sections 4.1 and 4.2) were studied simultaneously and comparatively in order to identify their common attributes. Through the comparison, the cases were treated as equals to broaden and strengthen the foundations of the emerging conceptual model (i.e., the axial categories). The data collected from the cases also allowed us to define hypotheses about the problems that are critical to a successful adoption of enterprise architecture. These hypotheses were then tested with the survey study and were used to focus the concluding results of this research. In regard to case studies, our main interest was not to explain the cases as such but rather to collect data on that the theory could be grounded. Therefore, we used case studies primarily as a data collection method. Finally, the key purpose of the theoretical model developed during this re-

search is to provide practical value for the organizations adopting the enterprise architecture; thus, to facilitate the change rather than to pursue the all-inclusive description of a static research object.

During the later stages of the research process, our complementary cases were treated as comparative cases. The purpose was to test and enhance the concepts and categories that were developed from the previous cases and to deepen the understanding about the studied phenomena.

3.1.2 Problems of a case study research

Next, problems of a case study research setting are briefly discussed to allow the reader to evaluate the feasibility of the research process and methods chosen for this study. We will further address the issues related to the scientific foundations of a case study research in the Section 3.4 where the validity and reliability of the research are assessed.

Lee (1989) has presented methodological problems raised by the study of a single case. The four problems include 1) making controlled observations, 2) making controlled deductions, 3) allowing for replicability, and 4) allowing for generalizability. In testing for relationships that are theorized to exist among different factors, natural scientists observe the influence of one factor on another factor and try to remove or control the confounding influences of all other factors. Laboratory experiments let the researchers use control groups and treatment groups, whereas in statistical experiments the control is accomplished with the help of statistical controls. A case study, however, takes usually place in a real-world setting that precludes the laboratory controls and experiments and often yields more variables than data points, which renders statistical controls inapplicable. (Lee, 1989)

In the natural sciences, it is common to make controlled or logical deductions with mathematical proportions. However, it is rare that a case study would produce numerical data. Instead, the case researcher must manage with qualitative data and verbally stated proportions. Rich sources of empirical data on one hand allow the observation of complex organizational environments but these variables are often difficult to replicate in experimental research (Fernández, Lehmann & Underwood, 2002). Such empirical data easily favors thick narrative descriptions instead of creation of testable theories (Eisenhardt & Graebner, 2007). With regard to replicability, Lee (1989) points out that the case researcher is unlikely to observe the same set of events (the same configuration of individuals, groups, social structure, etc.) unfold again in the same way. This makes the subsequent attempts to replicate the study in order to verify the findings very difficult, if not impossible. Because the research setting of a case study cannot be controlled, Cunningham (1998) recommends the use of evidence from different viewpoints and time perspectives.

Finally, the fourth problem concerns how to allow for generalizability. The generalizability of a case study research has been questioned and it has been argued that the findings based on unique and non-replicable events can only claim validity in the context of the particular cases (e.g., Hitchcock & Hughes, 1989; Lee, 1989; Walker, 1993). Therefore, generalization of the case study re-

sults, from either single or multiple cases, is made to model or theory and not to population (Yin, 1984). Multiple cases can be used to strengthen the results by replicating the pattern matching, and thus to increase confidence in the robustness of the theory (Tellis, 1997).

The typical weaknesses of building theory from cases include similar issues. According to Eisenhardt (1989), with rich quantitative data there is a risk that the resulting theory tries to capture too much. If the data does not allow the use of quantitative instruments or observations across multiple studies, the researcher may not be able to assess which are the most important relationships and which are idiosyncratic to a particular case. The resulting theory can be very detailed but lack the simplicity of overall perspective or it may be overly narrow. In any case, raising the level of generality of a case study based theory is always a challenge that must be acknowledged.

In response to the challenges that were discussed above, in addition to our preliminary cases, we observed complementary cases a few years later than the original ones, and conducted a survey study that allowed us to present our preliminary findings to a larger audience and to collect quantitative data on the phenomenon that was until then only observed in terms of qualitative data.

3.2 Grounded theory

The field of information systems research has been a late adopter of the grounded theory research method that social scientists have used for over 40 years (Fernández, 2004). However, the use of grounded theory has gradually increased over the years as qualitative research has become more prevalent in information systems studies (Urquhart & Fernández, 2006). There are examples of highly meritorious use of grounded theory in information systems research, such as Orlikowski's (1993) MIS Quarterly's Best Paper Award winning study and the method has proved to be well suited for developing context-based, process-oriented descriptions and explanations of information systems phenomena (Myers, 1997; Urquhart, Lehmann & Myers, 2010).

Grounded theory is a qualitative research method that can be used to analyze phenomena such as social processes and human interactions, usually in their natural environments. There has been some discussion whether grounded theory is a methodology (e.g., Glaser, 1992; Allan, 2007; Holton, 2007) or a method (e.g., Strauss & Corbin, 1990; Urquhart & Fernández, 2006; Fendt & Sachs, 2008). For an in-depth discussion on the topic, see Tan (2009). We approach grounded theory as a method, in accordance with Gurd (2008) who argues that methodology reflects the ontological and epistemological beliefs while method concerns the specific research practice, and Strauss and Corbin (1998, 3), according to whom a method is a set of procedures and techniques for gathering and analyzing data. In the following, we will apply grounded theory as a tool-like instrument for theory building rather than as a methodology.

Grounded theory uses a systematized and logically consistent set of collection and analysis procedures for qualitative data to inductively develop a theo-

ry or a conceptual model describing the phenomenon under the research (Martin & Turner, 1986; Strauss & Corbin, 1990, 24; Pidgeon, 1991; Fernández, 2004). In short, grounded theory is "the discovery of theory from data" as expressed by Glaser and Strauss in their pioneering work (Glaser & Strauss, 1967, 1). In contrast to quantitative methods, where the existing factors must be recognized prior to initiating the research (Crook & Kumar, 1998), when using the grounded theory method, the researcher attempts to identify patterns in data and by analyzing these patterns derive an empirically valid theory (Glaser & Strauss, 1967; Martin & Turner, 1986; Urquhart & Fernández, 2006). Thus, the goal of the grounded theory research is not to test the validity of an existing theory but rather let a new theory to inductively emerge from the researched phenomenon itself (Strauss & Corbin, 1990). For a theory-building qualitative research, the grounded theory method and its procedures are among the most influential and most widely used research approaches (Strauss & Corbin, 1997).

Glaser and Strauss (1967) argue that grounded theory is well suited for studying the phenomena that are lacking the existing research. According to Strauss and Corbin (1990, 19), grounded theory is to "uncover and understand what lies behind phenomenon about which little is known". According to Tan (2009), regardless of the discipline, grounded theory research is best applicable in the following cases:

- The researcher seeks to create a theory about issues of importance in people's lives and specifically focuses on human interaction or aims to explore new territory (Denscombe, 2003).
- The study focuses on new socio-technical phenomena (Fernandez, 2004).
- The area of interest is a developing one and does not have a long, firm and empirically based literature (Goulding, 1999).

Since their original work published in 1967, Glaser and Strauss disagreed on some focal issues regarding on how to carry out a grounded theory research. This disagreement split the grounded theory into Glaserian and Straussian paradigms. Kelle (2005, 14) has presented a practically oriented summary of the differences between the paradigms: "The controversy between Glaser and Strauss boils down to the question whether the researcher uses a well-defined 'coding paradigm' and always looks systematically for 'causal conditions' and 'consequences' in the data, or whether he or she should employ theoretical codes ad hoc, thereby drawing on a huge fund of 'coding families'". The inductive approach assumes that theories can emerge out of data when meticulously examined, while theoretical strand acknowledges the usefulness of prior knowledge about the world and scientific theories (Bryant & Charmaz, 2007, 223). Glaser stresses the emergence of theory by data conceptualizations, while a coding process introduced by Strauss and Corbin (1990; 1998) has a strong emphasis on conditions, context, interaction strategies, and consequences (Tan, 2010; Goulding, 2002, 158). For Strauss and Corbin (1998, 15), a theory is "a set of well-defined concepts related through statements of relationship, which together constitute an integrated framework that can be used to explain or predict phenomena". According to Strauss and Corbin (1990), such a theory derived from the phenomenon must meet four criteria: 1) fit, 2) understanding, 2) generality, and 4) control. Fit denotes that the theory must fit the substantive data,

i.e., the theory should explain the data set. As the theory is constructed from a corpus of data, the resulting theory should explain at least this one set of data perfectly. Understanding entails that the theory is comprehensible to those involved in the area of study. This requirement can also be dissected from the viewpoint of abductive inference that aims at 'making sense' of the phenomena under the examination. Generality is to ensure that the theory is applicable in a variety of context. Finally, the theory should provide control over the actions toward the phenomenon. Another major premise of grounded theory research is to produce accurate and useful results, or as Glaser and Strauss write: "basic position is that generating grounded theory is a way of arriving at theory suited to its supposed uses" (1967, 3). Therefore, grounded theory has its theoretical underpinnings especially from pragmatics.

Glaser criticized Straussian approach for adopting a process that emphasizes conceptual description over theory generation. Glaser argued that open coding and category building must not be forced into preconceived second-level axial groupings (McNabb, 2002, 313). Despite of their different views, both Glaserian and Straussian approaches have been used in numerous studies and choosing between them should be based on the data, specific research topics and the goal of research.

O'Connor, Netting and Tanner (2004) investigated 229 dissertation abstracts of the studies that utilize grounded theory. They established two measures for validating grounded theory research based on the underlying assumptions and paradigmatic dimensions (Tan, 2010):

- Positivist, objectivist assumptions: grounding in data (i.e., assuming the research can be generalized eventually); and
- Interpretive, subjectivist assumptions: grounding in context (i.e., focusing on context-embedded meaning made within multiple perspectives).

From the epistemological viewpoint, the research approach applied in this study is rather interpretive than positivist. It is essential to credit the complexities of the organizational context as well as participants' assigned subjective and intersubjective meanings by incorporating them into an understanding of the phenomenon (Martin & Turner, 1986; Pettigrew, 1990; Orlikowski, 1993). Therefore, our research mainly follows the Straussian approach with regard to underlying assumptions it makes and the process of data analysis procedures. Jones and Alony (2011) have summarized the central differences between the Glaserian and Straussian approaches to grounded theory as presented in Table 6.

Table 6 Comparison of Glaserian and Straussian schools of grounded theory (Jones & Alony, 2011, 5)

GLASERIAN	STRAUSSIAN
Beginning with general wonderment (an empty mind)	Having a general idea of where to begin
Emerging theory, with neutral questions	Forcing the theory, with structured questions
Development of a conceptual theory	Conceptual description (description of situations)

(Continues)

(Table 6 continues)

Theoretical sensitivity (the ability to perceive variables and relationships) comes from immersion in the data	Theoretical sensibility comes from methods and tools
The theory is grounded in the data	The theory is interpreted by an observer
The credibility of the theory, or verification, is derived from its grounding in the data	The credibility of the theory comes from the rigor of the method
A basic social process should be identified	Basic social processes need not be identified
The researcher is passive, exhibiting disciplined restraint	The researcher is active
Data reveals the theory	Data is structured to reveal the theory
Coding is less rigorous, a constant comparison of incident to incident, with neutral questions and categories and properties evolving. Take care not to 'over-conceptualize', identify key points	Coding is more rigorous and defined by technique. The nature of making comparisons varies with the coding technique. Labels are carefully crafted at the time. Codes are derived from 'micro-analysis which consists of analysis data word-by-word'
Two coding phases or types, simple (fracture the data then conceptually group it) and substantive (open or selective, to produce categories and properties)	Three types of coding, open (identifying, naming, categorizing and describing phenomena), axial (the process of relating codes to each other) and selective (choosing a core category and relating other categories to that)
Regarded by some as the only 'true' grounded theory method	Regarded by some as a form of qualitative data analysis (QDA)

3.2.1 Data analysis in grounded theory research

It is essential to the grounded theory research that empirical (i.e., data gathering) and theoretical (i.e., data coding and analysis) activities are tightly interwoven. Data collection and analysis are interrelated processes and the analysis should begin as soon as the first bit of data is collected (Corbin & Strauss, 1990). This allows data and analysis to benefit from each other and advance the growth of insight (Glaser & Strauss, 1967, 32). According to Strauss and Corbin (1990), there are three basic elements to the data analysis, namely concepts, categories and propositions. These are related to the three-level coding schema: open, axial, and selective coding (Figure 10). The coding is of central importance for generating a grounded theory. As it is easy to get lost in the rich qualitative data, codes give condensed and abstract view to the data and allow the researcher to transcend its empirical nature (Glaser, 1978, 55).

Concepts serve as the labels that the researcher uses to conceptualize the phenomena that appear in the data. Concepts are identified during the first phase of the coding process, the open coding. During the coding, the phenomena that the researcher believes to carry some relevance are labeled with descriptive concepts. Then, as the researcher encounters other incidents that appear to resemble the same phenomena, they are labeled with the same concept (Corbin & Strauss, 1990). Essentially, this means that the data is read and sections are labeled according to the matter of topic. Comparing incidents and naming like phenomena with the same term accumulate the basic units for theory (Corbin & Strauss, 1990). At this time, it is often advised that the researcher should avoid focusing on any predetermined themes. According to Glaser (1978, 56), open coding is coding the data in every way possible, or "running the data open".

This also allows the researcher to code different incidents using as many different codes as necessary.

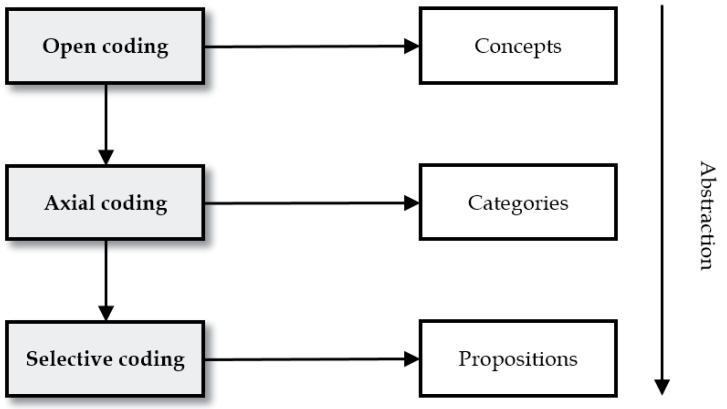

Figure 10 Grounded theory data analysis

Categories are the product of axial coding. Corbin and Strauss (1990) describe categories to be higher in level and more abstract than the concepts they represent. However, they are generated through the same analytic and comparative process to highlight similarities and differences between the lower level concepts. Thus, the main goal of defining categories is to identify the concepts that represent or can be seen to belong under the same category. According to Corbin and Strauss (1990), categories are the cornerstones of developing theory and they provide the means by which the theory can be integrated.

In many cases, there are several different ways to categorize the concepts and the most suitable approach should be chosen in accordance to the goal set for the research. In their example, Corbin and Strauss (1990, 7) cite a respondent's statement: "Each day I spread my activities over the morning, resting between shaving and bathing". This phenomenon is labeled as "pacing". Corbin and Strauss continue by telling that in addition to "pacing" the researcher might generate concepts of "self-medicating", "resting", and "watching one's diet". Further, according to Corbin and Strauss (1990, 7), while coding, the researcher may notice that these concepts represent activities directed toward a similar process: keeping an illness under control. Therefore, Corbin and Strauss (1990, 7) conclude that the concepts can be grouped under the more abstract category "Self Strategies for Controlling Illness". In this case, the rationale behind the categorization is that the activities (concepts) are directed toward a similar process (category). The above example also manifests some characteristics to Straussian approach to theory building. The researcher takes an active role in interpreting and revealing the theory and therefore structures the data accordingly. One could plausibly argue that in the above example several different concepts and categories could be applied as well, should the researcher pursue different interests with regard to the theory describing the data.

In general, however, during the axial coding the researcher examines the relationships between the central phenomenon of interest, the causal conditions

that relate to the phenomenon, the context in which the phenomenon exists, and any strategies and consequences of the emerging phenomena (Crook & Kumar, 1998).

The propositions are the third basic element of grounded theory. They indicate generalized relationships between a category and its concepts and between discrete categories (Pandit, 1996). Accordingly, the third coding phase of grounded theory research is called selective coding. This phase aims at integrating and refining the theory by identifying the core category that characterizes the phenomena. The other categories are subordinates to the core category and it serves as the root for the resulting conceptual system. According to Creswell and Brown (1992), during the selective coding, the researcher should develop a narrative that integrates the results of axial coding.

Strauss and Corbin (1990) emphasize that grounded theory is not generated a priori and then tested. Instead, it is "inductively derived from the study of the phenomenon it represents. That is, discovered, developed, and provisionally verified through systematic data collection and analysis of data pertaining to that phenomenon" (Strauss & Corbin, 1990, 23). In principle, it should be possible to create a grounded theory inductively and while doing so, avoid any preconceptions and prior knowledge about the researched area. However, this is very challenging and it is difficult to come up with well-reasoned guidelines for the categorization without any prior theoretical knowledge. Therefore, it has been argued that the effect of researcher's previous knowledge and subjective input to the analysis process cannot be fully avoided (e.g., Charmaz, 2006). As noted by Urquhart and Fernández (2006), instead of pure induction, it is more accurate to say that the grounded theory research does not start with a theory to prove or disprove.

During our research process, we were aware of our research objectives while coding and analyzing different data. This allowed us to rationalize the process of theoretical and purposeful sampling (Patton, 2002) and also to establish a focused and stable basis for the categorization. Therefore, instead of trying to apply the strictly inductive approach, we adopted the approach that lends towards the abductive reasoning, i.e., the inference to the best explanation. This also allowed us to draw from the evidence that may not be explicitly available in the recorded data but instead originates in the field observations and the theoretical sensitivity that follows the researcher's immersion in the data.

3.2.2 Types of theories generated with grounded theory approach

Generally, the goal of grounded theory research is to produce either a substantive theory or a formal theory. Substantive theories are grounded on research on one particular substantive area (Strauss & Corbin, 1994, 281) or an area of enquiry (Urquhart et al., 2010). While substantive theory is purposed to apply only to a specific substantive area, it is independent of the observed incidents and may have important general implications and relevance (Glaser & Strauss, 1967, 79). Formal theories, on the other hand, represent the highest level of abstraction in grounded theory. Independently of substantive area, a formal theory (or general theory) focuses on conceptual entities such as organizational

knowledge, organizational learning or collaborative work (Urquhart et al., 2010). It is suggested that a comparative analysis of different substantive theories within a particular substantive area as well as comparison of different substantive theoretical ideas from many different cases are needed in order to create a formal theory (Glaser & Strauss, 1967; Urquhart et al., 2010). While a formal theory can be created directly from data, it is more desirable and usually necessary to start from a substantive theory (Glaser and Strauss, 1967, 79). In this sense, a substantive theory provides a stimulus and an initial direction for the development of formal theory.

Although the theory created in our research (Chapter 8) can be seen to be independent of a specific area of enquiry, is based on multiple cases as well as data representing different types of organizations, and arguably is 'sufficiently general to be applicable to a range of situations' (Orlikowski, 1993, 335), our research setting is so deliberately focused on a certain substantive area that, for the time being, we refrain ourselves from pursuing a formal theory and will leave it as a topic for future research.

3.2.3 Generic grounded theory research process

Although it is often advised that preconceived theoretical ideas should be avoided during the early stages of grounded theory study (e.g., Eisenhardt, 1989; Kelle, 1995; Richardson & Kramer, 1996), a researcher can begin the research process driven by his or her previous experiences, an anecdotal evidence, a hunch, or even other theories (Urquhart et al., 2010). These lead a researcher to an area of enquiry, i.e., the substantive area that is relevant for the purpose of research and suitable for providing the first batch of data (Figure 11). Once the data has been collected, it is coded and the characterizing categories are formulated. According to Urquhart et al. (2010), data can come from many different sources and can be collected using many different methods, which enables corroboration and triangulation of the data.

Next, additional data are acquired to further the conceptualization and to establish the relations between the emerging categories (Glaser & Strauss, 1967, 35). Grounded theorists emphasize the constant comparison between new and previous data, concepts and categories, and that the additional data should be acquired by a means of theoretical sampling until no more new categories and relations emerge (Strauss & Corbin, 1994). Finally, the saturated concepts are then reduced to the relationships between core categories that form a grounded theory. The purpose of this process is to ensure that the produced theory is firmly anchored in the data that led to its formulation (Urquhart et al., 2010).

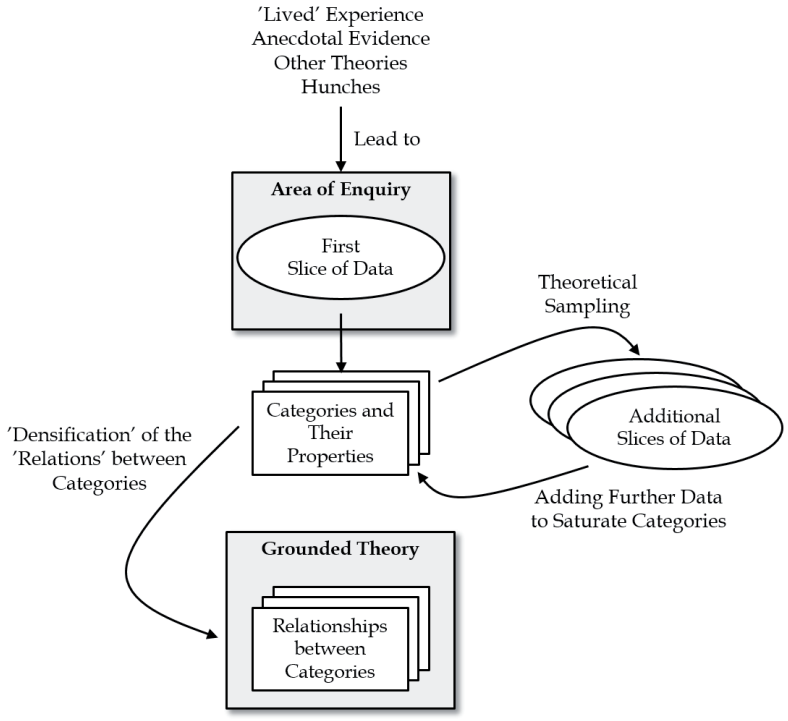

Figure 11 Data collection and analysis in grounded theory (Urquhart et al., 2010, 363)

3.3 Research process

Our research process explained in this section follows the basic structure of data collection and analysis of the above generic grounded theory process by Urquhart et al. (2010), and, while reasoning the decisions that were made during the process, it refers to the framework of building theory from case study research by Eisenhardt (1989) as well as Pandit's (1996) application of the grounded theory method for creation of theory. Figure 12 shows the overall structure of our grounded theory research process. It includes all the components presented by Urquhart et al. (2010) and elaborates their model by adding the specific activities that were carried out during our research.

The concept of 'slice of data' was coined by Glaser and Strauss to reflect the fact that different kinds of data give the researcher different views from which to understand and develop the properties of categories (Glaser & Strauss, 1967, 65; Urquhart et al., 2010). Slices of data can come from many different sources and can be collected using various data collection methods, which provides an opportunity for data triangulation (Urquhart et al., 2010). The data for our research was first obtained from the case studies using several data collection methods and then by conducting a practitioner survey study. While describing the stages of our research process in the following, we also cover the

data collection methods that were used during the process. The data analysis, although inseparable from the data collection in grounded theory research, will be discussed later, in Chapters 5, 6, and 7.

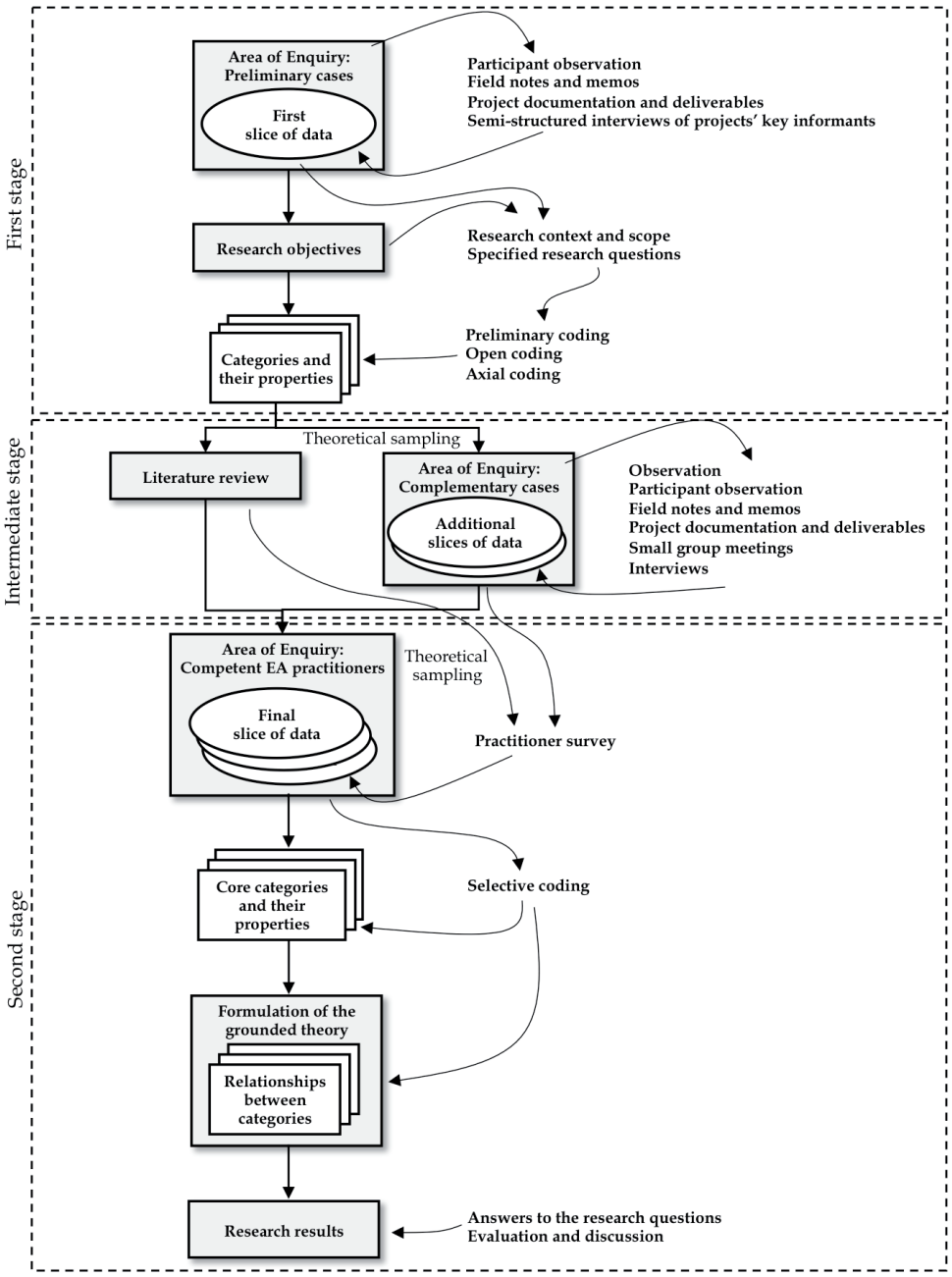

Figure 12 Our adaptation of grounded theory research process

During a case study, typically several data collection techniques such as archives, interviews, questionnaires, and observation are combined (Eisenhardt, 1989). In the field of qualitative research, the term triangulation is used to describe the use of multiple strategies to study the same phenomenon (Denzin, 1989). It is argued that "looking at something from several different points gives a more accurate view of it" (Neuman, 2000, 521) and triangulation lets one use the strengths of one method to offset the weaknesses of another (Denzin, 1989). When several data sources are used to describe the same phenomenon, it is possible that in part the results seem inconsistent. However, in theory building research, triangulation across various techniques of data collection provides multiple perspectives on the phenomenon, supplies more information on emerging concepts, allows for cross-checking, and yields stronger substantiation of constructs (Glaser & Strauss, 1967; Eisenhardt, 1989; Pettigrew, 1990; Orlikowski, 1993). Triangulation also broadens the scope and improves the reliability of the research (Pries-Heje, 1991). Figure 13 illustrates our data triangulation setting across the areas of enquiry in this research effort. The bidirectional arrows in Figure 13 indicate that the data sources were used comparatively to strengthen the validity of analysis of each source, whereas the unidirectional arrows indicate that the sources were used as a means of inference.

Using multiple data sources together made it possible for us to obtain a more comprehensive picture of the phenomena that were being studied. Participant observation allows one to obtain a large amount of contextual data and a wide range of types of data and informants but does not lend itself to the efficient management of data. The individual interview, on the other hand, makes it possible to gather a large amount of data over a short period of time but the data may be erroneous or misleading depending on the skills of the interviewer and the willingness of informants to be open and honest. (Marshall & Rossman, 1989; Roer-Strier & Sands, 2006) Therefore, towards the end of the theory building process, we compared our emerging findings with the existing literature and then evaluated them with a means of quantitative data obtained from the survey study that was targeted to the audience outside the case organizations.

3.3.1 Preliminary research cases

Our research process began with selection of the first cases. The selection of studied population defines the set of entities from which the research sample is drawn, controls unnecessary variation, and helps to define the limits for generalizing the findings (Eisenhardt, 1989). Glaser and Strauss (1967) recommend that instead of sampling cases by random, they should be chosen for theoretical, instead of statistical, reasons, i.e., with a means of theoretical sampling. The cases may be chosen to replicate previous cases or to provide examples of polar types (Eisenhardt, 1989).

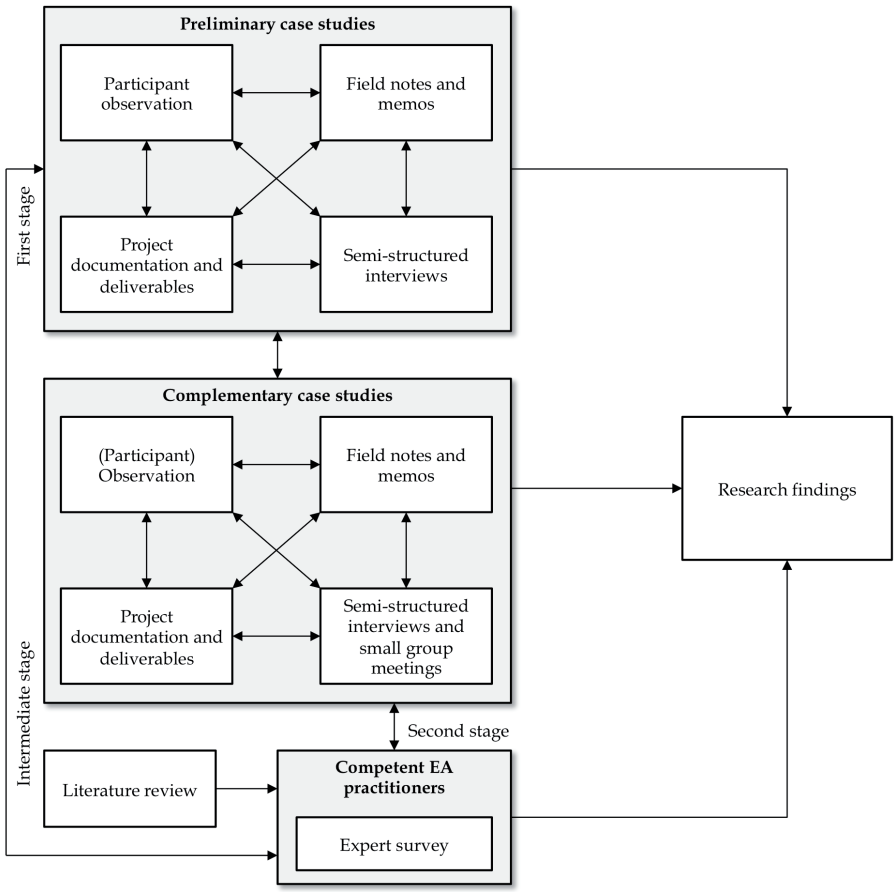

Figure 13 Data triangulation setting

The first cases that we studied were the enterprise architecture adoption projects that took place in two Finnish government agencies during the years 2007 and 2008. The cases are discussed in more detail in Sections 4.1 and 4.2. The project managers were contacted and they approved our participation as a researcher in the projects. The original purpose of the study, which was conducted while we worked in the Finnish Enterprise Architecture Research project[8], was to document the agencies' experiences on enterprise architecting in general and on the use of then recently released Finnish government EA Method.

The participant observation was first used as a method to obtain qualitative data from the case studies. Our role as an observer varied between passive participation, i.e., activities were observed in the setting but without participation in activities, and moderate participation, i.e., activities were observed in the setting with almost complete participation in activities (Kawulich, 2005). For example, we would often participate in discussions during the project group meetings and take part in the project workshops. However, sometimes we pur-

[8] https://www.jyu.fi/it/laitokset/titu/projektit/kaynnissa/fear/in_english

posefully avoided taking an active role, and just observed and took notes. This was the case, for example, during workshops in which the staff outside the project groups was invited to join. These situations also broadened the scope of observation beyond the project groups.

Benoliel (1996) argues that grounded theory research often fails to identify basic social processes by using interview data only. Therefore, the participant observation provided us with better tools for data analysis as it allowed us to recognize the context and social processes behind the data. During the observation, we also got acquainted with the personnel of the case organizations and later while conducting the interview study, this helped in creating the open and relaxed atmosphere.

While participating the case projects, we cursorily reviewed literature on enterprise architecture to familiarize ourselves with the field that we were not previously familiar with. In order for a researcher to retain theoretical flexibility, Eisenhardt (1989) points out that ideally a theory building research should begin with no theory under consideration and no hypothesis to test. At the time we first entered the field, we had not defined hypotheses or exact research questions that we wanted to seek answers for, and the study at this point largely focused on just making neutral observations on the agencies' experiences on enterprise architecting. In this sense, the premise of conducting grounded theory research with an "empty head" (e.g., Kelle, 1995, 41; Richardson & Kramer, 1996) was quite well achieved. During the early stages of the field research and data collection, possible bias caused by preconceptions or prejudices remained minimal in relation to our observations, and during the later stages of the research process their effect was intentionally avoided.

The grounded theory approach advocates the use of multiple data sources converging on the same phenomenon. Glaser and Strauss (1967, 65) write that "in theoretical sampling, no one kind of data on a category nor technique for data collection is necessarily appropriate. Different kinds of data give the analyst different views or vantage points from which to understand a category and to develop its properties". Data triangulation provides stronger evidence for constructs (Eisenhardt, 1989), enhances internal validity and strengthens grounding of the theory (Pandit, 1996). Our data from the cases was collected by taking field notes and memos, reviewing project deliverables, and by interviewing key informants of the projects.

According to Eisenhardt (1989), field notes, which are written records of observation data produced by fieldwork (Montgomery & Bailey, 2007), serve a critical purpose in accomplishing the overlap of data collection and analysis, as well as cross-case comparisons. We documented our observations and emerging ideas in dozens of pages of notes. Although field notes and memos are sometimes considered too subjective for scientific discussion (Ottenberg, 1990), they are commonly used techniques in qualitative research to record processes of data collection and conceptual insights (Montgomery & Bailey, 2007). For grounded theory research, Strauss and Corbin (1990) as well as Glaser (1992) advocate the use of noting. As pointed by Montgomery and Bailey (2007), while Strauss and Corbin have developed the use of memos with a topology (e.g., code notes, operational notes, theoretical notes, and types of diagrams), Glaser

(1998, 178) suggested that a theoretical memo should simply capture the "meaning and ideas for one's growing theory at the moment they occur". Our approach to using notes was more akin to the one of Glaser's. No different classes of notes were used and there was no systematic method of documenting field experiences with memos. Neither did we code the notes and memos but they were rather used in a supporting role, cross-compared with other data sources while their coding and analysis were being conducted, and then were again reviewed when we started to formulate the core categories.

We also had an access to the project documentation and deliverables. These, too, were used as a secondary source of data that helped the fact checking and filling in gaps in other data when necessary. The project plans also included risk analyses that, although these mainly focused on project management risks, later provided some interesting insights to the research topic.

At the end of the year 2008, we conducted a series of semi-structured theme interviews with the key informants of the enterprise architecture adoption projects in the preliminary case organizations. The semi-structured interview is neither a free discussion, nor does it follow a structured questionnaire. The interview is carried out following an interview guide, which, instead of containing exact questions, presents the themes that are covered during the interview (Järvinen, 2001, 131). Our interviews followed the thematic agenda (Table 7) that was built on topics that had appeared relevant during the participant observation. Ten individual interviews were conducted and each interview lasted approximately two hours. Almost all the active participants of the projects were interviewed and with regard to data saturation, the sample appeared to be sufficient in size. The interviews were recorded and transcribed, and the transcriptions were then sent to the interviewees for validation. Some minor changes to transcriptions were made to hide interviewees' identity and to conceal organizational subject matters that at that time were not made public to a larger audience. Data ordering and time stamping (Pandit, 1996) were performed at the same time with the data collection. In total, the interviews resulted in 170 pages of transcriptions. The quotations from the transcripts that are used in the remainder of this thesis were translated from Finnish to English.

Because the interview data from the preliminary cases was collected using in-depth interviews (cf., Legard, Keegan & Ward, 2003) and due to the interview topics it was necessary that the interviewees had had an active role in the enterprise architecture adoption projects. For the interviewees we chose the persons we believed to be best capable of commenting the topics, and thus used the purposeful sampling by reaching for information-rich cases (Patton, 2002). Another goal was to interview persons who would represent different roles and different groups of enterprise architecture stakeholders (Jonkers, Lankhorst, ter Doest, Arbab, Bosma & Wieringa, 2006) in order to reflect the diversity within a given population (Kuzel, 1992). Thus, the interviewees included both project group members and representatives of the IT consulting companies that delivered the projects. Also the project owners were interviewed. The interviewees' previous experiences on enterprise architecture varied. Some were competent due to their previous professional assignments or personal interests whereas

some had no prior experiences on enterprise architecture at all before their participation in the projects.

Table 7 shows that a variety of themes were covered during the interviews. As mentioned above, the goal of the study was to collect the agencies' general experiences on enterprise architecting so that this knowledge could be passed on to the other government agencies. The interviews were used to complement the data that was collected during the participant observation and helped us to identify issues that had escaped our attention. As we acted both in the roles of a participating observer and an interviewer, we could exploit the knowledge that had accumulated during the observation to adjust the course of the interviews and to reflect and cross-evaluate the different data sources. In order to avoid the influence of researcher's opinions and preconceptions, the questionnaire avoided emphasizing any specific themes. The problems of enterprise architecture adoption, which was later set as our main research interest, were not directly addressed besides the theme 8 in the questionnaire. Thus, our focus was quite broad at the early stages of the research process and it was sharpened only as the research advanced.

Table 7 Topics covered in semi structured interviews in the preliminary case organizations

1	The interviewee's background information, including the current position in the agency and the prior knowledge on enterprise architecture and experience on enterprise architecting.
2	The project group's composition and the interviewee's opinion on its suitability for the task at hand.
3	The methods of working that were used during the project work and the interviewee's opinion on their suitability for the task at hand.
4	The project's objectives and how well the project succeeded in achieving them.
5	Possible changes to the organization and its operations that the project evoked.
6	The interviewee's opinions on the EA Method.
7	The interviewee's opinions on the need for enterprise architecture specific software tools.
8	Difficulties and challenges that were faced during the project work, if any.
9	Need for enterprise architecture related training that became apparent during the project work, if any.
10	The interviewee's proposals for the measures that could be used to support the enterprise architecting in the Finnish government organizations in the future.
11	The interviewee's requirements and expectations for the State IT Management Unit office's operations in future.
12	The interviewee's recommendations for the future enterprise architecture adoption projects in the government agencies.

All the collected data from the preliminary cases was stored in chronological order by using the time-stamped files. The data ordering was performed constantly as new data were gathered. This was done for two reasons. First, the ordering facilitates data retrieval while analyzing data and it allows easier access to other investigators to review the evidence without being limited to the written reports. Second, chronological ordering allows the researcher to determine causal events that appear in data over time. (Yin, 1989, 98-99, 119) Pandit

(1996) also notes that a case study database increases both construct validity and reliability.

3.3.2 Formulation of the research objectives

Eisenhardt (1989) emphasizes that even if the research questions and possible constructs would be early identified, it is important to recognize that they are only tentative. We refrained ourselves from defining research questions until the data collection in the preliminary case organizations was completed. Although the data collection had not focused on the problems of enterprise architecting, it soon became apparent that this was one of the dominant themes that was present throughout all the data. This inspired us to focus our further studies on the problems of enterprise architecture adoption, after which we detailed the research scope and context, and decided on the research questions.

3.3.3 Development of categories and their properties

In qualitative research that aims at theory development, tentative themes, concepts, and relationships between variables start to emerge during the analysis of data. Eisenhardt (1989) advises that the process should remain iterative: the central idea is to constantly compare an emerging theory and data, and through iterations to try to reach a theory that fits the data as closely as possible. Shaping hypothesis involves measuring constructs and verifying relationships similarly to traditional hypothesis-testing research. However, as it is not possible to use statistical tests with qualitative data, the construct definition emerges from the analytical process rather than being specified a priori. (Eisenhardt, 1989) Indicators can vary across the cases and qualitative data is difficult to collapse using exact measures. This is different to the traditional hypothesis-testing research where the aggregate relationships across the data are tested using summary statistics (Yin, 1984; Eisenhardt, 1989). Cases that confirm emergent relationships enhance validity of the relationships whereas disconfirming cases provide an opportunity to refine and extend the theory.

We decided to use grounded theory as our main research method. Grounded theory appeared to be the best suited for our research topic and setting, and it offered good instruments for a systematic analysis of the qualitative data that was already gathered. Prior to entering the open coding phase that usually starts the grounded theory data analysis, as we knew that we were going to focus on the problems of enterprise architecture adoption, we performed a preliminary coding round. During the preliminary coding, we used two broad auxiliary codes, namely *Facilitator* and *Barrier*. According to a theme and tone of the interviewee's statement or other point of data, the Facilitator code was used to mark the subject matters that came forth as factors that helped the adoption of enterprise architecture, while the Barrier was used to mark the themes that hampered the adoption. This should not be confused with the use of a priori constructs to constraint irrelevant variation and to sharpen external validity (e.g., Pandit, 1996) but the preliminary coding was just used to make the following coding process more controllable. In practice, preliminary coding allowed

us to outline the sections of data that contained information relevant to the research questions and to focus on these sections during the open and axial coding.

The phases of open coding and axial coding followed next, in accordance conventional progress of Straussian grounded theory data analysis (Jones & Alony, 2011). At the same time, a conceptual model of problems of enterprise architecture adoption was built. The results of the preliminary, open and axial coding are further discussed in Chapter 5.

3.3.4 Literature review

After the empirical data from the preliminary case studies was coded and analyzed, we started to review existing literature on enterprise architecture (Chapter 2). The review demonstrated that the research on the adoption of enterprise architecture is lacking. The literature review also allowed us to evaluate our axial categories of the enterprise architecture adoption problems against the results of other researchers, which gave us support to that the problems we had identified have relevance also outside of our specific research domain of Finnish government organizations and, on the other hand, that we could add to the existing body of knowledge with our research. The main objective of the literature review, however, was to support the last data collection phase, which was implemented as an online practitioner survey (Chapter 6), and to strengthen the reliability of the survey's measures.

3.3.5 Complementary research cases

As noted by Eisenhardt (1989), researchers tend to leap to conclusions based on limited data (Kahneman & Tversky, 1973), are overly influenced by the vividness of the responses (Nisbett & Ross, 1980) and by more elite respondents (Miles & Huberman, 1984), sometimes tend to ignore basic statistical properties (Kahneman & Tversky, 1973) and may inadvertently drop disconfirming evidence (Nisbett & Ross, 1980). The purpose of cross-case comparison is to avoid premature or even false conclusions as a consequence of biased information processing.

Therefore, in between the preliminary case studies and the final round of data collection, we discussed about the experiences on enterprise architecture adoption and presented our preliminary results to several experts working in local government organizations, institutions of the tertiary and higher education, and private companies. Most of the organizations whose representatives we discussed with had either recently started using enterprise architecture or were adoption it, and therefore had a good perspective to the adoption problems. We obtained data from eleven educational institutions, a national service and development center, three local government organizations, and two private companies. The data collection took place in the small group meetings each of which lasted approximately two hours. The meetings followed the loosely structured agenda during which the following themes were discussed: 1) background information and motivation to start enterprise architecting; 2) action

plan for enterprise architecting; 3) goals of enterprise architecting; 4) present results of enterprise architecting; and 5) overall opinions and experiences on enterprise architecting. Some of the meetings were also scheduled to focus on certain special topics according to the specific experiences and expertise on enterprise architecture management in these organizations. In addition to these data, we conducted a few individual interviews that focused on the problems of enterprise architecture adoption, instead of more generic themes that were addressed during the small group meetings. Appendix 2 details the possible special topics and the data collection techniques for each complementary case organization.

In addition, during the year 2012, we worked at the enterprise architecture adoption project that took place in the University of Jyväskylä. Although we did not participate the project as a researcher, we gathered data throughout the year by documenting the project incidents and making observations from the perspective of our research interests. In this case, a complete participation as an observer was used, i.e., activities were observed in the setting with full participation in the activities as well as the culture (Kawulich, 2005). The complete participation provided us with a deeper understanding on our research topic, showed intra-organizational complexities that affect the enterprise architecture adoption, and gave us new insights to our previously gathered data. As noted by Kawulich (2005), in order to attain a complete understanding of an activity, instead of simply observing, it is important to actively participate in it.

The data collected from the complementary cases served in a supporting role with the primary purpose of providing us with additional slices of data that would enable comparison between different cases and data (Glaser & Strauss, 1967), and allow us to evaluate the construct reliability and to increase the validity of the indicators to be used in the following survey study. Due to the heterogeneity and the purpose of use of supporting data, we decided to not treat these data with a systematic coding procedure. However, in practice, this stage still allowed us the continuous and joint collection and analysis of data, which is deemed as an important characteristic in grounded theory research (Glaser & Strauss, 1967). According to Corbin and Strauss (1990), observations and questions inspired by data analysis must drive the continuous data accumulation so that interrelated procedures expand the research process to capture all potentially relevant aspects and, on the other hand, to drop those that are irrelevant. Overall, this stage in the research process allowed us to confirm, extend and sharpen the resulting theoretical framework.

3.3.6 Survey study

Use of different types of data in combination can be highly synergistic. According to Eisenhardt (1989), quantitative evidence can help a researcher to assess the impressions in qualitative data more objectively. Altering data collection methods in correspondence to emergent themes also allows a theory building research to understand the studied phenomenon in as much depth as is feasibly possible. Slices of data that come from different sources and are collected using

different methods provide an opportunity to corroborate or question findings based on one source of data (Eisenhardt, 1989; Urquhart et al., 2010).

Our final slice of data was obtained from a survey study that was targeted to experienced actors of the enterprise architecture development in the Finnish public sector. The practitioner survey method was deliberately chosen for a number of reasons. At first, we wanted to extend the scope of our research outside the case organizations in order to test and verify the preliminary results by exposing them to a larger, yet highly knowledgeable, audience. Therefore, the survey was targeted to experienced actors of the enterprise architecture development in the Finnish public sector who were approached either directly via e-mail or on special interest forums. Second, before moving to the phase of selective coding, the survey study allowed us yet to enrich our data and to improve the objectivity by means of quantitative and statistical analyses.

We used the literature review alongside with our qualitative data to populate the survey questionnaire with the issues that we believed to pose the most challenge to a successful enterprise architecture adoption. The questionnaire was structured to embody the phases of organizational change processes (especially the ones of Kolb & Frohman, 1970; Slevin & Pinto, 1978; Keen, 1981) that were then detailed with typical work packages from the Finnish government EA Method and other established enterprise architecture methods and development processes (e.g., Boster et al., 2000; Armour & Kaisler, 2001).

The data obtained from the survey study revealed several interesting and even surprising insights. First, as the survey study was conducted several years after the preliminary case studies took place, it showed us what problems of enterprise architecture adoption still remain highly relevant and, on the other hand, which of them no longer seem to pose as much of a challenge. Second, due to the structuring of the survey, it also showed us which specific stages of the enterprise architecture adoption are the most challenging. Especially this latter insight substantially contributed to the process of selective coding, identification of the core categories, and the resulting grounded theory. The structure of survey study and the analysis of its results are explained in more detail in Chapter 6.

3.3.7 Development of core categories and formulation of grounded theory

After the survey study data was analyzed and a reasonable level of theoretical saturation was reached, we started the process of selective coding. The purpose of selective coding is to integrate the existing categories and to reduce the saturated concepts as much as possible to the relationships between core categories (Urquhart et al., 2010) to build a theoretical framework. By this means, the categories are conceptualized into theoretical constructs according to their properties and by establishing relations between them (Glaser & Strauss, 1967, 35). Inferential and/or predictive statements about the phenomena are made by stipulating relationships between individual constructs. These relationships can be causal, associations or influences. (Urquhart et al., 2010) The selective coding resulted us with the three core categories, whose relationships were mainly examined in a form of influence effects. We end up proposing that our core cate-

gories not only describe the major problems of enterprise architecture adoption but they also represent its critical success factors.

Based on the identified core categories, we formulated a theoretical model of the key issues in enterprise architecture adoption (Chapter 8). Whereas the earlier stages of the research process focused on identifying and analyzing the problems of enterprise architecture adoption, we present the concluding theoretical model in a form that can give organizations guidelines to overcome the problems by taking advantage of their existing capabilities and driving motivators. At this stage, the properties of each core category and their relationships are also elaborated and the potential practical implications of the model are discussed.

3.4 Reliability and validity of the research

Qualitative research uses a naturalistic approach whose purpose is to understand phenomena in the context-specific setting (Golafshani, 2003) where the researcher does not attempt to manipulate the phenomenon of interest but rather let it unfold naturally (Patton, 2002, 39). Whereas quantitative studies seek causal determination, prediction, and generalization of findings, qualitative research seeks illumination, understanding, and extrapolation to similar situations (Hoepfl, 1997; Golafshani, 2003). The definitive goal that the assessment of reliability and validity pursue is the generalizability of the research. They both represent the quality attributes of the measurement irrespective of whether the measures are quantitative or qualitative.

Generalization of the case study results, from either single or multiple cases, is made to the theory and not to the population (Yin, 1984). As noted by Corbin and Strauss (1990), the grounded theory research aims at perfectly explaining the data the grounded theory will be based on. Strictly considering, generalization of the grounded theory should only be assessed against the corpus of data in the original context and not the broader population. This does not, however, rule out that grounded theory research can produce theories that – although often just implicitly (Corbin & Strauss, 1990) – can be used to explain and predict the similar phenomenon that take place in reasonably similar surrounding and conditions.

The generalization of grounded theory takes place through the research process (Mjoset, 2005) and therefore it is required that the grounded theory "specifies the conditions under which a phenomenon has been found in this particular data" (Corbin & Strauss, 1990, 424). As with any research method, evaluation of the research setting and meticulousness of the data collection and analysis can be used to assess validity and reliability of the grounded theory.

The ideas of reliability and validity are originally rooted in positivist research perspective. Positivism is an epistemological perspective that emphasizes that the authentic knowledge arises from sense experience and is based on positive verification. Its key premise is that "the world of phenomena involves an objective reality that can be measured and the relationships between entities

in this world can be captured in data that is reasonably representative and accurate" (Straub, Boudreau & Gefen, 2004, 381). In contrast, social constructivism emphasizes the possibility of alternative interpretations (Kuzmanic, 2009) and as an epistemological stance better supports the use of qualitative instruments.

The use of reliability and validity evaluation are common for quantitative research but their assessment is more challenging for the research that follows the qualitative paradigm. However, increasing efforts are taken to ensure validity and reliability of the results gained with qualitative instruments. As discussed by Straub et al. (2004), modern positivist researchers are willing to accept that many of the entities they articulate are intellectual or social constructions. Therefore, even the positivist research is allowed to address constructs and phenomena that are more a 'fuzzy set' than the near perfect surrogate of an objective reality. As Straub et al. (2004) point out, these constructions still have the permanent presence in the real world and therefore it is possible to evaluate them along the same lines as 'harder' and less subjective realities.

Kirk and Miller (1986, 20) define reliability as the degree to which the finding is independent of accidental circumstances of the research. It can be seen that reliability considers the repeatability and consistency of the measures and other means of data collection and analysis. However, as discussed earlier, for the quantitative research, it is very difficult to set up experimental designs that would perfectly replicate all of the original conditions of the research and to control all the extraneous variables that may affect the phenomenon that is being investigated (Mjoset, 2005). In addition, grounded theory as a research approach relies heavily on the researcher's interpretation of the data and the commonly used data collection methods such as the participant observation are inherently subjective.

The data for our research was collected over a period of six years. We believe that the slight variations that are identifiable in data collected in different points of time are mainly due to the evolvement of practices of enterprise architecting and not due to the measurement error. For example, the preliminary case studies led us concluding that there were some noticeable challenges that related to the EA Method, whereas the recent survey study indicated that most of the respondents were quite satisfied with the EA Method, which has now gone through several iterations and the organizations have had time to learn its idiosyncrasies. Therefore, a reader who is reasonably familiar with the enterprise architecting in Finnish public organizations over the last years should be well capable in evaluating the reliability of this research in the right context. For those readers who are not, we will address the deviations that can be explained with the changes in context over the time.

The data that were collected during the earlier points in time were carried on throughout the entire research process and were constantly compared against new data. Therefore, we argue that our concluding answers to the research questions will depict the issues that were the key challenges to a successful enterprise architecture adoption five years ago and that still are. The fact that our findings have remained reasonably consistent despite of that the data has been collected over the years and using different instruments strongly speaks for the reliability of this study. Although the primary interest of this re-

search is to generalize our data into a form of theoretical model, we believe that the way this research was executed also allows its generalization to a wider population.

The data from the complementary cases that was collected using more informal methods, such as conversations that did not follow a strict agenda, and whose analysis did not follow formal procedures were only used in a supporting and confirming role towards the formulation of the research results. In order to ensure that it is possible to assess the reliability of this research, none of the concluding results were derived so that it would not be possible to trace their argumentation. The axial categories were systematically created according to the frequencies of the coded themes and the final slice of data almost completely comprises of quantitative information that allowed the objective evaluation of our preliminary results. The grounded theory method, however, emphasizes immersion and interpretation of the data and identification of subtle clues. Therefore, instead of constantly forcing ourselves into the rather mechanical coding processes, we see that the approach to the analysis of supporting data, during which we just read the data and pondered about the evidence, gave us an important alternative viewpoint to the phenomenon under the study.

As noted by Golafshani (2003), although the researcher would be able to prove the research instrument repeatability and internal consistency, it is possible that the instrument itself is not valid. Validity concerns whether an observation measures what it is intended to measure (Järvinen, 2001, 145) and how truthful the results are (Golafshani, 2003). Reliability of the instruments is a prerequisite for attaining valid findings. However, as the reliability of individual instruments used in qualitative research is generally difficult to control, we have used both data and method triangulation in order to ensure the reliability and validity of the research. The qualitative data and analyses (First and Intermediate stages of our research process, cf., Figure 12) were first used to guide the formulation of the quantitative instruments, and then again to support the analytical interpretation of the quantitative data and the assessment of validity of the emerging results (Second stage of our research process).

In the next two sections we will address the data collection and analysis methods that were used in this study in regard to their reliability and validity. In addition to triangulation, the key in this is to underline the transparency of the used techniques by documenting all the steps in the research process, so that it is possible for other researchers to evaluate them (Armstrong, Gosling, Weinman & Marteau, 1997).

3.4.1 Data collection methods

Recreating a qualitative research setting is very complex or even impossible as there are several time-dependent, contextual and uncontrollable factors that can affect the observed phenomena (e.g., Kuzmanic, 2009). In addition, characteristics of the researcher always color the collection and analysis of the qualitative data. The researcher-bias inevitably affects the following decisions: from what sources to collect the data, how to compose and utilize the data collection instruments, how to structure the data, which data should be emphasized and

which can be omitted, and when the sufficient level of data saturation has been reached. Therefore, especially naturalistic and qualitative research approaches demand attention to controlling bias and establishing valid propositions (Mathison, 1988). According to Kuzmanic (2009), in qualitative research, validity is not the property of a research tool but rather it should be addressed throughout the entire research process and it is about credibly representing different interpretations to the readers.

Multiple cases strengthen the results by replicating the pattern-matching, and thus increasing confidence in robustness of the theory (Tellis, 1997). Within each case, we used several different sources of data in a triangulation setting (Figure 13). Data triangulation helps eliminating bias and establishing truthful propositions about the phenomenon that is being studied in a qualitative research setting (Mathison, 1988). Utilizing multiple data sources allows the researcher to improve the validity of research by ensuring that independent measures agree, or at least do not contradict, with the findings (Miles & Huberman, 1984; Pandit, 1996).

Participant observation, in particular, is inherently subjective as a data collection method, as it stresses the researcher's observations and personal interpretation of the phenomenon. Although it is forbidden to impose researcher's beliefs and intentions on the subject, the validity and reliability of the observations made during the participation are easy to question. Use of several observers could strengthen the findings and help avoiding observer-bias but for us this was not feasible due to limited resources. Therefore, in our research setting, the data collected through the observation serves only as one, although important, source in the data triangulation. Participant observation does, however, provide a unique first-hand experience on the phenomena that other data collection methods fail to achieve. As discussed earlier, the observations were documented by taking field notes (cf., Appendix 1) that could be compared with other data during the analysis. Instead of basing any of the findings solely on the observations, these data were used to confirm and validate the argumentation of the interviewees and to provide the data coding process with additional guidelines.

Participant observation sessions that took place over several months allowed us to get acquainted with the prospective interviewees of the next data collection stage. This helped in creating an open and unrestricted atmosphere for the interviews. Second, during the data analysis, it helped us to identify the context and social processes behind the data. Finally, it allowed us to compare the interview transcripts with our observation notes, and thus strengthened the construct validity.

The actor-observer hypothesis (Jones & Nisbett, 1971) states that people tend to explain their behavior differently from the way an observer would explain the same behavior (Malle, 2006). It has also been argued that people's behavior change when they are being openly observed, which may limit the credibility of the findings (Germain, 1993). This has a significant effect in terms of validity of the behavioral data collected through the open observation. In our case, however, this is not a relevant problem as the traits of behavior of the observed persons were not an item of interest.

The interviews of the projects' key informants served as the primary source of data from the preliminary case studies as the interviewees had the most intimate knowledge about the problems their organizations faced during the enterprise architecture adoption. The interviewees were sent the interview themes prior to the study took place. This let the interviewees prepare themselves for the interview if they so wanted. The interviewees were selected from the group of people that actively participated in the project work. Representatives of the different stakeholder groups, including project group members, project owners, and external consultants, were interviewed. Interviewees' different positions, varying viewpoints and experience on enterprise architecting allowed different perspectives and opinions to emerge, and thus strengthened the construct validity. All the interviews were recorded and transcribed. The respondent validation was applied in two forms. First, the interviewees were allowed to inspect the transcriptions and second, they were given an early access and a possibility to comment the report (Seppänen, 2009) that was written on a basis of the data. The analysis of the interview data is presented in Chapter 5, in which a number of transcript citations are used to give the readers a possibility to evaluate the validity of the conceptual constructs.

As the final stage of data collection, we conducted a practitioner survey study on the problems of enterprise architecture adoption. In addition to extending the research scope outside the case organizations, the survey served as a primary instrument in evaluating the validity of the previous stages of the research process. The survey was specifically targeted to the knowledgeable respondents who have experience in enterprise architecting in public organizations. The formulation of the quantitative instrument was driven by our earlier qualitative data analyses, and the following interpretation of the obtained quantitative data was performed in constant comparison with this quantitative data. The external validity of the survey instrument was also strengthened by structuring the questionnaire to take into account previous studies on enterprise architecture. Thus, the survey as an instrument allowed us to evaluate the external validity of the preceding stages of our research process, as well.

Finally, it should be noted that none of the data sources were conflicting with each other. There were some slight differences in the accents that different sources put on different themes and some variations that can be explained by the progress in the field of enterprise architecting in public organization that has taken place over the time of data collection. This uniformity of the data that were collected from different sources and with a variety of methods strongly supports the validity of observations. Consequently, the data was saturated at the relatively early stage of the research process.

3.4.2 Data analysis

The majority of our qualitative data was treated with four rounds of coding, as explained in Chapters 5 and 7. As the result of axial coding, we ended up with eight categories to describe the key classes of problems of enterprise architecture adoption. The resulting categories were formulated according to the frequency of different codes used in the data. The purpose of this was to limit the

number of resulting categories, to avoid showcasing themes that do not describe the significant characteristics of data, and to improve the traceability of the theory building. The lowest frequency of appearance for codes that were given a place in the conceptual model as a category was 16. The categories that were referred to less than 16 times were deliberately removed, as they were not believed to carry a considerable role in explaining the data. Eight categories seemed to provide a balance between delivering enough descriptive information and abstracting the data at the same time.

However, the frequencies were not taken unconditionally as certain interviewees revisited particular topics several times during the interviews in order to deliver their message more effectively. On the other hand, they assumedly did this intentionally and therefore the very procedure of counting the number that certain themes were referenced to by the interviewees – in addition to searching more subtle verbal clues in their statements – allowed us to identify the themes the interviewees thought to be the most important issues. During the coding of the interview transcriptions, other data sources (i.e., notes and project deliverables) were analyzed in parallel to find possible supporting and contradicting arguments.

In analyzing qualitative data, it is possible to use investigator triangulation strategy to improve the inter-rater reliability. In investigator triangulation, several researchers independently code the data and the codes are compared for agreement (Armstrong et al., 1997). However, according to Armstrong et al. (1997), applicability of inter-rater reliability to qualitative research is not clear. Morse (1994) argues that the use of external analysts is more suited to quantitative research as it is unrealistic to expect that another researcher would have the same insights from a limited base of data (Armstrong et al., 1997). 'Postmodernist' qualitative researchers (Vidich & Lyman, 1994) have challenged the whole notion of consistency in analyzing data: "The researcher's analysis bears no direct correspondence with any underlying 'reality' and different researchers would be expected to offer different accounts as reality itself (if indeed it can be accessed) is characterized by multiplicity." (Armstrong et al., 1997, 2) However, contrasting arguments have been presented as well (e.g., Hammersely, 1991). The empirical study on inter-rater reliability conducted by Armstrong et al. (1997) showed that close agreement on the basic themes on data could be reached but each analyst packaged the themes differently. We decided not to use several investigators to code the data. The main reason for this was that we operated on the field alone during the data collection. Therefore, external analysts would not have been familiar with the context of data nor the processes and instruments it was produced with.

The literature review later indicated our findings to be reasonably converging with the previous studies on enterprise architecture. The studies that would specifically focus on the problems of enterprise architecture adoption are lacking but similar themes as those that we identified could be found in several research reports (cf., Chapter 2). This, together with the survey study, supports the credibility and external validity of our results.

The survey study produced both quantitative and qualitative data, the latter of which was obtained from the responses to open questions. The quantita-

tive data was analyzed using respondent distribution, t-test and Chi-Square test that are suited to reasonably small data sets. The qualitative data from the survey was frequently used in parallel with quantitative analysis to provide a deeper insight and understanding about the responses (Section 6.4). The findings of the survey were also constantly compared with our other data as well as previous research literature on enterprise architecture, in order to strengthen the external validity and to identify possible deviations between the sources of data. The quantitative analysis was particularly used to support the formulation of the core categories.

The final stage of data analysis in grounded theory research process is often referred to as selective coding. During the selective coding previously identified categories are further refined, abstracted, their relations are contemplated, and they are finally integrated to shape the theory that describes the studied phenomenon (Strauss & Corbin, 1998; Price, 2010). Prior to starting selective coding, we normalized the frequencies the categories were referred to in different sources of data and the level of challenge they pose for a successful enterprise architecture adoption according to the survey respondents (Figure 26). The commensurate values for each category were then used as an instrument to guide the process of selective coding, while it was still framed by our observations and qualitative measures. In order to articulate formulation of the core categories, we related them with the problems of enterprise architecture adoption as they were presented in the survey (Section 7.1) and positioned each axial category originating in the qualitative data in relation to the core categories (Figure 29). By this means, the core categories and their relations summarize the findings of the entire research process in a transparent and traceable way, and their validity can be assessed in accordance to the earlier stages of the research process.

4 RESEARCH CASES

In order to set the context for the empirical groundings of this research, this chapter first describes the cases from which the majority of qualitative data was collected. The observed enterprise architecture adoption projects took place in Finnish government agencies of State Treasury and Road Administration[9]. Both agencies are fairly large in size and run operations that require active coordination and interaction with several external stakeholders that include other government organizations as well as citizens and private companies. The agencies also use the information technology extensively in their day-to-day operations. For these reasons, the agencies were fitting to be the early adopters of enterprise architecting as improved business-IT alignment and interoperability are considered to be some of the key benefits of enterprise architecture.

We will first describe the case organizations. Then their enterprise architecture adoption projects and the project goals are discussed. The project plans of both State Treasury and Road Administration covered potential project risks and the prospective counter-measures to these. In the following, we will address these risks as they are closely related to our research interests.

At the end of the chapter, we will also briefly describe the complementary research cases from which supplementary data was collected between the first and final stages of the research process.

4.1 State Treasury

State Treasury is a quality-managed service agency that operates under the Ministry of Finance. The agency's main sphere of authority includes the state's internal financial and fiscal administration, pension and damage compensation

[9] On January 1st 2010, the Central Administration of the Road Administration, the infrastructure operations of the Maritime Administration and the Rail Administration were merged to form the Finnish Transport Agency. Please notice that the structure and operations of the agencies are described in this section as they were at the time of the agencies' enterprise architecture adoption projects.

plans, and military injury and veterans' affairs. State Treasury also develops government control systems, and produces financial and personnel management support services for the government. The clients of State Treasury's services include, in addition to government units, municipalities, state-aided institutions and their personnel, and the beneficiaries of treasure lending activities as well as the persons entitled to receive military injury compensation or other types of compensation. There are three State Treasury offices located in Helsinki and five in other cities.

State Treasury is organized in three divisions. Administrative Management provides services that are related to financial and personnel administration, performance guidance, information systems and information production. The division's responsibilities also include the development and harmonization of the government's financial and personnel administration processes and information systems. The division has six operating units and employs over 70 people. The Finance division manages the central government's debt, cash funds and financial assets, and administers most of the loans and interest-rate subsidies granted from central government funds. The Insurance division is the state insurance institution. It promotes risk management in the entire central government and handles statutory employment pensions, accident, rehabilitation and liability insurance for the state bureaus and institutions. The Insurance division also provides compensation services for war veterans and other beneficiaries.

4.1.1 State Treasury's Arkki project

In December 2006, the executive board of State Treasury accepted the development plan for agency's electronic services. While the plan was being prepared, the need for enterprise architecture was identified as for a means for improving the alignment between business operations and information systems and to improve the productivity and cost-effectiveness of IT operations.

The preparing activities for the project were started in June 2007 and the project was launched in August 2007. According to the original plan, the project was supposed to finish at the end of the year 2007 but the schedule was extended as creating the enterprise architecture target state scenarios took longer than it was expected. The project officially ended in early 2008, although the adoption process of enterprise architecture still continued. The responsible external consultancy for the project was Capgemini Finland Ltd.

Arkki project was assigned to develop enterprise architecture for the entire agency in parallel with the domain-level architecture for the planned electronic services platform. The main focus of the project was on the latter. With regard to enterprise architecture the goal was establish the preliminary version of the EA that would be then continuously developed. The goals for the project included the following (Valtiokonttori, 2007):

1. Pilot testing of the EA Method and its modeling techniques, and their adaptation for the agency's specific needs.

2. Modeling the architecture for the electronic services platform, including the interconnections and dependencies between the State Treasury's business units and external stakeholders.
3. Creating the plan about how the systematic governance and advancement of enterprise architecture and electronic services will be taken into account in State Treasury's daily operations.

At first, the project group adapted the EA Method to meet the State Treasury's specific needs. The project's steering committee inspected the method adaptation and accepted it with minor revisions. The third goal of the project was closely related to the adaptation of the EA Governance Model. As discussed in the Section 1.2.2, the Governance Model was lacking the plan for its actual implementation and the administrative power behind it. It also required considerable readjustments in order to fit the existing organizational structures and operating models of the agencies. As a result, the implementation of the Governance Model was found to be far more laborious than what was expected. Therefore, it was decided to lower the detail of the electronic services platform architecture description and to put more effort on the tasks related to the Governance Model adaptation. The Governance Model implementation was still continued with the lead of the State Treasury's Architecture Steering Group after the Arkki project was finished.

4.1.2 Arkki's project organization

Arkki's project group consisted of six State Treasury employees, three consultants and an enterprise architecture expert from the State IT Management Unit. The project manager and two project group members were located in the State Treasury's central IT Development Unit. The other three project group members represented the State Treasury's different divisions and were employed in the divisions' IT units. Their role was to serve as liaisons between the project and the agency's lines of business. The project's steering group comprised of the IT Development Unit's development director as the head of the group, the head of security, the heads of IT units from each line of business, a representative from the State IT Management Unit, two external consultants, and Arkki's project manager.

As previously discussed, one of the primary goals of enterprise architecting is to align the IT solutions with the organization's strategic goals. Therefore, it is important that operational managers and staff are involved in the enterprise architecture projects. However, the projects tend to emphasize the technological details and pay insufficient attention to the operational issues. Also Arkki project's organization was mainly comprised of personnel working in IT related duties. Within the Arkki's project group, there were uncertainties about whether the project was only to define the technological architecture and policies, as the business units did not directly contribute to the work.

4.1.3 Arkki project's risks and challenges

State Treasury is organized in three functional divisions that operate rather independently. Their areas of responsibility, and thus also the operations, differ greatly from each other. This organizational setting induced some expectations about the problems to enterprise architecture adoption. At one extreme, it was questioned whether it is even reasonable to model the divisions' operations in a uniform manner as it was not seen feasible to establish shared processes and services that could be used across the divisions. Because it was known in advance that the differences in operations and cultures of the divisions could cause challenges during the enterprise architecture adoption, it was seen vital that all the divisions were committed to the project, and had liaisons and representatives in the project group. The importance of commitment to the project was also promoted by the active organizational communications. Despite of that, the project was strongly IT driven and failed in achieving the full business support.

Modeling the baseline enterprise architecture involves collecting information about the organization's processes, applications, data, and technologies. It is important that this information is correct, consistent and accurate enough. The different documentation conventions that were used in the divisions complicated the establishment of baseline architecture during the Arkki project. In addition, it was found challenging to reach the right personnel and to get them committed to the work. This caused certain tasks to fall behind in the schedule. State Treasury responded to the challenge by supporting the commitment towards enterprise architecting with several measures, such as increasing organizational communication on the payback and the benefits of enterprise architecting, assigning coordinators to represent the different divisions in the project group, by ensuring that the instruments that were used to collect the information regarding the enterprise architecture were expedient, and by checking the validity of the collected information with systematic inspections.

Arkki project followed customary steps (cf., Boster et al., 2000) in enterprise architecture implementation. At the first stage, the baseline architecture was described. This was followed by the target state architecture definition and creation of the transition roadmap. Regardless of certain challenges, the first stage was completed in a satisfactory manner. While working on the target state architecture, however, the project faced problems, which eventually lead to that one of the divisions was released from the original project schedule. Developing the target state architecture is not just a mechanical modeling task but it requires a clear and well-defined vision about the organization's ambitions and strategic goals in a predetermined time in the future. Therefore, it is mandatory that people with both competency and authority to make such decisions are tightly involved in this process.

Another concern of the pilot projects regarded the practices and continuity of the enterprise architecting in Finnish public organizations. At that time, the government-level principles and standards for enterprise architecture were still shaping up and the guidelines for use and adaption of the EA Method and the Governance Model were lacking. On one hand, this gave the projects a freedom

to adapt the EA Method to their liking but also brought concerns about that the project deliverables might be rendered obsolete as the directions and guidelines would later be specified.

4.2 Road Administration

Finnish Road Administration was a process-managed organization that operated under the Ministry of Transport and Communications. Its main responsibility was the planning, maintenance, and development of the road traffic transport system in cooperation with the authorities responsible for the other modes of transport. The agency's head office focused on strategic and performance management and process development. The unit of Expert Services produced technical services to support the Road Administration's strategy and core competencies. The unit's services also included research and development. Nine regional units that operated under the head office were responsible for local road management and regional cooperation. Finally, the Traffic Center unit was responsible for the production of basic traffic services.

4.2.1 Road Administration's Karkki project

The Karkki project was launched in May 5th 2007 and ended in November 26th same year. Tieto Ltd. delivered the project in a role of an external consultancy. Prior to starting Karkki, Road Administration had already been developing their enterprise architecture for several years and the agency was commonly considered as a forerunner of enterprise architecting in public administration in Finland. At first, the enterprise architecting had focused only on IT assets but later increased efforts were taken to encompass also the agency's core business areas. However, Road Administration had not utilized any common methodology on enterprise architecture development throughout the different business units. Instead, each unit had developed their architecture on a basis of individual needs and therefore, to some extent, had failed to attach to the organization-wide design. Neither the structures for the EA governance were implemented.

One of the key motives of Karkki project was the opportunity to adopt coherent procedures for enterprise architecture management that could be brought about with the common EA Method and the Governance Model. With enterprise architecture, the Road Administration pursued the structures for their service model and IT solutions that would better support the forthcoming organizational change and transformation towards the customer-driven public-private partnership operating model. It was seen in the agency that the IT services would soon exceed the traditional operational functions in value and importance. However, the agency's current IT solutions were partly outdated and some duplicate and non-interoperable data resources were identified.

The following goals were set for Karkki project (Tiehallinto, 2007):

1. Development of Road Administration's enterprise architecture on the selected areas.

2. Implementation of the governance model for the maintenance and advancement of enterprise architecture in Road Administration.
3. Modeling of the domain architecture for the Travel and Traffic Information services using the dimensions of business, data, and information systems.

The project especially focused on creating target state business architecture descriptions with the goal of supporting the development of business-driven IT solutions with consistent and coherent means. In addition, Road Administration wanted to be prepared to implement future IT solutions using the service-oriented architecture (SOA) model and to improve the agency's readiness for the cross-sector cooperation.

At the beginning of the project, the agency's existing enterprise architecture models and other documentation were collected from throughout the organization. The project goals were then translated into the four work packages. The first work package contained the tasks of establishing new foundations for enterprise architecting. These included the adaptation of the EA Method and the definition of the Governance Model, governance processes, roles and responsibilities. The Governance Model was found to be too general purpose and lacking in detail, and therefore the project spend some time in specifying it to fit the agency's needs. The second work package, the enterprise architecture modeling, started with the analysis of the existing baseline models and by deciding on the quality and functional requirements for the target state models. Then, the target state enterprise architecture was modeled in accordance with the requirements and the analysis of current state descriptions. Also a high-level design model for the SOA's target stage was created. The third work package contained the tasks that contributed towards the continuous and methodical use of enterprise architecture in the agency. Focal to this were the launch of the center of excellence for the enterprise architecture maintenance and the implementation of the adapted Governance Model. Finally, the fourth work package included the tasks of modeling domain-level (Travel and Traffic Information) business, data, and application architectures.

4.2.2 Karkki's project organization

Karkki project did not have as tight connection to the State IT Management Unit through its project organization as the State Treasury's Arkki project did. However, the IT consultancy company that the project used had contributed to the project that had created the EA Method. Therefore, the participating consultants were well capable to answering the questions regarding the use and adaptation of the method, which at that time was not yet fully documented. Karkki's project was organized according to the work packages. There were separate project groups for the organization-wide enterprise architecture development and the domain-level architecture of Travel and Traffic Information services. The project groups consisted of both enterprise architecture experts and business owners. There were also advisor groups that helped the project by providing it with an easy access to the relevant documentation and other sources of information that were needed during the work. The advisors also reviewed the project de-

liverables on their areas of expertise. Five external consultants were used during the project. Two of the consultants contributed to all of the project's tasks, one to those that related to the organization-wide EA, and one to those of Travel and Traffic Information services' architecture development. The fifth consultant acted as a reviewer and was responsible for overall quality assurance.

4.2.3 Karkki project's risks and challenges

Road Administration had developed the agency's enterprise architecture already for several years prior to launching the Karkki project. Although this was in many ways advantageous for the successful implementation of the project, it also caused certain challenges. The existing enterprise architecture documentations were created in organizational silos with guidance from several different consulting vendors. These enterprise architecture descriptions were not necessarily compatible with the newly released EA Method. It was also identified as a risk that the agency's existing skill sets would not meet with the new requirements. If the existing resources and structures for the enterprise architecture related decision-making and development would not support the new way of working, it was seen possible that as a consequence the confidence on enterprise architecting could decrease. To address these risks, Road Administration saw it necessary to provide training on the EA Method as well as the Governance Model, and the quality assurance group meticulously reviewed the existing enterprise architecture descriptions to ensure their compatibility with the EA Method.

Another predicted risk was that the enterprise architecture development would fail to attend the agency's operational functions, and therefore, the project could not provide support for the planning and development of the agency's core operations. As the precaution, the agency took measures to involve and commit operational personnel in the work and arranged training sessions on enterprise architecture. The project's coordination group also analyzed and prioritized the project's tasks to ensure their orderliness and control over the different domains and areas of development. Special attention was paid on key processes and common information sources that were used across the agency.

Failure to identify, implement and manage shared services to support cooperation of Road Administration and its affiliate agencies was also noted as a potential risk. Therefore, briefings and training sessions were arranged also for the affiliates and other stakeholders to advance the mutual understanding about of the common goals of enterprise architecting.

Finally, in order to gain the full benefits of enterprise architecting, it was seen imperative that the EA Method and the Governance Model are adopted and systematically used throughout the organization. Therefore, in addition to training, the agency invested in creating a communication strategy to help the entire organization to engage and commit to the enterprise architecture adoption.

4.3 Complementary research cases

During the years 2012 and 2013 we collected additional data from several institutions of Finnish tertiary and higher education, as well as some local government organizations and private companies. While a few of these organizations had been using enterprise architecture already for years, most of them were currently adopting it. Experiences on the enterprise architecture adoption were discussed with representatives of eleven Finnish educational institutions, a national service and development center, three local government organizations, and two private companies with a considerable amount of experience on the enterprise architecture development and consulting. The techniques that were used in data collection are discussed in Section 3.3.5 and detailed in Appendix 2. Due to the number of complementary cases, the heterogeneity of objectives of their enterprise architecture adoption projects and development efforts, and that this data was only used in a supplementary role during the selective coding process (Chapter 7), we will not address these cases in detail.

5 DATA ANALYSIS: PRELIMINARY, OPEN AND AXIAL CODING

This chapter explains the first stages of the coding process of qualitative data that were collected from the preliminary case studies. The results of this analysis establish the foundations for the conceptual model that will be later developed towards the grounded theory with the support of additional data. We did not start the final stage of the coding process, the theoretical coding, until we had obtained the final slice of data for the analysis from the survey study. This part of the analysis is reported in Chapter 7.

Data coding is the focal phase of analysis in grounded theory research. Coding refers to the interpretive analysis that is based on categorization of data according to recurring themes and concepts that are relevant to the research objectives. Figure 14 shows the overall course of the stages of analysis discussed in this chapter, as well as the different data collection methods and sources of data. The analysis mainly follows the Straussian coding paradigm.

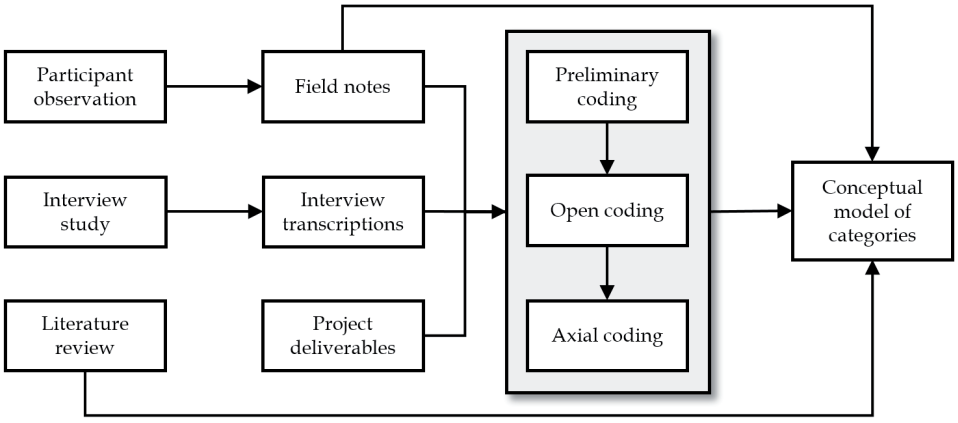

Figure 14 The process of formulating the categories

5.1 Preliminary and open coding

Coding is the process of applying some conceptually meaningful set of identifiers to concepts, categories, and characteristics in data. In both Glaserian and Straussian approaches of grounded theory research, the first stage of coding process is that of open coding. According to McNabb (2002, 311), the purpose of open coding is to establish or discover categories and their properties in the data. It involves the free assignment of data to groupings that appear naturally and serve as explanatory factors that identify the central research concepts (McNabb, 2002, 311).

Since our research goals were decided prior to starting the open coding, we could focus the coding process to the specific parts in variety of data that seemed to carry relevant information. Therefore, at first, the data were coded using two preliminary codes: facilitator and barrier. These codes were used to mark the sections in data that referred to issues that had either facilitated or impeded the work during the enterprise architecture adoption projects and achievement of the project goals. Some of the facilitators and barriers were explicit whereas the recognition of more subtle ones required familiarity with the projects, their context and environmental issues, and the interviewees. Table 8 presents an overall summary of the preliminary coding round. The total number of applied codes was 372. 304 of these were used to mark barriers and 68 to mark facilitators of the enterprise architecture adoption appearing in the data.

Table 8 Summary of the preliminary coding

	Barrier	Facilitator	Total	Barrier/Facilitator Ratio
State Treasury	164	30	194	5.47
Road Administration	140	38	178	3.68
Total	304	68	372	4.47

Although one question in the interview questionnaire explicitly focused on challenges faced during the project work, the number of identified barriers is still relatively high compared to the number facilitators. Also, one must notice that an interviewee could mention the same topic more than once during the interview and therefore the frequencies do not represent unique themes. If an interviewee referred to the same topic more than once when answering to a single question, the code was applied only once but if the theme was referred to again later during the interview a new code was applied. This practice allowed us to evaluate the weight of the themes as it was assumed that the interviewees revisited the themes they believed to be the most important.

It must be noted that these numbers should not be used to draw any direct conclusions (e.g., the State Treasury would have had more problems than the Road Administration). Although the number of interviewees per organization was the same, durations of the interviews varied and the semi-structured interviews always did not strictly follow the same agenda. Neither is the difference

between the agencies statistically significant. Chi squared equals 2.152 with one degree of freedom, resulting in the p-value of 0.0712.

The software tool that was used in the analysis of qualitative data let us attach notes to the preliminary codes. This feature was used during the open coding. Each preliminary code was revised and then complemented with one or more notes. These notes contained short commentaries or keywords (codes) describing the subject matter under the discussion. Already at this point, repeating themes started to emerge and prepared the data towards the axial coding. Later, during the axial coding (Section 5.2), these codes were compared and merged to outline more refined code categories. Table 9 shows examples of citations from transcriptions marked with facilitator and barrier codes. Also the notes from the open coding are shown as well as the visualization of the more fine-grained codes attached to the data. During the preliminary coding, we often coded entire chapters of text and these codes were then narrowed down towards the more specific items within the data according to the attached notes and, later, the axial categories as explained in the next section.

Table 9 Example of codes created during the preliminary and open coding

Preliminary code and attached notes	**Interview citation**
Facilitator (**shared vision**, *target state*, competence / experience)	It has helped us that we have had mostly the same people [participating in the follow-up projects] as […] we now have a **common vision** about *the target state*, and we already see the things so that if we had some **common *goals to reach for***, the enterprise architecture can provide a one *way to piece that picture together*.
Barrier (**ownership**, *management*, IT driven)	**We are doing this [project] at the IT department**. I think that is not… It can never really succeed if the IT department ***owns*** and *coordinates* the EA.

Our main goal for the first rounds of coding was to identify a variety of issues that hindered the adoption of enterprise architecture in the studied agencies and by this means to prepare the data for the axial coding. This theme would also serve as the guiding principle during the later stages of the data analysis. Therefore, one could argue that we omitted the traditional open coding where the data is coded in every possible way (Glaser, 1978, 56). Instead, with the preliminary coding we followed the approach that utilized certain presuppositions about how we wanted to structure the data. However, it must be emphasized that preconceptions or previous theoretical knowledge did not affect the coding process or the resulting codes, and the purpose of preliminary coding was solely to steer the analysis so that it could best serve the research objective of identifying the key issues in successful enterprise architecture adoption.

5.2 Axial coding

During the axial coding, the researcher first defines several categories that bridge all open-coded concepts. Next, the concepts are examined to find out within which category they fit in. The process is continued until all the data have been compared against the categories and classified accordingly. If needed, new categories can be established at any time. (McNabb, 2002, 312) Our goal was to define more focused and descriptive categories from the preliminary barrier and facilitator codes that were used as the placeholders and annotated with notes during the open coding. As an example, Figure 15 illustrates partial outcomes of the coding process that resulted in the axial category Strategy Linkage.

Of twelve tactics for identifying categories discussed by Miles and Huberman (1984, 215), we used several. First, the numbers that different themes were mentioned in the notes were counted and the repeating themes were identified. We also searched intervening variables and relationships between them (for example, 'shared vision', 'way to piece that picture together', 'enterprise architecture target state', cf., Table 9). Finally, we moved from particular variables towards more general ones. In total, eight categories were created during the axial coding process. The axial categories are briefly summarized in Table 10 and will be discussed in more detail in relation to the data in Section 5.3.

Table 10 Axial categories

Category	**Brief explanation**
Competence	Level of experience, capabilities, skills, and know-how regarding the enterprise architecture and enterprise architecting throughout all the levels of an organizations.
Enterprise Architecture Method and Tools	Methods, frameworks, best practices, and software tools used in enterprise architecting.
Governance	Enterprise architecture governance, governance models, processes, and structures
Managerial Support	Managerial commitment, involvement, and support for enterprise architecting.
Operational Personnel Involvement	Operational personnel's commitment, involvement and support for enterprise architecting.
Organizational Issues	General organizational characteristics and attributes; organizational structure (e.g., divisional structure, functional silos, customers, stakeholders and partners), existing processes and operating models.
Resources	Resources available for enterprise architecting.
Strategy Linkage	Enterprise architecture's relationship with the organization strategic and operational goals.

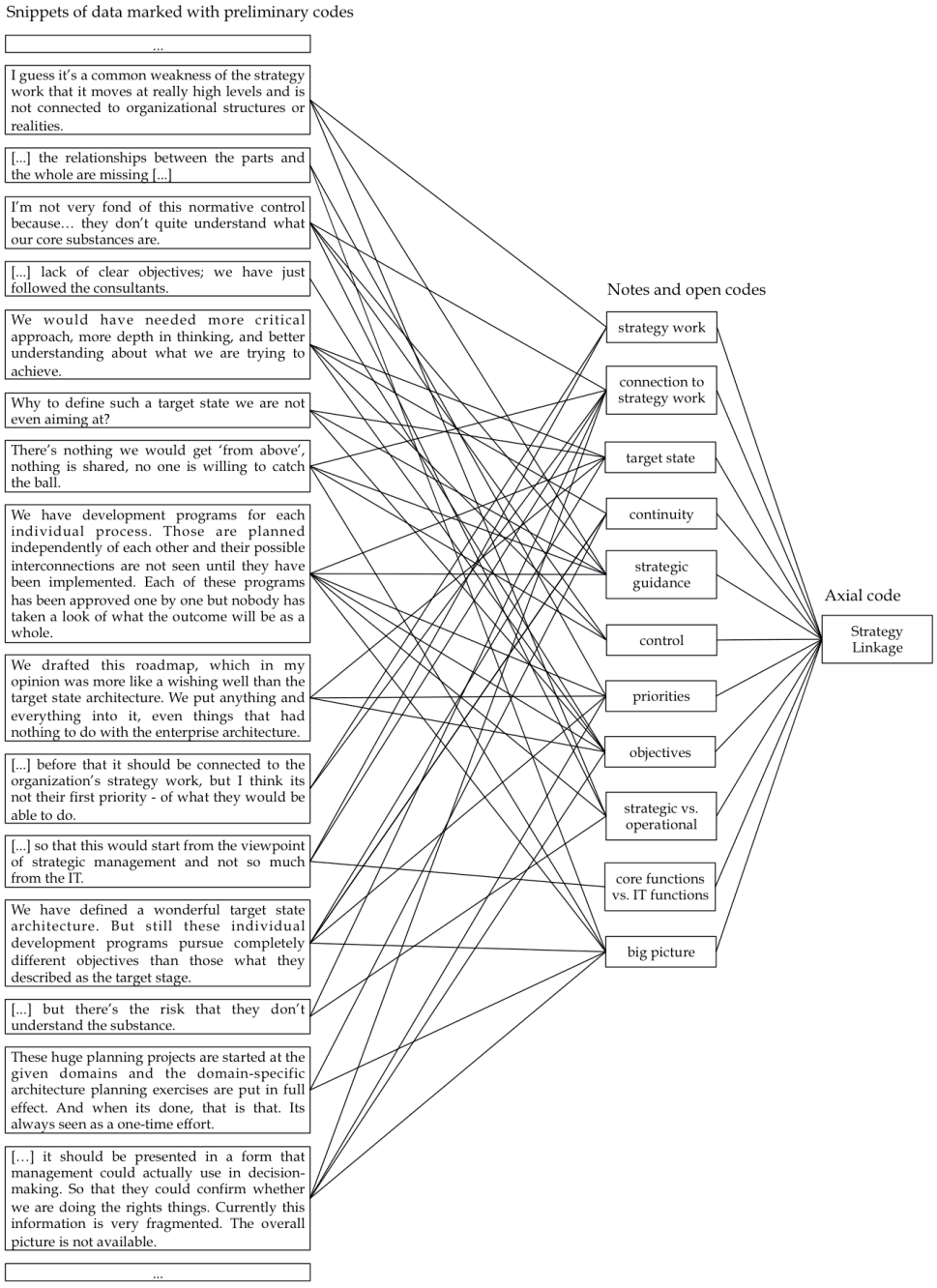

Figure 15 Example of outcomes of the coding process

Once the categories were formulated, the preliminary codes and the annotated open codes were inspected and the data was recoded using the axial category codes. These codes were also marked according to their context in order to dif-

ferentiate whether an issue was originally identified as a facilitator or a barrier. The preliminary and open codes whose description did not fit under any of the categories were removed. Figure 16 illustrates the iterative coding process that was repeated until the data was completely analyzed and new categories no longer emerged.

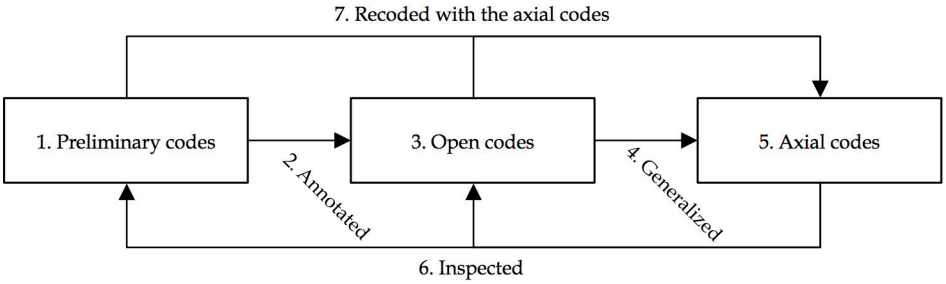

Figure 16 Axial coding process

The objective to identify the critical issues of enterprise architecture adoption did serve as the guiding principle throughout the data analysis. As discussed above, on the first coding round, we had marked the issues that were seen to hinder the enterprise architecture adoption. Next, in order to approach the same research objective from the alternative perspective, each reference to a theme that had helped in attaining the project objectives were marked with the Facilitator code. While the axial categories were being developed, it was noticed that the issues marked with Barrier and Facilitator codes were quite consistent and they often expressed the two sides of the same theme. For example, several issues that were coded as Barrier actually referred to situations where facilitating factors were lacking.

The issues that appeared as barriers did fall under eight categories and seven categories were identified to represent the facilitating issues. All of the seven facilitating categories coincided with the barrier categories, i.e., the lack of a facilitator. There was only one category (Organizational Issues) that did not appear at all in a positive, facilitating context in either agency. Table 11 shows the numbers that the categories were referred to in both hindering (-) and facilitating (+) contexts in the data collected from the studied agencies.

Table 11 Numbers of the references to the categories in both hindering and facilitating contexts

State Treasury		**Road Administration**	
Category	**Frequency**	**Category**	**Frequency**
– Competence	35	– Managerial Support	34
– Operational Personnel Involvement	29	– Governance	26
– Governance	22	– Enterprise Architecture Method and Tools	25
– Managerial Support	19	– Competence	20
– Enterprise Architecture Method and Tools	19	– Strategy Linkage	17
– Strategy Linkage	17	+ Operational Personnel Involvement	14
– Organizational Issues	16	+ Competence	12
+ Enterprise Architecture Method and Tools	7	– Operational Personnel Involvement	8
– Resources	7	+ Strategy Linkage	7
+ Competence	6	– Organizational Issues	5
+ Managerial Support	5	– Resources	5
+ Operational Personnel Involvement	4	+ Resources	3
+ Strategy Linkage	4	+ Governance	1
+ Governance	3	+ Enterprise Architecture Method and Tools	1
+ Resources	1		
Total	194	Total	178

Table 12 shows the ratios of references to each category that were made in hindering and facilitating contexts. Especially in State Treasury, issues in the category Organizational Issues were found challenging. Enterprise architecture is commonly promoted as a tool to increase both inter-organizational and intra-organizational interoperability. As discussed in Section 4.1.3, one of the anticipated risks of the Arkki project was that the agency's divisions would not be able to find common grounds for enterprise architecting due to heterogeneity of their business functions and supporting structures. Apparently, this risk was also realized. For Road Administration, the lack of managerial support for enterprise architecture seemed to be the key challenge. This issue appeared in the data 34 times in a negative context and not once as a facilitator.

Table 12 Negative-positive ratios for each category

State Treasury		**Road Administration**	
Category	**Ratio**	**Category**	**Ratio**
Organizational Issues	16.00	Managerial Support	34.00
Governance	7.33	Governance	26.00
Operational Personnel Involvement	7.25	Enterprise Architecture Method and Tools	25.00
Enterprise Architecture Method and Tools	7.00	Organizational Issues	5.00
Resources	7.00	Strategy linkage	2.43
Competence	5.83	Competence	1.67
Strategy Linkage	4.25	Resources	1.67
Managerial Support	3.80	Operational Personnel Involvement	0.57

Table 13 shows the combined references to the categories in both hindering and facilitating contexts.

Table 13 Combined references to the categories

State Treasury		**Road Administration**	
Category	**Frequency**	**Category**	**Frequency**
Competence	41	Managerial Support	34
Operational Personnel Involvement	33	Competence	32
Enterprise Architecture Method and Tools	26	Governance	27
Governance	25	Enterprise Architecture Method and Tools	26
Managerial Support	24	Strategy Linkage	24
Strategy Linkage	21	Operational Personnel Involvement	22
Organizational Issues	16	Resources	8
Resources	8	Organizational Issues	5
Total	194	Total	178

Table 14 shows the references to the categories combined from the data from both agencies. Competence, or lack thereof, appears to be the category that was referred to most often in both facilitating and hindering contexts.

Table 14 Combined references to the categories in both hindering and facilitating contexts

Code category	Frequency
– Competence	55
– Managerial Support	53
– Governance	48
– Enterprise Architecture Method and Tools	44
– Operational Personnel Involvement	37
– Strategy Linkage	34
– Organizational Issues	21
+ Competence	18
+ Operational Personnel Involvement	18
– Resources	12
+ Strategy Linkage	11
+ Enterprise Architecture Method and Tools	8
+ Managerial Support	5
+ Governance	4
+ Resources	4
Total	372

Table 15 shows the ratios of references to each category that were made in hindering and facilitating contexts in the data collected from the both agencies.

Table 15 Negative-positive ratio for each category combined from the data collected from the both agencies

Code category	Ratio
Organizational Issues	21.00
Governance	12.00
Managerial Support	10.60
Enterprise Architecture Method and Tools	5.50
Strategy Linkage	3.09
Competency	3.05
Resources	3.00
Operational Personnel Involvement	2.05

One question in the interview schedule regarded the key difficulties the interviewees had faced during the project work. Although this does not fully compare to the broader view of enterprise architecture adoption problems, there is a resemblance between the answers to this question and the overall analysis of the data (Table 16). The categories that appear most frequently in the data (i.e.,

Competence and Managerial Support) are the same that the interviewees most often referred to while assessing the key difficulties of the projects.

Table 16 Frequencies of the challenges as they appeared in the answers to the direct question about the challenges during the project work

Category	Referenced to in the interview question	Referenced to in all data
Competence	6	55
Managerial Support	6	53
Governance	2	48
Enterprise Architecture Method and Tools	2	44
Operational Personnel Involvement	2	37
Strategy Linkage	3	34
Organizational Issues	3	21
Resources	2	12

Table 17 shows the total numbers of references made to the categories. The codes spread relatively evenly over the different categories, each of which will be discussed in more detail in Section 5.3. Before moving onwards, however, we will address the categories of Organizational Issues and Resources, which were referred to considerably less often than the other categories, and argue why their place among the axial categories is justified.

Table 17 Combined references to the axial categories

Code category	Frequency
Competence	73
Managerial Support	63
Operational Personnel Involvement	55
Governance	52
Enterprise Architecture Method and Tools	52
Strategy Linkage	45
Organizational Issues	21
Resources	16
Total	377

The problems that were coded to the category Organizational Issues appeared more often in the data collected from State Treasury. It was discussed in the section 4.1 that the divisions of the agency operate autonomously and their business functions significantly differ from each other. Some interviewees even compared the agency to three separate organizations that operate under the same roof. Therefore, several interviewees argued that it might not feasible to

try to create shared organization-wide processes and services, as they could not effectively serve all the divisions. For the same reason, adoption of the uniform methods for developing operations and modeling relevant information in each division was not seen reasonable. The currently used documentation techniques were diverse and the level of detail of the existing models varied greatly. This also caused some problems while the baseline enterprise architecture descriptions were created during the project. Thus, it was seen challenging to introduce many of the functional premises of enterprise architecting. Problems related to the Organizational Issues that were recognized in the data from Road Administration were only a few. However, in order to acknowledge the organizational diversity in the two-case study, it was decided to treat Organizational Issues as one of the axial categories. In addition, it is worth noticing that none of the issues in this category were seen as something that would have facilitated the adoption of enterprise architecture in the agencies. Therefore, it seems that it is inherently challenging to fit certain aspects of enterprise architecting with structure and current operating models of the public organizations.

We decided to include the category Resources into the conceptual model even though it appeared in the data only 16 times. The availability of resources was referred to four times in a facilitating context and the lack of resources 12 times as something that hindered the enterprise architecture adoption. It should be also noticed that in both observed agencies the enterprise architecture adoption projects were officially supported by the agencies' executive boards and subsequently were allocated with appropriate resources. However, as the government organizations in Finland usually use funding mechanisms that assume fixed-term contracts and projects work (Isomäki & Liimatainen, 2008), it could be assumed that the resources dedicated for the continuous development and maintenance of the enterprise architecture would not be as generous once the adoption projects had finished. Our later data confirmed this assumption, as the issues related to the availability of resources were the second most common problems that our survey respondents had met while adopting the practices of enterprise architecting in their organizations (cf., Figure 23) and these problems were considered to pose highest challenge on the successful adoption (cf., Figure 25). Still in 2014 it is rare that a public organization would employ full-time enterprise architects. The development and maintenance of enterprise architecture commonly competes on working hours and other resources with other operations that may appear to be more pressing. Therefore, it is highly critical to plan the allocation of resources for the long-termed development work at the early stages of the enterprise architecture adoption.

5.3 Axial categories elaborated

We identified eight axial categories for the issues that impeded the enterprise architecture adoption during our preliminary case studies. In this section, we will discuss the properties of these categories in more detail and provide evi-

dence for their grounding in empirical data. Later during the research, these categories will be used as the foundation for the resulting grounded theory.

5.3.1 Competence

The category Competence refers to skills, capabilities and overall knowledge regarding the adoption and operationalization of the enterprise architecture function. Themes such as the enterprise architecture maturity, the understanding about the goals of enterprise architecting, how these goals could and should be pursued, and both soft and hard skills that an organization must to be able to deliver during the enterprise architecture adoption will be discussed. The lack of competence was the most often referred theme when the problems of enterprise architecture adoption were discussed with our interviewees, and it also seems to inflict issues in several other categories, as well.

Many of the interviewees pointed out that the term enterprise architecture itself can be difficult to understand. In the following excerpt an interviewee comments on the lack of common language and general understanding that shrouds the enterprise architecture.

> *It feels like we haven't established a common understanding about the enterprise architecture, yet. We cannot expect that everyone would speak the same language. Or perhaps the words are the same, they're customary, but how they are understood is different from person to person.* (Interviewee F)

A recent study indicates that this problem still exists in Finnish public sector and the concept of enterprise architecture is commonly misunderstood (Lemmetti & Pekkola, 2012). Another interviewee expressed a need for the efficient enterprise architecture 'sales pitch'. Lacking understanding about the purpose and goals make it difficult to promote enterprise architecting to managers and other organizational decision makers. This will further lead to the poor managerial commitment, which again will inflict other challenges to the adoption.

> *General managers – those who in the end are responsible for making the decisions – don't understand what the term enterprise architecture means. […] We expected that either the State IT Management Unit or the project contractor would have had this simple, clear message with which we could have explained to our general managers and Ordinary Joes what this is all about.* (Interviewee I)

An interviewee with a considerable level of experience on enterprise architecting commented that it could take years until an organization reaches the level of maturity on which it is capable to fully utilize the enterprise architecture and to capitalize the benefits. He also mentioned that it is often not sufficient if an organization has only one or two experts who can grasp the concept and understand how organization's different components are related to each other form the viewpoint of enterprise architecture. Rather, this knowledge should be absorbed organization-wide.

> *The adoption of enterprise architecture definitely requires that all the concerned parties know what they are doing and what they are aiming at. In my opinion, we started the adoption too early.* (Interviewee J)

Another interviewee pointed out that conducting enterprise architecting on an organization-wide level is by no means a trivial task. It requires specialized skills and a capability to discern large and complex structures. The existing professional skills sets may not be satisfactory for the purposes of enterprise architecting.

> *Many of us can draw process models and do such a planning work but it is still challenging to step outside of our own silos and to transfer these skills into the context of enterprise architecting.* (Interviewee A)

To compensate the lack of in-house skills and resources, external consultants are often used to help delivering the enterprise architecture adoption projects. An organization's inadequate internal competence in enterprise architecture can make it difficult to define and position the project in an appropriate manner. In the worst case, a flawed project design can escalate into a misguided or even a failing project. As a consequence, a great responsibility lies on the expertise of the contractor who is then forced to adapt an operative role instead of serving as a facilitative consultant (Spewak, 1992). On the other hand, as pointed out by our interviewees, the active participation and skills of the staff still have a critical role in the project implementation as, in addition to the enterprise architecture competences, the successful adoption project necessitates in-depth knowledge about the workings of an organization.

As the studied agencies had the pioneering position in enterprise architecture adoption in Finnish public administration, it is understandable that they faced challenges that come with the domain where everything was relatively new and untried. However, an interviewee cited below still stated a surprise on the lacking practical knowledge on how the enterprise architecture adoption should be conducted in government agencies, proving the general immaturity of the field.

> *There may have been some common schemes and theories behind these ideas but we lacked the concrete and practical aids. And we still do. We were surprised how immature this whole field actually is.* (Interviewee I)

According to our interviewees, the capabilities that are required to strategically design and model the organization-wide enterprise architecture were generally lacking at the time of their projects. Enterprise architecting requires not only certain technical skills but also thorough understanding about the organization's business objectives, its operations and the use of information technology. In addition, managing an organizational transformation, which enterprise architecture adoption projects usually pursue, requires a variety of people skills and the ability to deal with organizational politics (Boster et al., 2000).

5.3.2 Enterprise Architecture Method and Tools

> *It just doesn't go like that you would launch the project, adopt method and governance model and drop in all the good pieces. That won't happen because the mindset for EA modeling comes only after you've been doing it for a while.* (Interviewee A)

The category of Enterprise Architecture Method and Tools covers the topics that relate to the EA Method, the associated best practices, templates, deliverables, as well as the modeling tools, repositories and other aids that the agencies used to support the adoption and implementation of their enterprise architectures.

The enterprise architecture method has a focal role in the success of enterprise architecture implementation. The method not only defines the structure and form of the enterprise architecture models and other artifacts and deliverables, but also other crucial and more far-fetching factors such as the domains and scope of the modeling. Therefore, the chosen enterprise architecture method directly or indirectly affects on the applicability and usefulness of the outcome of enterprise architecting. Should the method lack some models that are essential in order to created the comprehensive view to the organization, it is possible that these will never be created, which thus results in less than satisfactory end product. Braun and Winter (2005) argue that holistic, multi-layered enterprise architecture frameworks are often rather abstract and do not consider all necessary design layers or do not specify consistency in adequate rigor. This often manifests in partial, aggregate, or completely lacking metamodel that would specify consistency of the artifacts on different layers and in different views (Braun & Winter, 2005). Especially for the organizations whose enterprise architecture maturity and competences are low, and that therefore may not be capable to critically assess the applicability and purposefulness of enterprise architecture methods, it is important that the chosen method would guide its users to do the right things in the right way. However, there is not a method that as such would fit the varying needs of different organizations. The methods, including the Finish government EA Method, always require more or less adaptation before they can be put in effective use (Valtonen et al., 2009). Most modern enterprise architecture methods include suggested governance models that are meant to advice the coordination of enterprise architecting and the definition corresponding roles and their areas of responsibility. Therefore, an enterprise architecture method has a decisive role in setting the overall structure and tone for the entire enterprise architecture.

It must be noticed that at the time the preliminary case studies were conducted, the EA Method was just recently released and it was not tested in practice before. Therefore, some of the following commentary on the EA Method is outdated and not relevant for its current version. Our more recent data also indicates (see Section 7.1) that the users of the current version of the EA Method are relatively satisfied with it. However, we will next briefly discuss some of the generic criticism towards the EA Method that our interviewees presented and

which, in our opinion, can be directed to the enterprise architecture methods in general.

First, some interviewees experienced the EA Method to be stiff and as such not fully suited to organization-specific needs and working practices.

> *In my opinion, [the EA Method] is a bit black-and-white. It precisely tells you what to do and how to do it, what steps are to be taken and in which order. I mean, it is little rigid and inflexible.* (Interviewee H)

> *The EA framework was unsuited for us. We found some inconsistencies in it, mainly due to the unique structure of our organization. Therefore, we had to re-work it to make it better fit our needs.* (Interviewee F)

It was noted earlier that in the case organizations the project groups mainly consisted of IT staff. It is commonly argued that the enterprise architecture methods tend to emphasize the IT perspective, which undermines the capability of enterprise architecting to support the holistic development of organization's operations.

> *Most of these enterprise architecture frameworks only focus on the IT.* (Interviewee H)

Some of the more experienced project group members already had profound ideas about the enterprise architecting and its goals. However, as discussed in Section 5.3.1, the degree of awareness was not evenly spread throughout the organizations. Therefore, an interviewee argued that the enterprise architecture should highlight the operations development, even if this must happen on the expense of information systems and technology.

> *I wouldn't want to talk about the information systems development and the architecture methods that support only those functions. Instead, we should discuss about the development of operations in our organization and what kind of governance models and methods can be used for these purposes. And the enterprise architecture, in my opinion, is just that apparatus.* (Interviewee H)

The built-in complexity of the EA Method seems unavoidable due to the multi-layered structure of authorities of the Finnish public administration, as discussed in Section 1.2.1. However, some interviewees argued that the EA Method should provide more tools that are directed to addressing the issues in individual agencies.

> *It is a challenge that this easily becomes very complicated because of all the different layers [on the EA Method's framework model]. There is a layer for the administrative branch in which there can be different structures. Then there is a layer for the public administration as a whole and so on. First and foremost, the method should help in clearing your own field."* (Interviewee A)

> *I wish the models would be simpler and less laborious to build.* (Interviewee I)

In general, the opinions on the EA Method were divergent and probably reflected informants' personal competences and experiences on working with semi-formal modeling techniques. Some perceived that the EA Method was complicated and some argued that it was too restricting. Some interviewees on the other hand enjoyed the possibility to adapt the method to their needs, as the detailed guidelines of usage were not yet available. However, the following interviewee challenged the illusive degree of freedom built in the EA Method.

> *I believe that if 15 agencies or organizations implement their EA projects following these guidelines, we end up having 15 different and incompatible renditions.* (Interviewee F)

As the above interviewee justly argued, in order to support the coordinated planning, decision-making and interoperability within and across the agencies and administrative branches, the enterprise architecture models should be commensurate and comparable. Although the different needs of the different organizations can be acknowledged by allowing the adaptation of the method, some guidelines or regulations are definitely needed at the government level. By providing an extensive collection of templates and exemplary models would probably be the most unobtrusive way to do this. However, due to vastly different operations of the government agencies, development of an enterprise architecture method that could serve as the multi-purpose, all-in-one solution is quite challenging.

> *One of our core functions is procurement. What does it mean in some other government agencies? They're buying pencils and erasers. For us, it relates to the maintenance of the road network. How are you supposed to create common procurement process models for these two cases?* (Interviewee J)

Enterprise architecture tools are the software applications that are used to create, maintain and analyze the enterprise architecture models. Issues such as usability, interoperability, support for different modeling techniques and standards, ability to present different levels of representational abstraction for different stakeholders, and support effective and distributed group work should be considered while deciding on the tool. As discussed in Section 2.10, there are several alternatives available for a tool, yet most of them are currently lacking in some aspects. It is not uncommon to only use regular office applications, such as spreadsheets, presentation tools, and generic diagramming software for the purposes of enterprise architecting. This was also the case in the case organizations. Although the interviewees argued these were not by any means an optimal solution for the enterprise architecture modeling, they still managed to get the work done. However, such software do not support advanced functions of enterprise architecture specific tools, such as metamodels, inter-model relationships, and shared and interconnected modeling repositories, which are required to build the comprehensive and sustainable base of the enterprise architecture models.

> *A centralized modeling repository and a tool would give the chief architects a good overview that is required to make the decisions about the operations development.* (Interviewee G)

The enterprise architecture models and other deliverables are tangible results of the enterprise architecting jointly produced by enterprise architects using modeling, analysis and reporting tools in accordance to the enterprise architecture method. They are the utility articles for the decision-making, planning and development, and therefore, they should allow their utilization and support the communication between different stakeholders as boundary objects. The techniques commonly used in enterprise architecture modeling are not the best facilitators for these purposes as they can be difficult to approach and understand by those who are not familiar with the semi-formal modeling.

Finally, the last element of this category is the collection of enterprise architecture best practices. These can include, for example, modeling templates, guidelines, and documented experiences on enterprise architecting. Several interviewees hoped for a service that could be used in sharing modeling templates, examples and best practices. In addition, the interviewees identified a need for a central government enterprise architecture portal[10] and a modeling repository[11]. These services were not available at the time of the projects but they have been started since then.

> *A collection of the best practices should be put together. And I've heard that it is on its way - or at least some kind of an architecture portal is being planned. I mean, of course, it would be a great help to collect together different assets that everybody could utilize.* (Interviewee D)

A requirement for enterprise architecture methods, tools and deliverables is that they should effectively support the building of collective knowledge, decision-making and strategy development. In this regard, it is essential that the method and tools are applicable for all involved stakeholders and can be used to facilitate the communication. The language barrier between business and IT people is one of the most common reasons for failures of information systems development projects and this is also acknowledged as one of the key challenges of enterprise architecting (Armour et al., 1999b; Shah & Kourdi, 2007; Wang et al., 2008; Espinosa & Boh, 2009; Seppänen et al., 2009; Lucke et al., 2010).

5.3.3 Governance

The category Governance covers the topics related to the adoption of the EA governance model and management structures, and an organization's capability to steer its operations accordingly. As noted by Kaisler et al. (2005), the effective enterprise architecture requires investments not only on technical, but also

[10] The portal to support the development of government enterprise architecture and IT management was launched in the autumn 2011. It can be accessed at https://www.yhteentoimivuus.fi/ (in Finnish).

[11] The central enterprise architecture repository for public organizations is currently available at http://prosessipankki.qpr.com/. (in Finnish)

organizational and cultural infrastructures. Yet, it has been argued that enterprise architecture frameworks do not sufficiently emphasize the role of institutions and capabilities critical in enabling the governance, adoption, and diffusion (Janssen & Hjort-Madsen, 2007). While pursuing savings with the help of enterprise architecture, organizations tend to focus on standardization and centralization by prioritizing compliance with the technical standards. Ross (2003), for example, has criticized enterprise architectures for often being limited to technological issues only. However, the challenges of enterprise architecting are seldom technical. More often they arise from political, project management, and organizational issues.

The following citation indicates the lack of coordination of the development activities in government agencies. The agency's current governance model necessitated that each program initiative must go through the review board before getting accepted but the system still fell short in supporting the management of overall view.

> *We have development programs for each individual process. Those are planned independently of each other and their possible interconnections are not seen until they have been implemented. Each of these programs has been approved one by one but nobody has taken a look of what the outcome will be as a whole.* (Interviewee B)

The potential success of an enterprise architecture initiative lies in the operation of the governance model and the guidance it gives to the organizational transformation. The adoption of enterprise architecture requires strong program and project management processes (Seppänen et al., 2009), and its maintenance asks for refined change management procedures (Kaisler et al., 2005). In addition, creating a strategic architecture competency involves ongoing negotiations about the organization's business strategy and how information technology responds and shapes that strategy (Ross, 2003). Development of the enterprise architecture is a long-termed process, which requires robust governance structures. The governance pursues for better manageability and control, and, according to Janssen and Hjort-Madsen (2007), is the key in determining the adoption and diffusion of enterprise architecture.

The governance models often expect, at least implicitly, certain types of organizational structures, roles, and operational processes. As a consequence, both agencies found the adoption of the Governance Model to be difficult or even impossible. Below an interviewee explains how the Governance Model conflicted with their current roles and practices.

> *A monocratic office environment adds some of its own flavor to this. Basically, regardless of the governance model, it is our CIO who makes all the decisions related to the IT management, including the architectural issues. He gets help from different management and coordination groups but, in the end, all the decision-making power is his alone. Therefore, the adoption of such a governance model is an interesting task.* (Interviewee G)

Interviewees agreed that the adoption of the new governance model requires critical analysis and adaptation of the existing structures.

> *We have these certain groups that decide on the development efforts on different forums. We should have taken these existing groups under the scrutiny… We couldn't accommodate [the Governance Model] to our existing structures.* (Interviewee B)

Assessed in terms of potential changes that are required in the organizational modus operandi, the adoption of governance model is easily the most intrusive and laborious task of enterprise architecting. How dramatic these changes should appear, depend on the governance model's fit to the existing governance structures as well as the organizational culture and attitude towards the change. In any case, a strong change management program is required to support the comprehensive enterprise architecture adoption.

> *We should have carefully examined how our existing governance structures work. Then we would have known whether the enterprise architecture fits under the responsibility of some existing team or does it require totally new ways of thinking and restructuring of our existing operations.* (Interviewee B)

Due to the significance of changes in an organization that the adoption of Governance Model would require, the interviewees widely criticized the model's poor maturity at the time and its failure to respond to the needs of different agencies.

5.3.4 Managerial Support

> *To get the enterprise architecture up and running, we must first sell it to the top management.* (Interviewee A)

There is no argument about that the managerial commitment and support is the key in making the enterprise architecture successful (Bussells, 2006). Organizational decision makers are responsible for creating a favorable atmosphere that is required to ensure that the enterprise architecture function is granted enough time, money and other resources (van den Berg & van Steenbergen, 2006). The government's enterprise architecture working group in Finland has also continuously advocated this notion. For example, the memo that accompanied the request for comments on the government enterprise architecture (Ministry of Finance, 2011) emphasized the managerial commitment as one of the focal issues. Enterprise architecture must be closely connected to the organization strategy and management processes, which cannot be achieved without the support from the top-level decisions makers. In both of our preliminary case organizations, however, this seemed to be a challenge. Lack of the managerial support for enterprise architecting is the second most commonly referred problem in the interview data.

> *Although they were invited, the [workshop] attendees missed a large number of these decision makers. Our project's steering group had invited them to participate but… They were unavailable.* (Interviewee G)

There seems to be several reasons behind the managers' lack of interest or even the resistance towards the enterprise architecture. According to our interviewees, probably the most important reason was simply the false conceptions about the enterprise architecture. As discussed earlier, the traditions of enterprise architecting and most of the enterprise architecture methods are rooted in the information technology oriented views. As such, they are perceived to be complicated and unapproachable for non-IT savvy persons. There is an apparent contradiction in that enterprise architecture projects that promise to produce tools for strategic management and guidance are often planned and carried out solely by the IT departments, and the resulting deliverables are intelligible only to the IT staff familiar with semi-formal modeling techniques and architecture descriptions.

> *Go ahead and try to propose the EA as a new strategic guidance mechanism for the ministry representatives. They will show you the door… 'This is IT nonsense.'* (Interviewee I)

In our case organizations, the enterprise architecture adoption project groups mainly comprised of IT staff. The interviewees were unanimous in that the groups should have included representatives of different stakeholders, including those on the top-management levels, with sufficient understanding of enterprise architecture's strategies, goals, methods, and the mindset in general. If managers are not able to absorb the ideas of enterprise architecting, they may find enterprise architecture offensive to their authority and the existing management practices. Below, an interviewee explains how their executive committee thought that the enterprise architecture backed up by the IT department would be stepping on their toes.

> *We prepared a report [on the use of enterprise architecture] for our executive committee and wrote that [the enterprise architecture] is a strategic management tool. We were immediately asked to specify who would be managing with it and managing what!* (Interviewee G)

Similarly, a university rector in the audience of an enterprise architecture seminar made a semi-humorous remark asking whether he is needed at all after the enterprise architecture function starts running his university. Although such comments may rightly question occasionally overstated capabilities of enterprise architecture as a strategic mechanism, it is evident that organizational powers and politics play a considerable role in the success or failure of enterprise architecture adoption (e.g., Boster et al., 2000; Kaisler et al., 2005; Hjort-Madsen, 2006).

The observable lack of managerial commitment stirred up some serious discussions within the project groups in our case organizations. This lack of support threatened to vitiate the idea of enterprise architecture being better able

to align the IT with the organization strategy (this challenge is more specifically discussed in Section 5.3.8). Both studied projects admitted that they failed in this regard.

> *It takes a great deal of dialog to open up this model to our general managers. And we didn't succeed in it at all. As I said earlier, this was very prominently an IT project. We got some process owners – not the general managers, though - involved but they saw only the matters relevant to their own silos.* (Interviewee I)

The interviewees widely agreed in that the enterprise architecture projects should be positioned outside the IT organizations and argued that the project owners should be top-level managers. However, as this seldom seems to be the case, the enterprise architecture project manager should have the direct line of communication to the board of directors. Should the enterprise architecture function still lack the required mandate and the long-termed continuity plan, it can easily render the work as a documentation exercise that only produces deliverables with no real contact points to the relevant issues on the organization's core business areas.

Several interviewees conveyed the need for an enterprise architecture marketing strategy that would not focus on the IT but instead would emphasize enterprise architecture's potential role in supporting the development of organization's core functions. However, as an interviewee pointed out, if the enterprise architecture is being sold as a management tool it may encounter insuperable competition from other management practices.

> *We already have enough 'isms'. We have Management by Results, we have Total Quality Management, and we have all the other management paradigms. Being something rooted in the traditions of IT, this whole idea of steering the organization according to the EA models is a foreign concept for the general management.* (Interviewee H)

In this regard, the EA governance structures have a focal role. The governance model should support the strategy processes and the established management practices in harnessing the enterprise architecture deliverables and taking an advantage of what they have to offer. Enterprise architecture should help leveraging the strategy execution by revealing the gaps and shortcomings in the current state of the organizational assets and by directing the development efforts to those areas where it is needed. However, without the types of deliverables and other enterprise architecture work products that can be genuinely used by different stakeholders and provide real value, an organization-wide commitment to enterprise architecture is difficult to reach.

5.3.5 Operational Personnel Involvement

If some of the case organizations' managers seemed to be reluctant to adopt the enterprise architecture, neither did the operational personnel show their unconditional interest in it. The reasons were partly the same as for the lacking managerial support. The enterprise architecture was perceived to be an IT man-

agement practice with no palpable connection to the organization's core operations and personnel's daily work. This was an obvious shortcoming, as one of the key objectives of the enterprise architecture is to help the development of operational functions by improving their alignment with both strategic functions and supporting IT functions. If the input and feedback from the operational staff cannot be effectively taken into account during the enterprise architecture planning, attaining this objective becomes extremely difficult.

Both projects tried to respond to this challenge by organizing workshops into which personnel from different divisions were invited. However, this did not yield the desired results. As commented by an interviewee below, the personnel involvement in the project was limited at best.

> *We had people taking part in the workshops who clearly were not interested in it at all. And we failed to communicate why it is important that they bring forward their views, opinions and ideas during these sessions.* (Interviewee E)

The projects failed to deliver a message that would have inspired the personnel to actively participate in the work. Personnel were consulted when the projects developed baseline enterprise architecture descriptions and they were later given a possibility to validate the results. However, our interviewees argued that this was inadequate. Several interviewees stated that the representatives of operational personnel should have been included in the core of the project groups. By this means, they could have brought their input to the important subject matters and it would have possibly helped the projects to shake off the IT stigma.

The consultants who delivered the projects had a prominent role in preparing the deliverables. Therefore, interestingly, some of those who wanted to take more active part in the work felt that their willingness to contribute was not fully utilized.

> *It didn't stretch us very much. The consultants did most of the work and we were then just gathered to see what they had done.* (Interviewee G)

It is, however, understandable that the consultants who were hired to implement the projects with the given resources and in the reasonably tight schedule did have to prioritize the effectiveness over some other factors. Also, due to the lacking enterprise architecture competence of their client organizations, consultants are often required to adapt an operative role instead of a facilitating one (Spewak, 1992). However, in establishing the sustainable grounding for the enterprise architecture, the latter role would indeed be more beneficial for the client. Therefore, as noted by Hirvonen and Pulkkinen (2005), it is important to plan ahead the roles and competencies that are needed in an enterprise architecture project. This necessitates the support and active involvement from the operational personnel as well as the management. If the enterprise architecture cannot gain this support and its initiatives cannot be traced back to the organization's strategic objectives, it will lack the mandate and impact that are necessary in realizing the benefits of the work.

5.3.6 Organizational Issues

The organizational barriers can hamper the enterprise architecture implementation in several ways. According to Katz (1978), typical organizational barriers to change include inertia of organization structures and work group norms, threats to balance of power, and previous unsuccessful change efforts. Several of these can be also found in our data. In addition, especially in organizations whose operations across the divisions are diverse, have little common ground with each other and serve different client bases, the shared organization-wide practices that enterprise architecture tries to promote can be found challenging to adopt. This was especially the case in State Treasury.

> *I see this as a challenge. With respect to the core functions, our division has practically nothing in common with the other divisions. […] None of the business applications are the same […] even a common CRM system is difficult to implement as the customer relationship management functions on different divisions have so different requirements.* (Interviewee C)

The enterprise architecture is commonly considered as a tool for developing interoperability and integrability of the IT-supported systems and processes, and the overall organizational change agility (Hoogervorst, 2004). In Finland, one of the related objectives of government enterprise architecture development is the facilitation of the public-private cooperation in service provision. Janssen and Creswell (2005) emphasize that providing efficient government services requires effective communications between the public and private sector organizations. According to an interviewee, this has been a challenge.

> *This public-private partnership setting is very difficult. It is rare that the contracts would sufficiently consider the issues on the organizational boundaries and, therefore, each party has different assumptions on how they should operate on this interface.* (Interviewee H)

An interviewed consultant commented that these problems are due to the inherit inflexibility of the operations models of government organizations in comparison to those of their private partners.

> *Public administration can be quite rigid in some regards… It can cause some difficulties.* […] *Let me put it this way: public administration isn't as agile as the organizations on the private sector are – or at least want to be.* (Interviewee E)

Rigid hierarchies, multiple stakeholders, a number of cross-functional boundaries, overlapping initiatives, and stovepipe systems limit the public organizations' agility and responsiveness to change (Sundberg & Sandberg, 2006). Therefore, changes to the established procedures and structures will take time to actualize. While the enterprise architecture should help in this by presenting well reasoned and rationalized mechanisms for the joint development efforts, the very same issues that the enterprise architecture aims at solving can seriously hinder its own adoption process.

5.3.7 Resources

The pilot project position of the preliminary cases generally allowed them the sufficient resources. Therefore, the problems in this category were mostly related to the lack of human resources with necessary skills and organizational knowledge that were required during the enterprise architecture adoption.

> *Probably the biggest problem was that it was really difficult to get these 'right' people to participate in the work.* (Interviewee C)

A related problem was the number of working hours that these individuals were able to contribute to the projects.

> *Time is the major problem. People are willing to participate if they think it is important but fitting it into their busy schedules might still be difficult.* (Interviewee G)

The choice of words of the cited interviewees indicates that these issues were quite significant during the projects. Several interviewees also described this to be a characteristic to most of the public sector development projects. Even if the personnel would be motivated to participate in the organizational development, they may be unable to do so due to the other responsibilities and continuous rush.

It can be argued that issues in other categories can cause the above problems. During the preliminary case projects, the poor commitment of operational personnel contributed to the unsatisfactory participation in the project workshops and other events. Second, the poor commitment is probably at least partially caused by the lack of understanding about the content and goals of enterprise architecture as discussed in Section 5.3.1. If the enterprise architecture is conceived as something that is not relevant in regard to one's job description, it is natural to conclude that one's input is not needed. Therefore, it is essential to increase the overall awareness about the enterprise architecture throughout the organization prior to starting the adoption project. Third, as indicated by the interviewees above, even for those who were willing to contribute to the projects, it seemed challenging for one reason or another. As discussed in Section 5.3.5, both projects were driven by the external consultants and due to the tight schedules; they could not take full advantage of the organizations' internal resources. These issues also speak for the management related problems. The importance of the enterprise architecture program may not be clearly communicated and therefore will not be appointed the working hours and other resources it would require. If the enterprise architecture function lacks the mandate and is not supported by the management, it is obvious that personnel are unwilling to try to rearrange their busy schedules in order to participate yet another project work.

5.3.8 Strategy Linkage

It is often argued that organization's strategic foundation should guide the development and maintenance of enterprise architecture (Parker & Brooks, 2008). This notion of organization's strategy setting the requirements for enterprise architecture development has also been included in the Finnish government EA Method since its first version. In our case organizations, however, it appeared to be quite challenging to effectively shape the enterprise architecture related efforts with the strategic goals. Therefore, the category Strategy Linkage is used for the issues that are related to the relationship between the enterprise architecting and the organization's strategic objectives.

The target state blueprint should represent the form an organization wants to attain in the future. Both of the preliminary case projects created some target state descriptions but our interviewees considered these efforts to be somewhat meaningless exercises compared to the actual strategic planning.

> *We drafted this roadmap, which in my opinion was more like a wishing well than the target state architecture. We put anything and everything into it, even things that had nothing to do with the enterprise architecture.* (Interviewee G)

> *We have defined a wonderful target state architecture. But still these individual development programs pursue completely different objectives than those what they described as the target stage.* (Interviewee H)

Several possible reasons for why the case projects struggled connecting the enterprise architecture with the organizational strategy can be found from the data. First, neither of the agencies fully succeeded in instantiating the enterprise architecture governance structures during the projects (Section 5.3.3). According to Parker and Brooks (2008), the enterprise architecture should provide an actionable insight into an organization's business model and thus play a key role in executing the strategy. For this, the operational governance model is a requisite and, on the other hand, the organizational strategy should be used to guide the definition of these governance structures. Second, the lack of managerial commitment (Section 5.3.4) inflicts that it is very difficult to define any binding strategic objectives for the enterprise architecture, as indicated in the interviewees' comments above. If the enterprise architecture is not managed top-down, the validity and efficacy of the decisions made in the process are greatly reduced.

> *In my opinion, this should be led top-down. Now it feels like we're just a report generator. First, we plan something and deliver those plans. Then someone piles up all those papers, and finally someone at the ministry looks at that pile and wonders what the heck are they doing there.* (Interviewee H)

The reality of strategic planning does not necessarily meet the operational realities. Business strategies tend to be planned and represented at an abstract level that does not always connect and interact with operational functions. Similarly, the enterprise architecture needs to reach a certain level of maturity

before it can be assumed to provide tangible input and feedback for the strategy process. Our interviewees also contemplated about the right positioning of the enterprise architecture function in the organization. As discussed earlier, enterprise architecting is often profiled as an activity performed by the IT departments. There is a high risk of losing the connection to the strategy and organization's core business areas if the enterprise architecture distinctively remains as an IT function.

> *This is one of the key questions that should be answered in the beginning of EA the adoption project. How do you organize the project, under which unit you place it, and who is the project owner. This pretty much determines how the enterprise architecture will be positioned in the organization. If the IT drives it, EA may lose the connection to the organization's core operations and their planned target state, which, after all, are the key issues here. The information technology isn't that interesting.* (Interviewee F)

Finally, interviewees from the both case organizations expressed their concern about the continuity of enterprise architecture development and maintenance. Some were afraid that the enterprise architecture could be a passing fad soon to be forgotten after the adoption projects were completed.

5.4 Individual problems related to axial categories

To complete the discussion on the axial categories, we present an index of problems of enterprise architecture adoption. In order to more precisely assess the axial categories, they have been broken to individual issues that could be identified in our data as well as in literature on enterprise architecture that was reviewed in Chapter 2. The problems presented in Table 18 are related to one or more axial categories. The identification number given for each problem will be later used as a reference.

Table 18 Problems of enterprise architecture adoption in relation to the axial categories

Ref. no.	Related categories								Problem
	Competence	EA Method and Tools	Governance	Managerial Support	Operational Personnel Support	Organizational Issues	Resources	Strategy Linkage	
1	●								Lack of wide skillsets required in EA. (James, 2002; Strano & Rehmani, 2007)
2	●								Lack of practical skills on architecture modeling and EA methods. (Hauder et al., 2013)
3	●								Enterprise architects' lacking political and business acumen. (Kaisler et al., 2005)
4	●								Lack of understanding how EA models should be interpreted and used. (Kaisler et al., 2005; Hauder et al., 2013)
5	●								Lack of commonly accepted definition for EA. (Schöenherr, 2009; Zink, 2009; Lemmetti & Pekkola, 2012)
6	●								Lack of strong project/program management expertise. (Kaisler et al., 2005)
7	●								Over-modeling: too much detail in architecture models and too much time spent in validating them. (Armour et al., 1999b)
8	●								Lack of best practices.
9	●								Taking a big bang implementation approach instead of iterative tactic. (Armour & Kaisler, 2001; Liimatainen et al., 2008)
10	●								EA is pushed forward without concerning delicate change management. (Asfaw et al., 2009)
11	●	●							Too much focus is put on creating EA deliverables. (Asfaw et al., 2009)
12	●	●							General immaturity of the field.
13	●	●							Lack of meaningful metrics. (Lam, 2004; Namba & Iljima, 2004; Kaisler et al., 2005; Lucke et al., 2010)
14	●	●							Stakeholders are unable to take advantage of the EA deliverables. (Kaisler et al., 2005; Hauder et al., 2013)
15	●			●					Communication plan fails in selling the EA for the influential audiences. (Zink, 2009)
16	●						●		Goals of the EA program are too ambitious. (Armour et al., 1999b; Bernard, 2008; Zink, 2009)
17	●						●		Initial scope of EA is too large. (Armour et al., 1999b; Ylimäki, 2006; Bernard, 2008; Buckl et al. 2009; Zink, 2009)
18	●						●		Lack of skilled human resources. (Hauder et al., 2013)
19	●							●	Inability to define concrete goals for EA. (Armour et al., 1999a; Lam, 2004; Lapkin, 2005; Hjort-Madsen, 2006; Wang et al. 2008; Seppänen et al. 2009; Hauder et al., 2013)

(Continues)

(Table 18 continues)

20	●							●	No shared understanding about the goals of enterprise architecting. (Tarabanis et al., 2001; Hjort-Madsen, 2006; Lemmetti & Pekkola, 2012; Hauder et al., 2013)
21	●							●	EA is unable to respond to rapidly changing business requirements. (Kaisler et al., 2005; Lapkin, 2005; Hauder et al., 2013)
22		●							EA has an image problem due to long implementation times and technical presentation. (Asfaw et al., 2009)
23		●							EA must compete on attention with other analysis, design and management methods, such as BPR, Six Sigma, ITIL and CobiT. (Zink, 2009)
24		●							EA methods lack the alignment with other analysis, design and management methods. (Zink, 2009)
25		●							EA's incompatibility with the established management paradigms.
26		●							EA method and deliverables do not support the communication. Instead of solving communication problems EA rather inflicts them with idiosyncratic vocabulary. (Armour et al., 2003; Dreyfus, 2007; Lucke et al., 2010)
27		●							EA models and other deliverables are not commonly understandable. (Armour et al., 2003; Kaisler et al., 2005; Dreyfus, 2007; Lucke et al., 2010; Lucke et al., 2012)
28		●							The promise of EA supporting the organizational decision-making is not realized, as the EA is not answering the questions that users ask. (Kaisler et al., 2005; Asfaw et al., 2009)
29		●							EA methods are considered to be rigid, inflexible and complex. (Asfaw et al., 2009)
30		●							EA methods are overly IT-oriented. (Kaisler et al., 2005)
31		●							The actual enterprise cannot be defined and decomposed according to the expectations that are built in to the chosen EA method. (Asfaw et al., 2009)
32		●							EA modeling tools are complicated, inaccessible and poorly integrated. (Kaisler et al., 2005; Shah & Kourdi, 2007; Roth et al., 2013)
33		●							Many of the current modeling tools are oriented to modeling software architectures and lack capabilities of higher-level conceptual modeling. (Armour et al., 2005)
34		●							Modeling tools fail in representing different architecture perspectives and levels of abstraction, and system dynamics. (Kaisler et al., 2005)
35		●							The EA Method does not meet diverse needs of different organizations.
36			●						Complexity of the current organizational governance structures. (Janssen & Hjort-Madsen, 2007; Isomäki & Liimatainen, 2008)
37			●						Lack of strong management and governance processes. (Lam, 2004; Bernard, 2008; Zink, 2009)
38			●						Difficulties in implementing the Governance Model.
39			●						The Governance Model is incompatible with the existing governance structures.
40			●						The use of EA in development projects is not mandated. (Kaisler et al., 2005)
41			●						Immaturity of the Governance Model.

(Continues)

(Table 18 continues)

42			●	●					EA programs lack the authoritative power. (Dreyfus, 2007; Lucke et al., 2010; Larsson, 2011)
43			●	●					Unclear leadership of the EA function. (Dreyfus, 2007; Bernard, 2008; Zink, 2009; Lucke et al., 2010; Larsson, 2011)
44			●	●					Difficulties in reasoning the motivation to participate.
45			●	●					EA is not allowed touch the functional areas of an organization and thus fail in achieving real changes in business functions. (Hjort-Madsen, 2007)
46			●	●	●	●		●	Silo mentality. (Sumner, 2000; Armour & Kaisler, 2001; Bannister, 2001; Tarabanis et al., 2001; Lam, 2005; Janssen & Hjort-Madsen, 2007; Isomäki & Liimatainen, 2008; Valtonen et al., 2010)
47			●	●				●	Incapability to establish EA as a continuous process. (Isomäki & Liimatainen, 2008)
48			●	●				●	EA is not effectively used in the strategic decision-making due to lacking management and governance processes. (Bernard, 2008; Zink, 2009)
49			●					●	Unclear positioning of the EA function.
50				●					Lacking managerial commitment and buy-in. (Armour & Kaisler, 2001; Dreyfus, 2007; Shah & Kourdi, 2007; Isomäki & Liimatainen, 2008; Asfaw et al., 2009; Lucke et al., 2010; Lucke et al., 2012; Roth et al., 2013)
51				●					Lack of sponsorship. (GAO, 2006; Hjort-Madsen & Pries-Heje, 2009; Zink, 2009; Lucke et al., 2010; Lucke et al., 2012; Roth et al., 2013)
52				●					Oversupply of the managerial paradigms.
53				●					Executive management's lacking support for the IT governance. (Kaisler et al., 2005)
54				●					Unclear oversight authority of the system architect over system development projects. (Kaisler et al., 2005)
55				●					Previous failed attempts on other design and analysis methods render managers reluctant to try out yet another 'trick'. (Armour & Kaisler, 2001; Zink, 2009)
56				●					EA function is not allowed the necessary mandate. (Hjort-Madsen, 2006)
57				●	●				Lack of commitment and buy-in. (Armour & Kaisler, 2001; GAO, 2006; Isomäki & Liimatainen, 2008; Asfaw et al., 2009; Hjort-Madsen & Pries-Heje, 2009; Lucke et al., 2010; Lucke et al., 2012)
58				●	●				Lack of motivation. (Armour & Kaisler, 2001; Isomäki & Liimatainen, 2008; Asfaw et al., 2009)
59				●	●	●			Resistance towards organization-wide architecture planning and change in general. (Hjort-Madsen, 2007; Asfaw et al., 2009)
60				●	●	●			Inability to change the existing ways of working. (Armour & Kaisler, 2001)
61				●	●	●			Overall resistance to change. (Armour & Kaisler, 2001; Hjort-Madsen, 2007; Isomäki & Liimatainen, 2008)
62				●	●	●			Resistance of technology as a change factor. (Hjort-Madsen, 2007; Asfaw et al., 2009)
63				●		●		●	EA program is seen as a threat to project-specific or system-specific interests. (Bernard & Grasso, 2009)
64				●				●	Inability to define a meaningful target state architecture.

(Continues)

(Table 18 continues)

65						●			Inability to establish common policies and practices that would fit the needs of different divisions.
66						●			Diversity of the departmental requirements. (Armour & Kaisler, 2001; Bannister, 2001; Tarabanis et al., 2001; Janssen & Hjort-Madsen, 2007; Valtonen et al., 2010)
67						●			Inconsistent interests towards the development of EA. (Bernard & Grasso, 2009)
68						●			Silos due to technological, political and organizational reasons. (Sumner, 2000; Armour & Kaisler, 2001; Bannister, 2001; Tarabanis et al., 2001; Lam, 2005; Janssen & Hjort-Madsen, 2007; Isomäki & Liimatainen, 2008; Valtonen et al., 2010)
69						●			Barriers caused by organization culture; no history of working together and sharing information between divisions. (Sumner, 2000; Hjort-Madsen & Gotze, 2004; Lam, 2005; Ylimäki, 2006)
70						●			Organizational complexity and rigidity. (Bannister, 2001; Tarabanis et al., 2001; Isomäki & Liimatainen, 2008; Valtonen et al., 2010)
71						●			Public-private partnership setting.
72						●		●	IT departments' poor understanding or even ignorance of business requirements and strategy. (Espinosa & Boh, 2009)
73						●		●	IT departments are only concerned on technical issues of architecting. (Espinora & Boh, 2009)
74						●		●	Conflicting goals between the IT management and system owners. (Hjort-Madsen, 2006; Larsson, 2011)
75						●		●	Inability to align business architecture and IT architecture. (Armour et al., 1999a; Lam, 2004; Lapkin, 2005; Hjort-Madsen, 2006; Wang et al. 2008; Seppanen et al. 2009; Larsson, 2011)
76						●		●	Lack of communication between different stakeholders. (Armour et al., 1999a; Lam, 2004; Wang et al., 2008; Seppänen et al. 2009; Zink, 2009; Lucke, Krell & Lechner, 2010)
77							●		Insufficient funding for the EA program. (Dreyfus, 2007; Isomäki & Liimatainen, 2008; Zink, 2009)
78							●		Continuous struggle to justify the expenses of the EA function. (Dreyfus, 2007; Zink, 2009)
79							●		EA treated as a fixed-termed project and is not included in the long-term capital planning process. (Lapkin, 2005; Isomäki & Liimatainen, 2008)
80							●		Lack of time.
81								●	Difficulties in establishing meaningful value propositions for the EA. (Lam, 2004; Namba & Iljima, 2004; Kaisler et al., 2005; Bernard & Grasso, 2009; Lucke et al., 2010; GAO, 2012)
82								●	Poor correspondence of strategic and operative realities.
83								●	Lack of common language between different stakeholders. (Armour et al., 1999b; Armour et al., 2003; Dreyfus, 2007; Shah & Kourdi, 2007; Wang, et al., 2008; Asfaw et al., 2009; Espinosa & Boh, 2009; Seppänen et al., 2009)
84								●	Inability to define the business driven, commonly accepted and concrete enough goals for the architecture. (Armour et al., 1999a; Lam, 2004; Lapkin, 2005; Hjort-Madsen, 2006; Wang et al. 2008; Seppanen et al. 2009)

(Continues)

(Table 18 continues)

85								●	EA initiatives often start by standardizing platforms or products at the technology level instead of starting with a decomposition of the business strategy and only then moving towards technology. (Bellman & Rausch, 2004; Zink, 2009; Saha, 2010)
86								●	Project managers are capable of managing changes on local platforms but do not understand the impact of changes on other platforms. (Kaisler et al., 2005; Dreyfus, 2007)
87								●	Lack of control and communication between the EA and development projects. (Kaisler et al., 2005)
88								●	It is unclear how the project management decisions should be assessed against the EA. (Kaisler et al., 2005)

6 PRACTITIONER SURVEY ON PROBLEMS OF ENTERPRISE ARCHITECTURE ADOPTION

This chapter presents the survey study that was conducted to collect the final slice of data for the research. The survey study has several objectives. First, its purpose is to present our preliminary findings to the wider audience outside the studied case organizations and to test their validity and significance in a broader context. By doing this, in addition to previous qualitative information, we also want to attain quantitative data in order to enhance the diversity of the evidence. Second, by the structuring of the survey, we want to investigate which stages of an enterprise architecture adoption project are most prone to induce problems.

In the following, we will first describe the overall structure of the survey study and the contents of its questionnaire. Then, the remainder of this chapter presents the data analysis and the results.

6.1 Structure of the practitioner survey

Next we present a generic process model for enterprise architecture adoption project that was used to structure the practitioner survey. There are several enterprise architecture process models, which in many cases are closely coupled with a certain EA method (Pulkkinen & Hirvonen, 2005). The process presented in this study, however, does not commit to any single method but it focuses on the general characteristics of the enterprise architecture adoption regardless of the chosen approach. As discussed in the earlier chapters, it must be noticed that enterprise architecting is an ongoing process, which is not finished once the adoption process is carried through. Therefore, many of the process models are cyclic in nature and take incremental steps, which are usually undertaken in separate projects (Pulkkinen & Hirvonen, 2005). This is acknowledged also in our suggested adoption process, whose last phase is supposed to begin the institutionalization of enterprise architecture. At this point, the enterprise archi-

tecture maintenance and development is thus to become a part of an organization's standard activities of development and decision-making.

We present the following process model of the generic enterprise architecture adoption project (Figure 18) due to following reasons. First, many of the previously proposed models, such as the ones by Armour et al. (1999b) Boster et al. (2000) and Armour and Kaisler (2001), or for example the TOGAF Architecture Development Method (The Open Group, 2013, 48) and the one of the EA Method, implicitly assume that the adoption stage is already completed and the enterprise architecture development is being practiced as an ongoing process. Therefore, none of the enterprise architecture development models is fully suited for our purpose as such. This is not to say that we would disagree with these models. On the contrary, our process follows their basic structure and contains the customary activities that have taken a place of a de facto standard for the enterprise architecture development over the last 20 years. However, as this research specifically focuses on the adoption phase, which can be seen as the initiation period of the ongoing enterprise architecting process, it is reasonable to increase the level of detail in regard to the activities that are related to the adoption phase and, on the other hand, to omit the cyclicality and iterativeness of the process. Second, the process model is needed as a canvas on which we position the challenges of enterprise architecture that were discussed in previous chapters in order to structure the survey study. We use the structure borrowed from the process of planned change by Kolb and Frohman (1970) in our suggested enterprise architecture adoption process. The process is then detailed according to our observations on several enterprise architecture adoption projects as well as previously proposed models for the enterprise architecture development.

The process for planned change (Kolb & Frohman, 1970) incorporates characteristics that can be found in several processes of organizational development and change management. As illustrated in Figure 17, the process has seven stages, which may occur sequentially or simultaneously. The original context of the Kolb and Frohman process is the relationship between a client organization and consultants facilitating the organizational change. When necessary, during the following sections we adjust this process context towards the initial stages of the enterprise architecture life cycle management (see Figure 8). The process has two feedback loops that emphasize the need for continuing renegotiation during the process and the use of evaluations of previous actions to modify planning activities (Kolb & Frohman, 1970).

Both Lewin-Schein framework (cf., Keen, 1981) and Kolb and Frohman's process (Kolb & Frohman, 1970) have been used extensively in studies of organizational change and information systems implementation. The former has also been used in the context of enterprise architecture development (Hirvonen & Pulkkinen, 2005). Kolb and Frohman's process, however, is further specified, and as such more suitable for examining the nature of change that enterprise architecture adoption is to cause in an organization.

Based on the work of Adams and Barndt (1983), Slevin and Pinto (1987) suggest four stages for the project life cycle management. These stages can be paralleled with Lewin-Schein framework and Kolb and Frohman process as

shown in Figure 17 (adapted from Keen, 1981). Thus the activities in the model of Slevin and Pinto characterize change implementation as a project. The project standpoint provides a good complementary perspective to our process model. According to Slevin and Pinto (1987), conceptualization is the initial project stage during which it is determined whether the project is necessary. Then the preliminary goals and possible alternative approaches are specified. During the planning phase, the formal plans to accomplish the project's goals are created. These include scheduling, budgeting, and allocation of other specific tasks and resources (Slevin & Pinto, 1987). Execution stage comprises the actual work of the project: materials and resources are procured, the project is produced, and performance capabilities are verified. Finally, termination stage contains the activities that are performed after the project is completed. These include releasing the resources, transferring the responsibilities and reassigning project team members to other duties (Slevin & Pinto, 1987). However, contrary to a typical project with a definitive beginning and an end, an enterprise architecture adoption project is only the first phase of what should transform into the continuing processes of enterprise architecture planning, development and management. Therefore, during the termination stage, it is important to ensure the continuity of the work that has been started.

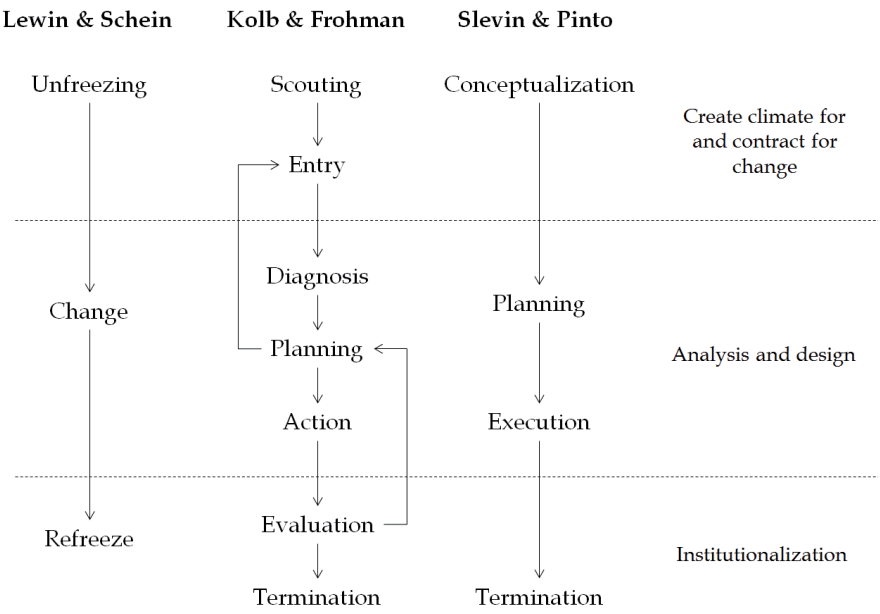

Figure 17 Lewin and Schein (cf., Keen, 1981) framework, Kolb and Frohman process of planned change (Kolb & Frohman, 1970), and Slevin and Pinto (Slevin & Pinto, 1987) project life cycle phases

Figure 18 illustrates the suggested enterprise architecture adoption process. The process model specifies the overall structure of the process of planned change with activities that are commonly taken during the enterprise architecture

adoption. Next we will discuss each stage of the process as well as the problems (in reference to Table 18) that potentially complicate these stages.

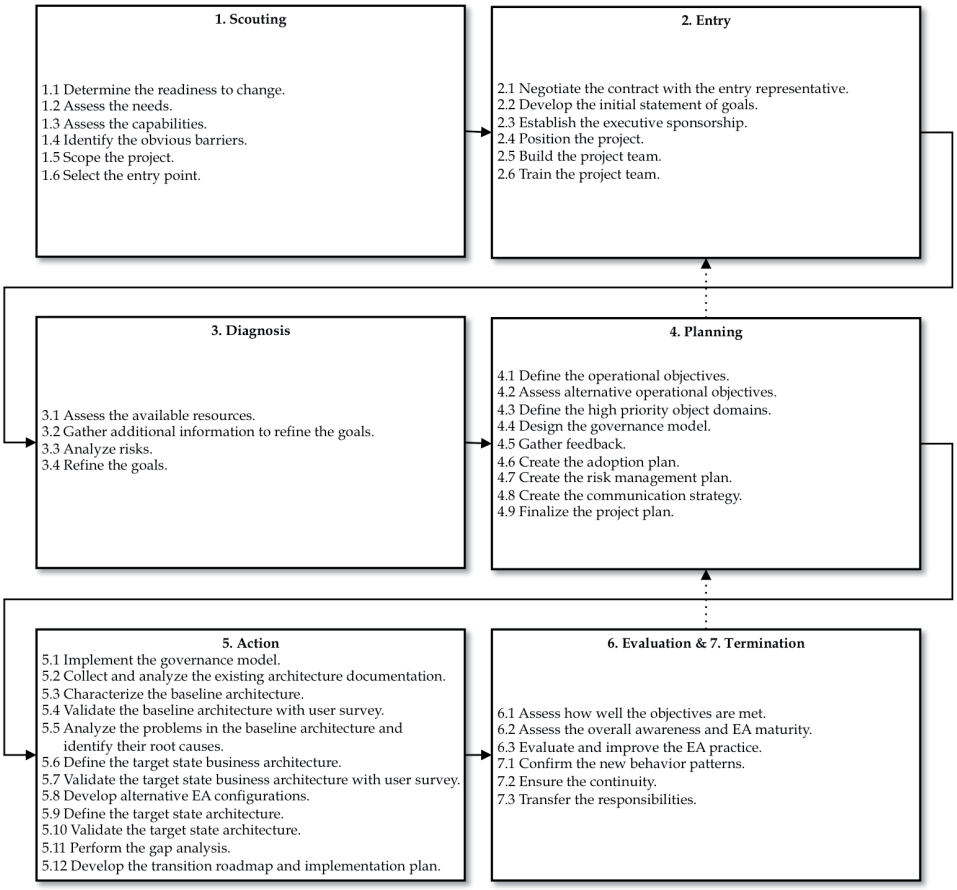

Figure 18 Enterprise architecture adoption process

6.1.1 Scouting

The first stage of the process of planned change is Scouting. Prior to starting the enterprise architecture adoption, it is important to probe the organization's needs and capabilities to undertake the project. How extensive this phase should be depends on how familiar the project leads already are with the organization that is going to undertake the project. Kolb and Frohman (1970, 54) advise that an external consultant should look at the following characteristics of the client organization: "1) major resources, 2) major limitations, 3) important social and cultural norms and values, 4) major subsystems within the overall system (departments, divisions, subsidiaries), 5) gross interrelationships among major subsystems, 6) attitudes toward change, authority, and outsiders, 7) relationship between client organization and other organizations in its environment, 8) motivation of the client organization to improve itself." All of these

topics are worth investigating when scoping an enterprise architecture adoption project as they give a good overall view to the organization and its readiness to change. In addition, for enterprise architecture, it is important to familiarize oneself with the resources and operating models of IT services production as well as the IT governance structures. The adoption of enterprise architecture requires thorough knowledge about the organization. Therefore, even if the external experts would carry out the project, it is important that the core project team involves in-house members who have the adequate knowledge about the profound issues such as organization's social and cultural norms, as well.

During the scouting stage it is also important first to probe and then to establish the entry contacts and sponsorship for the project. Although the Act on Information Management Governance in Public Administration mandates the government authorities to adopt the enterprise architecture, our data indicates that establishing the local sponsorship for enterprise architecting can still be difficult. Therefore, it is advisable to start early contemplating the possible project ownership and the project's position in the organization. As discussed earlier, an IT department seems to be the most likely location for an enterprise architecture project, although rarely the best. Likewise, it is important to try to identify the obvious organizational and other barriers that need to be bypassed during the early phases of the enterprise architecture adoption. Finally, the organization's overall readiness and the available resources then lead to the rough scoping of project. At this time it is not yet necessary to scope the project in relation with the goals and objectives but rather define the frames within which these can be set during the later stages of the adoption process.

Potential problems of the Scouting stage. By evaluating the problems of enterprise architecting identified in our data as well as in previous research literature (see Table 18 in the previous chapter) the following of them can be seen to relate to the scouting stage. First of all, an organization may be reluctant towards launching an enterprise architecture adoption project due to image problems of enterprise architecting caused by long implementation times and technical presentation (issue 22 in Table 18). Also, enterprise architecture may be perceived to be incompatible with the existing managerial paradigms (24). The organization-wide resistance towards change (10, 55, 59, 60, 61, 62, 65, 70) can severely hinder the capability to successfully deploy enterprise architecture and therefore these factors should be carefully considered during the scouting stage.

Poor understanding about the purpose (5) and goals of enterprise architecting (20) generally complicates the activities related to the scoping of the enterprise architecture projects. The initial scope is often set too large (17) and the goals overly ambitious (16). It is also common to take the 'big bang' approach to enterprise architecture development instead of more manageable iterative approach (9).

Finally, lack of skilled enterprise architects (1, 2, 3) and especially the lack of enterprise architecting related skills of the government organizations' staff (4, 18) have undermined the capabilities to adopt the enterprise architecture since the launch of the government EA program in Finland. This situation, however, is now resolving as more enterprise architecture training is being offered and also several private consulting companies have started to specialize in the field.

6.1.2 Entry

The Entry stage begins with a negotiation with the chosen entry representative or representatives, who also would be potentially suited as the project owners. This is followed by developing the initial statement of project goals and objectives in accordance with the needs, existing capabilities and the project scope that were investigated in the previous stage. The goals are then examined from the perspective of contributions they require from different stakeholders in order to be achievable. The goals that are related to the business architecture require different expertise than those related to the information systems architecture or technology architecture. The goal setting thus greatly affects to the composition of project team. Concurrently with the definition of the project goals the executive sponsorship for the project is established. As the value proposition of enterprise architecture can be the key selling point of the project and assist the commitment towards it, it is advisable to carry out these steps simultaneously and in interaction.

Next follow the positioning of the project and building the project team. The position should allow the project with enough authority to make the decisions that need to be made. The higher in the organization hierarchy the project ownership is located, the better the possibility to achieve a success in adoption is. Sometimes decisions related to the enterprise architecture development must touch delicate or even controversial issues within the organization. As discussed earlier, should the EA program be owned and steered by the IT department, it can be difficult to achieve real changes in business. On the other hand, it may be harmful for the enterprise architecture if it appears as a governance tool that is used to enforce the changes, such as enterprise standardization efforts, that the entire organization is not willing to accept. Therefore it is important to continuously communicate the decisions made and make the process as transparent as possible.

The project team should firstly embody the knowledge that is relevant in regard to project's primary goals. For example, if the goals focus on technology standardization, different expertise is needed than with the goals that relate to business process development. Secondly, to allow a wide range of perspectives, the team should employ as many different stakeholders as possible and encourage involvement with open participation. Training the project team is an optional step in the process that should be taken if needed. In addition to EA methods, the use of modeling tools and other such topics, it is especially important to ensure that the team members have a shared understanding about the enterprise architecting in general. As discussed earlier, enterprise architecture still lacks the shared terminology and there are different interpretations on how it should be approached and structured as a practice (Winter & Fischer, 2007; Schöenherr, 2009; Lapalme, 2012). Although it may sound trivial, establishing the common language for the project group may be challenging, especially if the group involves people with different educational and professional backgrounds.

Development of the project plan is also started during the entry stage. The project plan is refined during the next two stages and the formal project plan

document, including scheduling, budgeting, and allocation of other tasks and resources, is finalized at the end of the planning stage.

Potential problems of the Entry stage. There are several issues that should be cleared at the beginning of the EA adoption process. The mistakes made in the scoping of project can escalate during the definition of project goals. The goals should show the value that an organization can gain from the effort, and that it finds important and therefore is willing to commit to. On the other hand, in order not to suggest unrealistic value propositions, the goals must be composed so that they are attainable with the given capabilities and resources. The failure of doing so will not only lead to a failed project but can also compromise the entire concept of enterprise architecture. Often, still, the goals of enterprise architecting are reported to be ambiguous (19, 20, 81) and overly ambitious (16) or unable to deliver real business value (4, 8, 11, 14, 21, 27, 28, 33, 72, 73, 87, 88). Different departments of an organization may also have inconsistent interests towards enterprise architecture, which can be manifested as conflicting goals (67, 74).

One of the challenges most often stated by practitioners is the lack of managerial support for enterprise architecture (15, 50, 51). This is due to various reasons, one of which definitely is the weak business value provided by the enterprise architecture. Then again, this is often only due to decision-makers' inability to utilize the enterprise architecture deliverables effectively (14, 23, 24, 25, 26, 28, 48, 50, 52, 83). Therefore, it is pivotal that the steps "Develop initial statement of goals" and "Establish executive sponsorship" are executed in parallel and in alignment. By this means, the formulation of objectives can be rightly need-driven and, on the other hand, this way the sponsorship should be easier to motivate.

Positioning and ownership of the adoption project should be decided by anticipating the prospective ownership of the enterprise architecture function. On the one hand, the project position can be seen just as an administrative detail but as discussed above, the position can also either greatly help or hamper the possibility to attain the desired results. Our data as well as previous studies indicate that the positioning (49) and leadership (43) of the enterprise architecture function are often unclear or inexpedient. The enterprise architecture programs are often owned by the IT departments, which may undermine their capability to attain any changes in the core business functions (42, 56, 72, 73, 76).

Finally, several issues can hinder the formation of a capable project team. The lack of time (80) and other resources (77, 78) can lead to a less than optimal team composition. The special skills required in enterprise architecting are also a scarce resource (1, 18). Personnel may also lack the motivation (44, 58) to participate in the project whose purpose and objectives are not fully clear to them. Team members from different organization units may have conflicting interests towards the project goals (65) and it may be difficult to find a common language between the different groups of stakeholders (83). It can help on the above issues to provide the project team with training sessions prior to starting the actual work. In addition to training related to the EA method, modeling and other technicalities it is important to establish the shared understanding on the purpose and objectives of enterprise architecting.

6.1.3 Diagnosis

The Diagnosis stage focuses on refining the initial project goals. For this task, additional information is collected and the available resources are assessed. If the initial statement of objectives appears to be ill conceived or is constrained by the lack of resources, it should be redefined here. If necessary, the goals can be disassembled into more fine-grained subgoals that can be located into the organizational and architectural areas (cf., Pulkkinen & Hirvonen, 2005).

Risk assessment is an ongoing activity that is carried out in parallel with other activities during the Diagnosis and Planning stages. The risks are analyzed in terms of their possible impact on the success and this information is used as an input for planning the related activities. After the risks are analyzed, it is recommended to create a well-documented plan for the project risk management and mitigation.

Potential problems of the Diagnosis stage. There are not many potential challenges to the Diagnosis stage that would not have emerged in the process until now as the Diagnosis focuses on refining the project goals in the light of assessment of the available resources and the particularized information collected throughout the organization. The challenges that relate to the setting of the project goals and the lack of resources that were discussed in the previous section apply also here.

6.1.4 Planning

The Planning stage covers two parallel branches of activities. The first one contains the tasks that contribute to the project implementation planning and the second focuses on preparing the EA governance model implementation.

The Planning stage starts with the operationalization of the project objectives. At this point it is decided how the potentially rather abstract objectives will be approached and what tasks must be performed in order to achieve them. The areas of responsibility are shared among the team members and additional or external resources are requested for those tasks that require it. As noted by Kolb and Frohman (1979), the formulation of specific objectives also makes it easier to evaluate the project success.

Before moving forward, it is advisable to stop assessing alternative options. In some cases, it might be reasonable to approach problems from different perspective or to try to tackle them in different order. In general, the enterprise architecture should be driven by the organization's strategy. Therefore, in the literature, it is systematically recommended that the architecture planning should proceed from the conceptual business view towards the information and the information systems, and finally the technology. These decisions, however, are very much dependent on the task at hand, as well as the context and capabilities, and therefore for each objective the best approach should be contemplated given the circumstances.

Once the objectives are operationalized and aligned, they are prioritized. It is now decided, which tasks are the most important and should be taken first in

order to ensure that they can be accomplished with the available resources and within the schedule.

Next, the implementation plan is developed in line with the decisions made during the process so far. The feedback is then collected from different stakeholders and, if necessary, the plan is refined accordingly. Finally, this stage ends with creation of the formal project plan. In addition, prior to starting the actual project work, the communication plan should be created. This plan addresses all the relevant stakeholders, including the information sources and sinks, and the methods using which these groups are approached. It must be also considered in which kind of contexts the enterprise architecture should be discussed and how it will be presented for the organization-wide audience. As discussed earlier, mismatched communications and the lack of shared vocabulary are some of the key challenges of enterprise architecting (Armour et al., 1999b; Shah & Kourdi, 2007; Wang et al., 2008; Asfaw et al., 2009; Espinosa & Boh, 2009; Seppänen et al., 2009). As a rule of thumb, a technical jargon should be avoided in favor of business perspectives (Zink, 2009).

Concurrently with the preparation of the project implementation plan, the initial planning of the EA governance model is started. Adoption of the governance model appeared to be quite challenging in our preliminary case organizations. The governance model suggested along with the EA Method was found difficult or even impossible to implement as such in these organizations. The problems of governance model implementation in the case organizations were discussed in Section 5.3.3. For the government agencies, it is not sufficient to implement the enterprise architecture management only locally but it must be aligned with other agencies and administrative branches. Due to its intricacy, treating the planning and implementation of the governance model merely as a few steps in the enterprise architecture adoption process is an obvious simplification. There are, however, several acknowledged issues discussed in this chapter that relate to the successful establishment of the enterprise architecture governance structures either directly or indirectly.

Potential problems of the Planning stage. Transformation of the potentially abstract project goals into the executable tasks requires solid knowledge and practical skills related to the enterprise architecture method, processes and modeling (1, 18). Vague, ambiguous or overly ambitious goals (9, 14, 16, 17, 19, 20, 81) can greatly hinder the operationalization but, on the other hand, this stage also allows correcting some of the earlier mistakes by molding the objectives into more concrete form.

The successful implementation of the EA governance model requires it is aligned with the organization's existing management and governance structures (37), which, due to their complexity (36) or inherited incompatibility with the EA governance model (39), can be a formidable task. The governance model should involve the relevant stakeholders and designate the roles and responsibilities for the architecture related decision-making. Therefore, whilst the governance model is being designed, the intended use of the enterprise architecture in the organization must already be conclusively defined.

Enterprise architecture initiatives often start by standardizing platforms and products at the technology level instead of starting with a decomposition of

the business strategy and only then moving towards technology (85, 73). Therefore, especially at the early stages, enterprise architecting seems to be driven by the development of application and technology architectures (30, 33, 73) and may appear incapable of supporting business requirements or, in the worst case, to completely overlook the business architecture. This causes the general management to lose their interest in enterprise architecture and ruins the promise of supporting the business-IT alignment (75). If the enterprise architecture is only the IT departments' interest, it cannot become an integral part of the business-related decision-making and development (48). On the other hand, our data indicates that the correspondence between the strategic and operative realities can be flawed (82) and therefore the goals set in 'ivory towers' may be unfit to solve the problems of operative functions.

Due to the lack of managerial buy-in to enterprise architecture (50), many EA programs have been reported to have an insufficient mandate and authority to touch the functional areas of an organization (42, 45). Unclear leadership of the enterprise architecture function (43) also hampers the implementation of the EA governance model. It is not clear who should be involved in the governance processes, who should be heard for the architecture-related decision-making, and who should take the overall responsibility over it. Finally, establishing the common governance procedures that would satisfy the diverse requirements of different departments appears to be problematic (65).

There are several problems that should be tackled while establishing the communication strategy for the enterprise architecture adoption project, and for the enterprise architecture function in the long term. Probably the most critical issue is the challenge of reaching the influential audience and selling the idea of enterprise architecting to them (15). A number of studies have reported the lack of communication between the business and IT people (76), which, according to Lapkin (2005), enterprise architecture can facilitate by delivering the commonly understood terms and semantics for the dialogue between these groups. On the other hand, our data and some previous studies indicate that enterprise architecture deliverables do not necessarily support the communication but can rather inflict new communication problems with their idiosyncratic vocabulary (26).

6.1.5 Action

The Action stage can be divided into the three intertwining parts, namely modeling the baseline architecture, modeling the target state architecture, and planning the transition roadmap. If the organization has not yet acquired a dedicated, repository-based software suitable for enterprise architecture modeling and model management, it should be considered at this point. Standard office applications such as presentation tools and spreadsheets can be used at first but they are soon to become a limiting factor.

The Action stage starts with modeling the current state of an organization. At first, the existing process and data models, the documentation concerning the information systems, and other available documentation should be collected and their applicability analyzed. Organizations may already have reasonably

encompassing documentation available should they have used, for example, quality assurance methods such as Common Assessment Framework[12] that is commonly used in the Finnish government organizations as well as the universities, or IT governance frameworks such as COBIT or ITIL. Even if the documentation would not be methodically created or would lack in other ways it can still serve as a good starting point for the baseline modeling. Advanced enterprise architecture modeling tools can also create some models automatically by referring to, for example, system databases and service interfaces, and thus mitigate the routine documentation process.

The baseline models are then completed and refined in those areas where it is required. The modeling is done in accordance with the prioritized project objectives. The scope and the level of detail of documentation should be kept moderate in order to avoid the "analysis paralysis". Different stakeholders, preferably the owners of the actual subjects of the models, should then validate the deliverables, whether they regard business processes, business data or information systems.

Once the current state is characterized, the modeled constructs should be analyzed in order to reveal the obvious weaknesses and shortcomings in the existing architectural structures. This activity leads to the definition of the target state architecture. The business requirements and probably broader statement of the organizational vision should drive the target state design, and therefore it is recommended to first define the target state for the business architecture view. Either prior to or parallel with this, the problems of the existing architecture and their causes should be defined by interviewing process owners and other relevant stakeholders. Together with the organization's business goals, this analysis sets the frames for the rest of the target state architecture, and all the decisions made during the target state definition should be reflected against them. Yu, Strohmaier and Deng (2006) recommend outlining several alternative enterprise architecture configurations from which the most applicable solutions can be chosen. Later, while the processes of enterprise architecture management have matured, the configurations can be used as 'design patterns', i.e., well-developed and documented solutions applicable for a certain problem appearing in a certain domain.

When the target state objectives are defined and validated, the gap analysis begins the road-mapping phase. The current enterprise architecture is evaluated in regard to its readiness to execute according to the needs defined by the target state. The enterprise architecture configurations that were chosen for implementation serve as a basis for the evaluation. For those areas of the baseline architecture that are considered lacking, the improved designs are created in detail to allow the planning of the transition implementation. This planning typically involves activities such as requirements elicitation and business process development, both of which can be supported by the capable enterprise architecture modeling and management tools. Finally, the architecture transition plan should be divided into the manageable work packages that can be implemented as separate development projects.

[12] http://www.eipa.eu/files/File/CAF/CAF_2013.pdf

Potential problems of the Action stage. The tasks of the Action stage are mostly related to modeling the baseline and target states of the enterprise architecture, and planning the transition between the states. Expertise in semi-formal techniques (2), which most of the EA methods suggest for the modeling purposes, as well as the road mapping and other practical architecting skills are required, yet often found lacking (1, 18). Some generic challenges to modeling the enterprise architecture can be originated back to the goal setting of the project. Large project scope can cause the modeling task to become overly laborious especially in larger organizations where there are numerous functional domains, processes and systems to be modeled (17) in order to establish the baseline architecture. Therefore, it is advisable to moderately define the domains that are modeled in the first phase, and then particularize and expand the models during the later modeling iterations (9). The over-modeling should also be deliberately avoided. It is common that models are excessively detailed and too much time is spent in validating them (7).

Many of the current EA modeling tools can be criticized for that they emphasize the modeling of IT artifacts instead of the business objects. This is mainly due to that most of the tools have been originally developed for modeling software systems or software architectures, and therefore fail in representing different enterprise architecture perspectives and levels of abstraction (34). In addition to that, the enterprise architecture modeling is often started 'bottom-up' by modeling first IT artifacts even though the literature generally recommends the 'top-down' approach that starts by decomposing the business strategy and only then moves towards the information systems and technology (85). On the other hand, versatile modeling tools that cover different modeling domains are often complicated and difficult to use (32).

Also EA methods have been criticized for being IT oriented (30) and as such they cannot properly align the technology with the business domain. The methods are often perceived rigid, complex and inflexible (29), and require a lot of customization to meet the organization-specific needs (35). Enterprise architecture deliverables are argued to be difficult to understand (27) and they fail to support the communication between the stakeholders (26). EA methods and the types of deliverables they suggest to be produced may be difficult to interrelate with other design and analysis methods used within an organization (24). It is also possible that the actual organization cannot be defined and decomposed as the method expects (31). For example, it might be difficult to model networked or virtual organization structures according to certain EA frameworks.

The successful definition of the target state architecture necessitates that the organizational vision and strategic objectives have been made explicit. Without these it is practically impossible to design a sound target state that can produce real value for the organization. Unfortunately, according to our data as well as previous studies, developing business driven enterprise architecture seems to be difficult (84). If the business requirements are not reasonably paid attention to, one may end up developing solutions that brilliant as such but do not fit the needs (Armour et al., 1999a). Another challenge is to transform the vision into the executable development plan. It requires seamless cooperation between the business people, IT developers, and architects first to create the

enterprise architecture design that can implement the vision and then to put this design into the practice.

6.1.6 Evaluation

In the Evaluation stage, the results and contributions of the project are appraised. The natural yardsticks for the evaluation are the project objectives that were set and refined during the Entry and Diagnosis stages, respectively. In addition to these, however, it might be reasonable to evaluate the overall change that has taken a place: Has the awareness of enterprise architecture reached the necessary stakeholders? What is the general attitude towards the enterprise architecting? Has the project produced tangible benefits for the organization? Another, a complementary, approach to evaluate the project results is to perform an enterprise architecture maturity assessment, preferably by external evaluators. However, the maturity assessment is best suited as a developmental tool for more mature enterprise architectures and therefore its full potential cannot be reached soon after the initial adoption.

During the evaluation, it is important to remember that the adoption stage is just the initiating step in the continuous process of enterprise architecting. Most of the real benefits of enterprise architecting can be realized only after its potential is assimilated and mastered widely throughout the organization. However, the early experiences and the lessons learned during the adoption project should be critically evaluated and used as the information according to which the practice of enterprise architecting can be continuously improved.

Potential problems of the Evaluation stage. The cardinal challenge of evaluating the results of an enterprise architecture adoption project is that the enterprise architecture can seldom produce quick benefits (22). As discussed above, the adoption project aims at establishing the necessary foundation on which the practices of enterprise architecting can be built. This is not to say that one could not expect any tangible results from the adoption project, on the contrary, one definitely should, but demonstrating the long-term value is difficult after a short-termed project.

An issue identified by several researchers that complicates the evaluation of value of enterprise architecting is the lack of meaningful metrics (13) combined with difficulties in establishing the meaningful value proposition for the enterprise architecture (81). The enterprise architecture maturity assessment models are often mechanistic and mostly function on quantitative measures. They can be used to evaluate, for example, the overall awareness on enterprise architecture or how encompassing the produced documentation is. These alone, however, do not indicate the value that is being produced (84).

6.1.7 Termination

The Termination stage focuses on confirming new behavior patterns and ensuring the continuity of enterprise architecting. These include the operationalization of the EA governance model and transfer of the responsibilities accordingly. In many cases the members of the adoption project team have developed

invaluable skills and gathered in-depth knowledge during the project and therefore it is natural to start building the processes of enterprise architecture maintenance and development on these assets.

Potential problems of the Termination stage. Especially government organizations whose funding mechanisms are typically founded on fixed-term projects may struggle integrating the enterprise architecture function to their long-term capital planning process (47, 79). Instead, development of enterprise architecture is often treated as a series of fixed-term projects that are continuously required to justify their expenses (77, 78). As already discussed, the enterprise architecture is not an operative initiative that will produce immediate rewards. It is a strategic asset that can generate value only when being utilized persistently. If the organization is not ready to take this stance, it must seriously consider whether it is worthwhile to start the enterprise architecture adoption at all.

6.2 Survey respondents

The main purpose of the survey was to validate the issues that we believed to be the problems complicating the enterprise architecture adoption in public organizations. Therefore, the survey was specifically targeted to the experienced enterprise architecture practitioners in public organizations, municipalities and institutions of higher education. The respondents were approached due to their acknowledged status on the enterprise architecture related matters and it can be argued that the respondents represent experts on the subject matters that were covered in the survey. Over half of the respondents assessed their expertise on the topic to be at a high level. Approximately 50% of the respondents represented government organizations or municipalities, 25% of the respondents are actively involved in the enterprise architecture development in the field of higher education, and other 25% come from private IT companies experienced in consulting the public sector enterprise architecture development. The respondents were given an option to leave their e-mail address to receive a summary of the survey results. Other means to motivate the respondents were not used.

After the incomplete responses were removed from the data, the size of the sample consists of 49 respondents. The average response time for filling in the online questionnaire was approximately fifteen minutes. As the purpose of the survey was to validate our findings and the nature of the study was descriptive, the research design is adequate although the sample size and selection process would not support statistical representativeness or exploratory results (Otto & Reichert, 2010).

6.3 Contents of the survey questionnaire

This section presents the contents of the survey questionnaire. For the demographic information, the questionnaire asked the respondents for the topics shown in Table 19. Although survey was targeted for the audience experienced in practice of enterprise architecture related matters, we wanted to allow the respondents to give their subjective evaluation on their level of expertise, combined with the experience on working with enterprise architecture as well as the status of the enterprise architecture adoption in the organization they represent.

Table 19 Demographic details

Question	Answer options
The type of organization the respondent presents.	- Government agency or a public utility - Municipality - University or a vocational college - Private company - Other
The respondent's experience on working with enterprise architecture.	- Not at all - Less than one year - More than one year
The respondent's expertise on enterprise architecture related matters.	- Weak expertise - Intermediate expertise - Good expertise
The status of the enterprise architecture adoption in the respondent's organization.	- Adoption is not started - Adoption is started but not completed - Adoption is completed

The survey questionnaire presented 28 potential problems related to the adoption of enterprise architecture. These problems were then divided across the seven stages, according to the stages of the process model discussed in the Section 6.1. The last two stages of the process, i.e., Evaluation and Termination, were combined for the purpose of the survey study. Each of the resulting six stages comprised four to five issues that we believed to be highly significant with regard to a successful adoption of enterprise architecture.

Table 20 shows the issues[13] proposed to relate to the different stages of enterprise architecture adoption, and the problems (Table 18) that contribute towards these. The issues presented in the survey aim at summarizing and combining these more detailed problems and therefore several problems may contribute towards each of the issues.

The first group of questions, Scouting, focuses on issues related to an organization's willingness and capability to undertake the process of enterprise architecture adoption. The second group of questions, Entry, deals with topics that are related to the personnel's willingness and capability to commit themselves to the enterprise architecture as well as in establishing the responsibilities

[13] The survey was conducted in Finnish but is here translated to English. The original survey questionnaire can be found in Appendix 3.

and ownership of the enterprise architecture function. In the third group, Diagnosis, the first four issues focus on the definition of goals, i.e., what is the purpose of enterprise architecture adoption. The last question in this group addresses the enterprise architecture communication strategy, which is a subject matter often seen not only very important but also highly challenging. The fourth group, Planning, deals with two major themes. The first is the operationalization of the adoption activities and the second deals with the matters related to the EA governance, including the decision-making, the responsibilities, the mandate of the enterprise architecture function as well as the implementation of the governance model. The Action group focuses on the practical issues of modeling the baseline and target stages of the enterprise architecture. Finally, the questions in the Evaluation and Termination group deal with issues related to the evaluation and measurement of the benefits of enterprise architecting and establishing the enterprise architecture function as an ongoing process after the adoption project has been finished.

For each issue presented in the survey, the respondents were first asked if they had come across the said issue (answering *Yes* or *No*). Then, regardless of whether or not they had encountered the issue, the respondents were asked to evaluate how challenging they consider the issue by using a three-point scale (*Not challenging*, *Fairly challenging*, *Highly challenging*). At the end of each of the six stages of the survey, the respondents were allowed to write free-formed comments on the topics. The questionnaire did not necessitate the respondents to answer all the questions so they could leave the issues they were uncertain about unanswered.

Table 20 The issues presented in the survey and the contributing problems identified in data and literature.

SCOUTING		
Issue		**Related problems**
1A	The organization responds reluctantly to new ways of working and the changes they necessitate.	10, 59, 61, 62, 69
1B	The understanding about the purpose and goals of enterprise architecting is lacking in the organization.	16, 17, 19, 20
1C	Enterprise architecture has an image problem due to, for example, troublesome implementation and technical representation.	5, 7, 9, 17, 22, 26, 27, 28, 30, 32, 33, 72, 73, 83
1D	There has been an excess of different management and organizational development methodologies. Enterprise architecture gets lost among these or may not be compatible with them.	14, 23, 24, 25, 31, 52, 55
1E	The organization lacks the practical skills required in enterprise architecture development.	1, 2, 3, 4, 5, 11, 12, 14, 18, 32, 81
ENTRY		
Issue		**Related problems**
2A	The managers are not adequately engaged in the development of enterprise architecture.	15, 22, 23, 25, 50, 52, 53, 55, 62
2B	The employees cannot participate in the development of enterprise architecture due to lack of time or other resources.	47, 51, 77, 78, 80
2C	The employees are unwilling to participate in the development of enterprise architecture due to other reasons.	1, 2, 15, 18, 22, 44, 57, 58, 62

(Continues)

(Table 20 continues)

2D	Appointing the accountable leadership and ownership statuses for the enterprise architecture project appears problematic.	15, 18, 22, 43, 44, 49, 50, 51, 55, 56, 76, 80, 83
2E	The project group that executes the enterprise architecture adoption project is primarily staffed by the employees of IT department and the influence of other organization functions to the work is lacking.	10, 30, 33, 72, 76, 83, 85
DIAGNOSIS		
Issue		**Related problems**
3A	The goals that are set for the enterprise architecture are difficult to understand and poorly reasoned.	19, 20, 26, 81, 82, 83, 84
3B	The entire organization cannot commit itself to the goals that are set for the enterprise architecture.	10, 12, 20, 65, 66, 67, 69, 74, 76, 82, 83, 84
3C	The goals that are set for the enterprise architecture are too ambitious to be achieved with the allocated resources.	3, 9, 15, 16, 17, 18, 42, 45, 51, 56, 77, 79, 80
3D	The goals that are set for the enterprise architecture do not solve real problems and therefore cannot yield any real benefits for the organization.	3, 4, 11, 14, 20, 21, 26, 28, 33, 72, 81, 82, 84, 85
3E	The informing and communications related to the enterprise architecture are dysfunctional and/or do not reach the right audience.	15, 26, 81, 83, 87
PLANNING		
Issue		**Related problems**
4A	There are difficulties in transforming the goals set for the enterprise architecting into the practical tasks.	1, 8, 16, 17, 19, 31, 84
4B	There are difficulties in delegating the enterprise architecture development related decision-making rights and responsibilities	15, 22, 36, 37, 38, 39, 42, 48, 49, 50, 53, 54, 60, 61, 65, 68, 87, 88
4C	Due to its narrow mandate, the enterprise architecture cannot have a true influence on activities of organizational development.	3, 15, 25, 40, 42, 43, 45, 49, 50, 54, 56, 59, 61, 63, 68, 88
4D	There are difficulties in integrating the EA governance model with the present practices of the organization.	23, 24, 25, 36, 38, 39, 41, 43, 50, 60, 61, 65
ACTION		
Issue		**Related problems**
5A	The enterprise architecture method that is being used is inflexible and is not fully suited in modeling the organization's architecture.	12, 14, 24, 26, 27, 28, 31, 35
5B	The EA method and modeling techniques focus too much on information systems and technologies, and do not provide proper tools for modeling other functions.	30, 33, 35, 73
5C	The enterprise architecture models and deliverables do not produce real benefits for the organization.	4, 14, 24, 25, 26, 27, 28, 33, 34, 35
5D	The skills related to modeling the enterprise architecture are lacking.	1, 2, 4, 7, 11, 18, 27, 30, 32
5E	The information that is needed to define the target state for the enterprise architecture is difficult to obtain or is not available at all.	3, 31, 50, 60, 64, 65, 66, 67, 68, 81, 82, 84
EVALUATION and TERMINATION		
Issue		**Related problems**
6A	There are difficulties in evaluating the benefits of enterprise architecting with concrete measures.	13, 14, 16, 19, 81

(Continues)

(Table 20 continues)

6B	Justifying the expenses of enterprise architecture function is challenging due to the difficult verification of the benefits.	13, 47, 77, 78, 79
6C	The enterprise architecture is being developed in short-termed projects and it is difficult to establish the enterprise architecting as a continuous process.	9, 37, 47, 65, 77, 79, 80
6D	The organization as a whole has problems in developing its operations in long-termed and planned manners.	6, 37, 46, 55, 59, 60, 64, 65, 67, 68, 75

6.4 Results of the survey

This section discusses the data and the results of the survey study. First we present the demographic information of the respondents and then the subsequent sections go through the data following the stages of the enterprise architecture adoption process. Finally, we will examine whether there are differences in the conception of problems of the enterprise architecture adoption as the respondents are shared to groups according to the demographic information.

6.4.1 Demographics

Considering the focus of this study it is appropriate that the majority of the respondents came from the government organizations or other public utilities. Also universities were reasonably well represented, probably due to recently increased activities on development of the higher education system's enterprise architecture in Finland. Respondents also came from private IT and consulting companies that have plenty of experience in working with the enterprise architecture development in public and government organizations. Therefore, this group of respondents provided a valuable external viewpoint to the research topic. Table 21 shows the distribution of respondents' organization types.

Table 21 Organization types of the respondents

Organization type	**Respondents**
Government agency or a public utility	31.9 %
University or a vocational college	23.4 %
Private company	23.4 %
Municipality	14.9 %
Other	2.1 %
Not answered	4.3 %

The vast majority of the respondents had worked with the enterprise architecture for more than one year (Table 22). Approximately half of the respondents regarded their expertise on the enterprise architecture to be on an intermediate level and the other half considered it to be good (Table 23). The respondents were approached due to their acknowledged status on the enterprise architecture related matters in Finland or via professional communities. Therefore, it

can be believed that the respondents represented the expertise on the subject matters that were discussed in the survey.

Table 22 Respondents' experience on working with enterprise architecture

Experience	Respondents
Not at all	0 %
Less than one year	17.0 %
More than one year	79.0 %
Not answered	4.2 %

Table 23 Respondents' expertise on enterprise architecture related matters

Expertise	Respondents
Weak expertise	2.0 %
Intermediate expertise	44.9 %
Good expertise	46.9 %
Not answered	6.1 %

Only 17 percent of the respondents' organizations had completed the adoption at the time the study took place during the summer 2013. The majority of 68.1 percent of the organizations had started the adoption but not finished it yet, and 10.6 percent were still to start the adoption (Table 24). This indicates that the overall maturity of enterprise architecture in Finnish public organizations is still relatively low. One should also notice that the concept of 'enterprise architecture adoption'[14] might be somewhat ambiguous and even though the questionnaire briefly introduced our conception on it, it is possible that the respondents had different interpretations of the term.

Table 24 Current status of the enterprise architecture adoption

Status of the EA adoption	Respondents
The adoption is not started	10.6 %
The adoption is started but not completed	68.1 %
The adoption is completed	17.0 %
Not answered	4.3 %

6.4.2 Results on Scouting

As the Scouting stage of the adoption process precedes the actual launch of the project, this corresponding part of the survey did deal with organizations' readiness to undertake and complete this engagement successfully. According to the survey, the problems presented in this group were the most commonly encountered (Table 25). The mean rate of encounter over the five issues is 82.1 percent.

[14] The Finnish version of the survey questionnaire used the term 'käyttöönotto', which can also be translated as commissioning, deployment, implementation, introduction, or initialization.

Table 25 Scouting: Have you encountered this issue?

Issue	Yes %	No %
1A The organization responds reluctantly to new ways of working and the changes they necessitate.	88.1	11.9
1B The understanding about the purpose and goals of enterprise architecting is lacking in the organization.	92.9	7.1
1C Enterprise architecture has an image problem due to, for example, troublesome implementation and technical representation.	76.7	23.3
1D There has been an excess of different management and organizational development methods. Enterprise architecture gets lost among these or may not be compatible with them.	69.0	31.0
1E The organization lacks the practical skills required in enterprise architecture development.	83.7	16.4
Mean	82.1	17.9

This group also contains the single most commonly recognized issue in the questionnaire, namely the lack of understanding about the purpose and goals of enterprise architecting (issue 1B), which is encountered by 92.9 percent of the respondents. In the open comments, some respondents argued that especially the managerial levels of their organizations have not yet grasped the purpose of enterprise architecting and thus do not understand its implications in development of the organizational functions. Without understanding its purpose, the enterprise architecture is easily seen as an additional burden that managers already very occupied rather try to avoid.

Some respondents argued that the vocabulary used by the enterprise architects and consultants is filled with technical terms and jargon, which greatly contributes to the above problem. Accordingly, another respondent stated that:

> *The enterprise architecting is still seen as something that only propeller-heads would be interested in. The core business is not willing to participate and cannot see the benefits it could provide. The vocabulary that is being used is way too confused and complicated. The same issues are referred to with different terms and different issues are referred to with the same terms.* (Respondent 34)

The latter part of the above comment is remarkably similar with Lapalme's (2012) observation. It seems that practitioners of the enterprise architecture are still seriously lacking the agreed upon terminology.

Also the organizations' unwillingness to change their existing ways of working (issue 1A) was known to 88.1 percent of respondents. On the other hand, the issue 1D that was often referred to during our interviews with the representatives of the preliminary case organizations, namely the EA's tendency to get lost among other management and development methods and techniques such as TQM, BSC, or ITIL for IT governance, was the lowest ranking problem in this group, encountered by 69.0 percent of the respondents. However, since the interviews in the preliminary case organizations were conducted, the status and visibility of enterprise architecting in Finland has considerably strengthened, not least due to the recent Act on Information Management Governance in Public Administration. Still, in relation to this, in the section for open

comments, a respondent raised forward this issue from the viewpoint of the IT management:

> *It should be considered how to integrate the IT governance models, such as ITIL and COBIT, with the enterprise architecture. These models are commonly implemented in the organizations and their usage is pretty effectively monitored.* (Respondent 27)

The respondents considered the issues in this group to be quite challenging as well (Table 26). Again with the exception of the issue 1D, which was considered as not challenging (NC) by 35.0 percent of the respondents, all the other issues were considered to be either fairly challenging (FC) or highly challenging (HC) by over 80 percent of the respondents (FC + HC = FH).

Table 26 Scouting: How challenging is this issue?

Issue	**NC** %	**FC** %	**HC** %	**FH** %
1A The organization responds reluctantly to new ways of working and the changes they necessitate.	9.5	66.7	23.8	90.5
1B The understanding about the purpose and goals of enterprise architecting is lacking in the organization.	4.8	69.0	26.2	95.2
1C Enterprise architecture has an image problem due to, for example, troublesome implementation and technical representation.	18.6	65.1	16.3	81.4
1D There has been an excess of different management and organizational development methodologies. Enterprise architecture gets lost among these or may not be compatible with them.	35.0	50.0	15.0	65.0
1E The organization lacks the practical skills required in enterprise architecture development.	14.0	55.8	30.2	86.0
Mean	16.4	61.3	22.3	83.6

NC, Not challenging; FC, Fairly challenging; HC, Highly challenging; FH, Fairly + Highly challenging

The issues 1A and 1B, encountered by 88.1 and 92.9 percent of the respondents respectively, were seen to be exceptionally challenging. Both of them were considered to be either fairly challenging or highly challenging by over 90 percent of the respondents. The issue 1A rather describes the generic organizational resistance to change, which is a well-known and richly studied subject matter. However, the issue 1B is closely bound up with the very foundations of the practice of enterprise architecting and in this sense can be considered to be highly critical in the context of this research. If an organization that starts utilizing the enterprise architecture is not aware of why this is done, what does it mean in practice, and what goals should be pursued with it, it does give a good starting point for this engagement. It is also worth noticing that most of the respondents' organizations are required to manage their enterprise architecture according to the Act on Information Management Governance in Public Administration – the act whose letter and purpose apparently is not fully understood.

The issue 1E, i.e., the lack of practical skills on the enterprise architecture, was encountered by 83.7 percent of the respondents and was considered to be either fairly challenging or highly challenging by 86.0 percent of the respond-

ents. Throughout our data, the lack of enterprise architecting related skills appears a number of times. The following respondent called for more coordinated guidance from the central government for the development activities in municipalities:

> *The state authorities should have coordinated more closely the EA commission in the municipalities. Now, each municipality was allowed to scribble down what they wished. It would have been a lot easier if the municipalities were provided with proper and utilizable model and solutions for this task.* (Respondent 6)

The above citation resembles the comment by the Interviewee F (page 107) who feared that the lacking guidelines would result in different implementations of the enterprise architecture in different government agencies that are adopting the EA Method. It seems surprising how little the situation has improved since we interviewed the representatives of the preliminary case organizations. Another respondent commented that the training and instruction materials in Finnish language are still sketchy and poorly available. The respondent pointed that this seriously hampers the possibility to increase the overall awareness and skills on enterprise architecture.

In general, it seems that the Scouting stage of the adoption process is critical. If these issues are not solved early on, they may later compromise the success of the entire project.

6.4.3 Results on Entry

The issues presented in this group are related to the launch of the adoption project. As such, the issues cover topics such as structuring a project group that presents different organizational stakeholders and establishing the sponsorship and ownership statuses for the enterprise architecture function.

All the problems in this group were encountered over half of the respondents (Table 27). The most common issue, with almost 90 percent positive response rate, was the 2B, i.e., employees' inability to participate the development of enterprise architecture due to lack of time or other resources. This is presumably at least partly caused by the managers' lacking engagement, the issue 2A, which will lead to inadequate resources for the work, as noted by several respondents in the open comments section of the survey. The following respondent addresses this issue and its implications quite frankly:

> *This lack of time and other resources is often just an implication of the poor management. Managers do not manage the people, who then spend their time doing whatever they like. This is a problem. And it's not acknowledged in the organizations. Or they don't want to acknowledge it.* (Respondent 25)

At the same time, however, as noted by another respondent, the resources in many government organizations and municipalities are genuinely scarce and it is not possible to take under fully-fledged development activities even if their need was acknowledged. Therefore, it is not equitable to just accuse the decisions of resource allocation for this matter.

The lacking managerial support is often reported to be one of the most common problems of the enterprise architecture development. This issue was encountered by 73.8 percent of the respondents. The survey shows, however, that this is not an issue in every organization as commented by the following respondent.

> *The highest officials of the municipality have actively participated in analyzing the services of the IT management from the customer point of view. By using their input, we have crafted the roadmap towards the target stage and, also, the prioritization of the update schedules and the disaster recovery plan for over 140 information systems.* (Respondent 17)

Table 27 Entry: Have you encountered this issue?

Issue	**Yes** %	**No** %
2A The managers are not adequately engaged in the development of enterprise architecture.	73.8	26.2
2B The employees cannot participate in the development of enterprise architecture due to lack of time or other resources.	87.8	12.2
2C The employees are unwilling to participate in the development of enterprise architecture due to other reasons.	56.1	43.9
2D Appointing the accountable leadership and ownership statuses for the enterprise architecture project appears problematic.	70.7	29.3
2E The project group that executes the enterprise architecture adoption project is primarily staffed by the employees of IT department and the influence of other organizational functions to the work is lacking.	66.7	33.3
Mean	71.0	29.0

The issues presented in this part of the survey were in general considered to be either fairly challenging or highly challenging by 71.8 percent of the respondents (Table 28). The two issues that were seen to be the most challenging in this group were the issues 2A and 2B, and they were also the most commonly encountered issues. Both of these were considered to be either fairly challenging or highly challenging approximately by 85 percent of the respondents. Some respondents also argued in the open comments that the still prominent conception of that the enterprise architecture is something only the IT departments should be interested in is a notable problem. Therefore, the benefits the enterprise architecting can generate for the entire organization should be highlighted at the early stages of the EA adoption project.

On a more positive note, the issue 2C, i.e., the employees' unwillingness to participate in the development of enterprise architecture was encountered by only 56.1 percent of the respondents and was considered to be either fairly challenging or highly challenging by 57.5 percent of the respondents. Although these figures are not low, per se, they are among the lowest in the entire survey. This lets us believe that many organizations are increasingly aware about the importance of input from different stakeholders during the development of their operations and, therefore, the employees are more willing to participate in

the enterprise architecture related activities. However, half of the respondents' organizations still struggle with this issue, as noted by the following respondent.

> *Our* [EA] *team covers pretty inclusively the entire organization. However, many of these delegates in the team see this as something negligible and therefore often do not attend the meetings.* (Respondent 7)

Table 28 Entry: How challenging is this issue?

Issue	NC %	FC %	HC %	FH %
2A The managers are not adequately engaged in the development of enterprise architecture.	14.6	39.0	46.3	85.4
2B The employees cannot participate in the development of enterprise architecture due to lack of time or other resources.	15.0	40.0	45.0	85.0
2C The employees are unwilling to participate in the development of enterprise architecture due to other reasons.	42.5	52.5	5.0	57.5
2D Appointing the accountable leadership and ownership statuses for the enterprise architecture project appears problematic.	35.7	38.1	26.2	64.3
2E The project group that executes the enterprise architecture adoption project is primarily staffed by the employees of IT department and the influence of other organization functions to the work is lacking.	33.3	35.7	31.0	66.7
Mean	28.2	41.1	30.7	71.8

NC, Not challenging; FC, Fairly challenging; HC, Highly challenging; FH, Fairly + Highly challenging

6.4.4 Results on Diagnosis

Four out of the five issues in the Diagnosis group of the survey concern the goals of enterprise architecture. The fifth issue in this group deals with the matter of how the enterprise architecture should be communicated within the organization, which is, according to our experiences as well as other researchers', of critical importance. Not only it is extremely important to be able to sell the idea of enterprise architecting for influential audiences in the organization and by this means gain the sponsorship for the work, it also greatly affects the personnel's willingness to participate in the work. On the average, the issues in this group were encountered by 70.4 percent of the respondents (Table 29). The most commonly recognized problems here relate to the failing communications (issue 3E) and setting so ambitious goals for the enterprise architecture that they cannot be achieved with the allocated resources (issue 3C).

Table 29 Diagnosis: Have you encountered this issue?

Issue	Yes	No
3A The goals that are set for the enterprise architecture are difficult to understand and poorly reasoned.	65.9	34.1
3B The entire organization cannot commit itself to the goals that are set for the enterprise architecture.	70.0	30.0
3C The goals that are set for the enterprise architecture are too ambitious to be achieved with the allocated resources.	80.5	19.5

3D The goals that are set for the enterprise architecture do not solve real problems and therefore cannot yield any real benefits for the organization.	57.5	42.5
3E The informing and communications related to the enterprise architecture are dysfunctional and/or do not reach the right audience.	78.0	22.0
Mean	70.4	29.6

Approximately one fourth of the respondents also considered overly ambitious goals to be a highly challenging problem. Similarly, the respondents regarded the issue 3B, i.e., finding the goals that an entire organization would support, to be problematic. (Table 30) In the open comments section, a couple of respondents presented applicable ideas on this matter. One respondent commented that the goals of the enterprise architecting are often so abstract that it is almost impossible to evaluate the viable benefits of the work. Another respondent recommended for setting metrics in close relation to the goals.

> *It's important to set the relevant goals for the EA and for these, to define the well-articulated meters that visualize the progress of the work for the management as well as the employees.* (Respondent 27)

Some respondents also suggested for setting easily achievable and fine-grained goals.

> *The problems can be avoided by splitting the work into the manageable pieces. By breaking the goals into sub-goals. And it is also important to tolerate incompleteness!* (Respondent 67)

Table 30 Diagnosis: How challenging is this issue?

Issue	**NC**	**FC**	**HC**	**FH**
3A The goals that are set for the enterprise architecture are difficult to understand and poorly reasoned.	39.0	46.3	14.6	60.9
3B The entire organization cannot commit itself to the goals that are set for the enterprise architecture.	26.1	58.7	15.2	73.9
3C The goals that are set for the enterprise architecture are too ambitious to be achieved with the allocated resources.	27.0	48.7	24.3	73.0
3D The goals that are set for the enterprise architecture do not solve real problems and therefore cannot yield any real benefits for the organization.	45.0	32.5	22.5	55.0
3E The informing and communications related to the enterprise architecture are dysfunctional and/or do not reach the right audience.	29.2	53.7	17.1	70.8
Mean	33.3	48.0	18.7	66.7

NC, Not challenging; FC, Fairly challenging; HC, Highly challenging; FH, Fairly + Highly challenging

The problem that was the most rarely encountered is the issue 3D, i.e., the goals that are set for the enterprise architecture do not solve real problems and therefore cannot yield any real benefits for the organization. This issue was recognized only by 42.5 percent of the respondents. While this still is a problem for a considerable number of the respondents' organizations, it also speaks for the increasing confidence on the practice of enterprise architecting. However, on

the grounds of the responses to other issues in this group, it is important to clearly communicate the purpose and goals of enterprise architecture development (issue 3A) and to define the goals so that the entire organization can commit to them (issue 3B). Both of these issues advocate for the effort to be put in creating a proper communication strategy for the EA adoption project (issue 3E). Tackling the communication problems will also help on the matter of insufficient resources allocated for the work (issue 3C). The following respondent, however, comments how challenging this can be, as enterprise architects are often required to be the jacks-of-all-trades who operate between the business and IT.

> *Directing the communications to different stakeholder groups is challenging. The enterprise architects should be able to speak fluently both business language and the IT jargon.* (Respondent 27)

As noted by some of the survey respondents and many other practitioners on the field, it seems even to be advisable to purposely avoid using the term 'enterprise architecture' when addressing the upper management. One respondent put the blame on the enthusiastic EA consultants and argued that these ideas would be much easier to sell by using the language that is inherent to the organization.

6.4.5 Results on Planning

Overall, the issues in the Planning group characterize problems that relate to the operationalization of the enterprise architecture management and governance for which some of the issues discussed earlier (e.g., 2A and 2D) can be seen as prerequisites. On the average, the issues included in this group were encountered by 73.0 percent of the respondents (Table 31) and they were considered to be either fairly challenging or highly challenging by 73.5 percent (

Table 32).

Table 31 Planning: Have you encountered this issue?

Issue	Yes	No
4A There are difficulties in transforming the goals set for the enterprise architecting into the practical tasks.	73.7	26.3
4B There are difficulties in delegating the enterprise architecture development related decision-making rights and responsibilities.	81.6	18.4
4C Due to a narrow mandate, the enterprise architecture cannot have a true influence on activities of organizational development.	68.4	31.6
4D There are difficulties in integrating the enterprise architecture governance model with the present practices of the organization.	68.4	31.6
Mean	73.0	27.0

Table 32 Planning: How challenging is this issue?

Issue	NC	FC	HC	FH
4A There are difficulties in transforming the goals set for the enterprise architecting into the practical tasks.	31.6	55.2	13.2	68.4
4B There are difficulties in delegating the enterprise architecture development related decision-making rights and responsibilities.	21.1	52.6	26.3	78.9
4C Due to a narrow mandate, the enterprise architecture cannot have a true influence on activities of organizational development.	27.0	37.8	35.2	73.0
4D There are difficulties in integrating the enterprise architecture governance model with the present practices of the organization.	26.3	42.1	31.6	73.7
Mean	26.5	47.0	26.5	73.5

NC, Not challenging; FC, Fairly challenging; HC, Highly challenging; FH, Fairly + Highly challenging

The most common problem in this group is the issue 4B. According to 81.6 percent of the respondents, there are difficulties in delegating decision-making rights and responsibilities for the activities related to the development of enterprise architecture. One respondent commented that their organization overall lacks the project-oriented view to the development of internal operations and no ownership statuses are appointed for these activities. According to the respondents, the existing outdated management models, on the other hand, can give a good entry point for introducing the EA governance model. The Respondent 27 argued for the integration of the enterprise architecture with the project governance practices.

> *Based on my experiences, it is important to try to integrate the principles and requirements that come from the architecture management with the existing project governance models. This would help the EA's possibility to supervise and, especially, support the projects so that they understand the architectural requirements and can implement them in the right way.* (Respondent 27)

Combining the architecture management with the project management practices and the project portfolio planning is commonly considered to be a characteristic of the enterprise architecture process that has reached a high level of maturity. The leading EA modeling and management tools are also increasingly supporting this feature (Schekkerman, 2011). It seems to be advisable for the organizations to try to integrate the enterprise architecture function with the organization's existing structures and the ways of working. However, this often leads to that the tasks of enterprise architecture planning and development are added on top of staff's existing responsibilities. Currently in Finland, it is quite rare that government organizations would have hired dedicated enterprise architects, which also shows in the encounter rate of the issue 4B. It is not clear who should make the decisions and take the responsibility on the architecture development and management. Due to the required special skills and the overall effortfulness of the task, it is undeniably difficult to reach good results if the

enterprise architecture planning and management are not full-time responsibilities. This also leads to that the enterprise architecture appears just as a negligible tinkering for the IT departments. This topic is often referred to in our interview data and several survey respondents addressed it in their open comments.

> *I have seen that the executive managers are favorable to enterprise architecting and participate in it in the beginning. However, this soon goes astray as they think that they have successfully delegated the issue* [to the IT department]. *Demoting EA as only a matter of IT is a notable problem. We should definitely emphasize the viewpoint of business architecture.* (Respondent 33)

> *The team that implements the EA adoption mainly consists of IT staff. Therefore, the other functions of our organization can only have little to say on that.* (Respondent 54)

6.4.6 Results on Action

There are two issues that stand out in the Action group (Table 33). First, 81.6 percent of the respondents agreed that the skills of modeling the enterprise architecture (issue 5D) are currently lacking. However, as this is supposedly an issue that can be quite easily resolved with practice and training, only 18.4 percent estimated this to be a highly challenging problem.

> *The lack of skills can be dealt with by arranging accurately targeted training sessions. However, it is more difficult to change people's attitude.* (Respondent 20)

Table 33 Action: Have you encountered this issue?

Issue	Yes	No
5A The enterprise architecture method that is being used is inflexible and is not fully suited in modeling the organization's architecture.	23.7	76.3
5B The enterprise architecture method and modeling techniques focus too much on information systems and technologies, and therefore do not provide proper tools for modeling other functions.	50.0	50.0
5C The enterprise architecture models and deliverables do not produce real benefits for the organization.	52.6	47.4
5D The skills related to modeling the enterprise architecture are lacking.	81.6	18.4
5E The information that is needed to define the target state for the enterprise architecture is difficult to obtain or is not available at all.	64.1	35.9
Mean	54.4	45.6

Second, only 23.7 percent of the respondents agreed that the EA method they are using would be inflexible or not suited for modeling the organization's enterprise architecture (issue 5A). Approximately 70 percent of the respondents answered that this issue does not pose any challenge at all for their organizations and only 3.0 percent considered the issue to be a highly challenging problem (Table 34). Most of the respondents' organizations, being government organizations, municipalities, or universities do either use the Finnish Govern-

ment EA Method or Kartturi method[15], the latter of which is developed specifically for the purposes of the Finnish higher education organizations. Several respondents commented that the methods as such are fine but organizations still need to make their own decisions on how and for what purpose they should be used. Given that the architecture methods have been somewhat dominant topic of the enterprise architecture literature for years, the following respondent makes an interesting comment.

> *Of course, it is very important to model the business, information, and applications views to the enterprise architecture – at least at the higher abstraction levels. However, the method that is been used for the modeling is of secondary importance.* (Respondent 17)

Table 34 Action: How challenging is this issue?

Issue	NC	FC	HC	FH
5A The enterprise architecture method that is being used is inflexible and is not fully suited in modeling the organization's architecture.	69.7	27.3	3.0	30.3
5B The enterprise architecture method and modeling techniques focus too much on information systems and technologies, and therefore do not provide proper tools for modeling other functions.	45.9	37.9	16.2	54.1
5C The enterprise architecture models and deliverables do not produce real benefits for the organization.	39.5	42.1	18.4	60.5
5D The skills related to modeling the enterprise architecture are lacking.	34.2	47.4	18.4	65.8
5E The information that is needed to define the target state for the enterprise architecture is difficult to obtain or is not available at all.	44.7	36.9	18.4	55.3
Mean	41.1	41.0	17.9	58.9

NC, Not challenging; FC, Fairly challenging; HC, Highly challenging; FH, Fairly + Highly challenging

Other respondents also pointed out that the methods are always meant to be adapted to fit the needs of a user organization, and not to be used as such. Still, some respondents pointed the need for commonly understandable translations, or abstractions, of the enterprise architecture models.

> *Methods and modeling languages are flexible enough and do offer decent tools for planning and modeling. But they are not commonly readable and understandable, and therefore require vernacular translations before the full benefits can be reached.* (Respondent 33)

Some of the more advanced EA modeling tools support features such as the dashboards that aim at reducing the unnecessary detail of the models and try to provide the decision-makers with the abstracted and summarized information that is relevant for the task at hand. However, it still needs a certain level of expertise to make a good use of the models and analyzes provided by the

[15] https://confluence.csc.fi/display/RAKETTI/Kartturi, in Finnish

EA methods. The following respondent argued that creating a repository of models that would cover and well integrate all the different enterprise architecture dimensions is a challenge in this matter.

> *Modeling the IT infrastructure is not an impossible mission nowadays. There are several highly automatized tools, such as CMDB, available for that purpose. It is more difficult, in my experience, to model the applications and business processes so that they can be integrated into the big picture in a way that really makes sense and serves some real purpose. Therefore, in order to help this integration, organizations should try to bring the standardization of their modeling techniques and data models as far as possible.* (Respondent 27)

The second most commonly encountered problem in this group of the survey was the difficulties in obtaining the information required in defining the target state architecture models (issue 5E), which was met by 64.1 percent of the respondents. This issue, however, was considered to be either fairly challenging or highly challenging by just over 50 percent respondents. The following respondent comments that the availability of the information in itself is not a problem but rather reaching the common agreement on the direction that an organization wants to pursue, which is in close relation to the issue 3B in the Diagnosis group.

> *Establishing the vision for the target state is not actually a challenge because of the difficulties in obtaining the required information but rather finding the common directions for the target state. There are different agendas all around the house and each party participating in this work want to push their own purposes.* (Respondent 32)

The following respondent emphasizes the importance of the managerial support in regard to defining the enterprise architecture target state.

> *The architectural vision must be created hand in hand with the vision of the entire organization. Therefore the acumen and know-how of the management are critical.* (Respondent 50)

This continues on the observation by Respondent 33 in the previous section. It is not enough that the management's support for the enterprise architecting reaches only to the launch of the adoption project and delegation of the tasks. Instead, their involvement and contributions are needed throughout the ongoing process.

6.4.7 Results on Evaluation and Termination

The issues in the Evaluation and Termination group mostly deal with themes that hamper an organization's ability to establish the enterprise architecture as a continuing process after the adoption stage is completed. These problems seem to be quite familiar to the respondents (Table 35).

Table 35 Evaluation and Termination: Have you encountered this issue?

Issue	Yes	No
6A There are difficulties in evaluating the benefits of enterprise architecting, for example, by using concrete measures.	78.9	21.1
6B There is a continuous struggle to justify the expenses of enterprise architecture function, which is challenging due to the difficult verification of the benefits.	70.3	29.7
6C The enterprise architecture is being developed in short-termed projects and it is difficult to establish the enterprise architecting as a continuous process.	57.9	42.1
6D The organization as a whole has problems in developing its operations in long-termed and planned manners.	78.4	21.6
Mean	71.4	21.6

78.9 percent of the respondents had encountered problems in evaluating the benefits of enterprise architecting (issue 6A) and 70.3 percent had met troubles in justifying the expenses of the enterprise architecture function due to the difficult verification of benefits (issue 6B). Correspondingly, 40.5 percent of the respondents regarded the issue 6A as a highly challenging problem and 43.3 regarded it fairly challenging (Table 36). Also the issue 6B was considered to be either fairly or highly challenging by over 80 percent of the respondents. Therefore, it can be argued that demonstrating the benefits is one of the key issues for the successful adoption of enterprise architecture. On the other hand, as pointed out by a respondent, it is impossible to realize the benefits during the adoption. Therefore, it is highly important to try to communicate the potential benefits of the enterprise architecting credibly and truthfully at the early stages of the process. Another respondent also commented that creating the metrics for evaluating the benefits of any function that aims at developing an organization's operations is difficult and these metrics are often vague and only composed afterwards. There is a clear need for more concrete indicators to show the benefits of enterprise architecting. At the same time, although it is difficult, the benefits are required to be shown quickly, in order to justify the expenses.

> *All the results are wanted promptly – during a single quarter – without making investments in a long run. Organizations are not willing to appoint anyone for the EA permanently as it is thought that it can be done in addition to other duties, with no additional resources – not to mention the proper tools. This is a serious problem in regard to long-term development. It is very difficult to ask for the resources because the benefits of this work will realize only over a period time.* (Respondent 17)

Table 36 Evaluation and Termination: How challenging is this issue?

Issue	NC	FC	HC	FH
6A There are difficulties in evaluating the benefits of enterprise architecting, for example, by using concrete measures.	16.2	43.3	40.5	83.8
6B There is a continuous struggle to justify the expenses of enterprise architecture function, which is challenging due to the difficult verification of the benefits.	18.9	59.5	21.6	81.1
6C The enterprise architecture is being developed in short-termed projects and it is difficult to establish the enterprise architecting as a continuous process.	28.6	45.7	25.7	71.4
6D The organization as a whole has problems in developing its operations in long-termed and planned manners.	22.2	33.3	44.5	77.8
Mean	21.5	45.4	33.1	78.5

NC, Not challenging; FC, Fairly challenging; HC, Highly challenging; FH, Fairly + Highly challenging

78.4 percent of the respondents think that their organizations in general have problems in developing their operations in long-termed and planned manners (issue 6D), which was considered to be either fairly challenging or highly challenging issue by 81.1 percent of the respondents. The following respondent comments on the management culture of the Finnish public organizations, which in his opinion makes the long-termed planning and development very difficult.

> *Managers in these organizations tend to rush from one development program to another and almost completely forget what has been done before.* (Respondent 33)

The Respondent continued by giving his idea for establishing a continuous development cycle for the enterprise architecture.

> *Enterprise architecting should be a cyclic process in which the previous target state is implemented to create the new current state architecture. There should constantly be at least three different states for the goals: the target state that is being currently implemented, another target state that is being designed and architected, and the third one that is in the organization's vision. These three should form a coherent continuum for the EA management.* (Respondent 33)

The respondents unanimously agreed on the importance of establishing the enterprise architecture as a continuous process instead of taking separate short-termed projects. Several respondents noted that, in addition to managers this necessitates the commitment to enterprise architecture throughout all the levels of an organization. The implementation of an enterprise architecture governance model serves as a focal point in achieving the success. This, however, requires a good insight of the organization culture and its ways of working. The following respondent commented that this inevitably takes time, trials and errors.

> *Enterprise architecting must fit together with other development activities. Integrating these new tasks seamlessly with the existing development framework will*

require some experimentation and active search for the new ways of working. We have a plan for how to do this but the concrete results showing how well we succeeded will be there the next year – at the earliest. (Respondent 50)

6.4.8 The most common issues

All the issues presented in the survey were encountered by over half of the respondents with just one exception. The respondents were quite satisfied with the EA methods they are using and only 23.7 percent of the respondents agreed that the EA method they are using would be a limiting factor (issue 5A). Overall, ignoring that the skills of use of the methods are quite commonly lacking in Finnish public organizations (issues 1E and 5D), it seems that the current EA methods do not present considerable problems during the adoption projects.

The average confirming response rate over all the issues in the survey was 70.38 percent. The two most commonly encountered issues were both located in Scouting. The most commonly recognized issue regarded the lack of understanding of the purpose and goals of enterprise architecting (issue 1B), which was encountered by 92.3 percent of the respondents (Table 37). The second most common issue relates to the organizations' tendency to resist the change (issue 1A). This issue was familiar to 88.1 percent of the respondents. The third most commonly met issue indicates that the lack of time or other resources commonly restrains the staff's possibilities to participate in activities related to the enterprise architecture (issue 2B).

Table 37 The most commonly encountered issues

Issue		Respondents
1B	The understanding about the purpose and goals of enterprise architecting is lacking in the organization.	92.3 %
1A	The organization responds reluctantly to new ways of working and the changes they necessitate.	88.1 %
2B	Employees cannot participate in the development of enterprise architecture due to lack of time or other resources.	87.8 %

6.4.9 The most challenging issues

Table 38 shows the three issues that the respondents most commonly considered as highly challenging problems. Two of these issues locate in Entry stage and one in Evaluation and Termination stage. With 46.3 percent of the respondents, the lack of managerial commitment (issue 2A) was the most commonly considered to be a highly challenging problem. Employees' inability to participate in the enterprise architecture development due to insufficient resources (issue 2B) was also regarded highly challenging by almost as many respondents. It is also worth noting that, as argued by some respondents cited in Section 6.4.3, this issue in many cases may be caused by the lacking managerial support. Finally, 44.4 percent of the respondents agreed that the organization's incapability to execute planned and long-termed development activities (issue 6D) is highly detrimental in regard to successful adoption of enterprise architecture.

Table 38 The issues most commonly considered as highly challenging

Issue		Respondents
2A	Managers are not adequately engaged in the development of enterprise architecture.	46.3 %
2B	Employees cannot participate in the development of enterprise architecture due to lack of time or other resources.	45.0 %
6D	The organization as a whole has problems in developing its operations in long-termed and planned manners.	44.4 %

Table 39 shows the three issues that were the most commonly evaluated either as fairly challenging or highly challenging by the survey respondents. Interestingly, all of these issues are located in the beginning of the adoption process. The first two of these are the same issues as the two most commonly encountered problems (Table 37). For each of the issues, the number of respondents who considered that they have caused problems in their organizations during the enterprise architecture adoption is considerably high.

Table 39 The issues most commonly considered either as fairly challenging or highly challenging

Issue		Respondents
1B	The understanding about the purpose and goals of enterprise architecting is lacking in the organization.	95.2 %
1A	The organization responds reluctantly to new ways of working and the changes they necessitate.	90.5 %
1E	The organization lacks the practical skills required in enterprise architecture development.	86.0 %

6.4.10 Respondents grouped according to their expertise on enterprise architecture

We will next examine whether there are differences between the demographic groups. The abbreviations shown in Table 40 are used in the subsequent sections.

Table 40 The abbreviations used in Sections 6.4.10, 0 and 6.4.12

Abbreviation	Meaning
GE	Good Expertise
WIE	Weak or Intermediate Expertise
NC	Issue is Not Challenging
FC	Issue is Fairly Challenging
HC	Issue is Highly Challenging
AC	EA Adoption is Completed
ANC	EA Adoption is Not Completed

In the following, the answers from the respondents of weak expertise (2% of the respondents) and intermediate expertise in enterprise architecture (44.9%) are combined and compared against the respondents of good expertise (46.9%). Those respondents who did not give this information (6.1%) are ignored in the

comparison. In regard to whether the respondents had encountered the presented issues, the two-sample t-test between the groups equals to 0.381 with a degree of freedom exceeding 40 (Table 41). This results in the p-value greater than 0.05, which indicates that there are no statistically significant differences between the respondents that could be explained with their expertise in enterprise architecture.

Table 41 Comparison of the respondent groups GE and WIE: Have you encountered this issue?

The issues encountered by the respondents over the entire survey		
GE	**WIE**	**T-test**
73.1 %	67.8 %	0.381 p-value > 0.05

GE, Good expertise; WIE, Weak or Intermediate expertise

Likewise, the difference between these groups is low when the level of challenge is examined. The two-sample t-test results in the value 0.227 indicating no statistically significant difference between the groups (Table 42). Therefore, according to our survey, the level of respondent's expertise in enterprise architecture does not play a significant role in that how the problems of enterprise architecture adoption are perceived in regard to their challenge.

Table 42 Comparison of the respondent groups GE and WIE: How challenging is this issue?

The issues considered either fairly or highly challenging over the entire survey		
GE	**WIE**	**T-test**
73.8 %	70.0 %	0.277 p-value > 0.05

GE, Good expertise; WIE, Weak or Intermediate expertise

Table 43 shows the differences for individual questions of whether the respondent had encountered the presented issues. There are three issues where the difference between the respondent groups is over 25 percent. In general, it seems that the respondents with good expertise have encountered these problems more commonly, or are more competent of identifying these issues in their organizations.

Compared to the respondents with weak or intermediate expertise, 31.8 percent more of the respondents with good expertise have encountered that the narrow mandate of the EA function results in failure to have an influence on the organizational development (issue 4C). Likewise, the respondents with good expertise did identify the problem of integrating the EA governance model with the organization's existing practices (issue 4D) more often than the respondents with weak or intermediate expertise. On the other hand, resistance to change (issue 1A) was more commonly known problem for the respondents with weak or intermediate expertise. It can be speculated that this organizational tendency is one of the reasons why these respondents have not had a possibility to develop their expertise in enterprise architecture further. As the groups of respondents are compared using the two-sample t-test with a degree of freedom greater than 40, for each of these three individual issues, the differences between the respondent of good expertise and weak or intermediate expertise are statistical-

ly significant (Table 43). For the other issues presented in the survey, there are no statistically significant differences between the respondent groups.

Table 43 Comparison of the respondent groups GE and WIE for individual issues: Have you encountered this issue?

Issue		Has encountered the issue			
		GE	WIE	Diff.	T-test
4C	Due to a narrow mandate, the enterprise architecture cannot have a true influence on activities of organizational development.	81.8 %	50.0 %	31.8 %	2.327 $p \leq 0.05$
4D	There are difficulties in integrating the enterprise architecture governance model with the present practices of the organization.	81.8 %	50.0 %	31.8 %	2.327 $p \leq 0.05$
1A	The organization responds reluctantly to new ways of working and the changes they necessitate.	73.9 %	100 %	26.1 %	2.787 $p \leq 0.025$

GE, Good expertise; WIE, Weak or Intermediate expertise

The differences in responses between the groups of respondents based on their expertise on enterprise architecture were minor when opinions on the level of challenge of issues are compared. Table 44 shows the issues where the differences between the respondents in the groups with good expertise and weak or intermediate expertise are the greatest. Except for one issue, respondents with good expertise considered these problems challenging more often than the group with weak or intermediate expertise. However, almost 26 percent of the respondents with weak or intermediate expertise over the respondents with good expertise considered that the poor enterprise architecture related communications are either fairly challenging or highly challenging problem in their organization. This may be due to that the level of respondents' expertise also reflects the overall enterprise architecture maturity in their organizations and the organizations with more mature enterprise architecture function have already developed more advanced communication strategies and vocabularies more befitting for their organizations. On the other hand, some of the respondents with good expertise may already be accustomed with the enterprise architecture specific jargon and therefore do not perceive this as a considerable problem.

As tested with a t-test of two samples, the answers to the issues 4B and 4C do have statistically significant differences between the respondent groups. It is quite difficult to give this other explanation than that the respondents with high expertise have developed higher demands on what they think their organizations should be able to accomplish with the enterprise architecture. On the other hand, the respondents with lower level of expertise may not be as aware about the issues such as the decision-making rights or the mandate of enterprise architecture function.

Table 44 Comparison of the respondent groups GE and WIE for individual issues: How challenging is this issue?

Issue		Considered the issue challenging			
		GE	WIE	Diff.	T-test
4C	Due to a narrow mandate, the enterprise architecture cannot have a true influence on activities of organizational development.	85.7 %	58.8 %	26.9 %	2.078 $p \leq 0.05$
3E	The informing and communications related to the enterprise architecture are dysfunctional and/or do not reach the right audience.	59.1 %	85.0 %	25.9 %	1.983 $p > 0.05$
4D	There are difficulties in integrating the enterprise architecture governance model with the present practices of the organization.	85.7 %	61.1 %	24.6 %	1.892 $p > 0.05$
4B	There are difficulties in delegating the enterprise architecture development related decision-making rights and responsibilities.	90.9 %	66.7 %	24.2 %	2.021 $p \leq 0.05$

GE, Good expertise; WIE, Weak or Intermediate expertise

6.4.11 Respondents grouped according to the status of enterprise architecture adoption in their organizations

In this section, the responses from the respondents whose organizations have already completed the enterprise architecture adoption (17% of the respondents) are compared to those whose organizations have not either started (10.6%) or have not yet completed (68.1%) the adoption. The respondents who did not give this information (4.3%) are again ignored in the comparison.
As it can be seen from Table 45 and AC, EA adoption is completed; ANC, EA adoption is not completed

Table 46, the overall differences between the responses from these groups for both the encountered problems and their level of challenge are very small and do not reveal statistical significance.

Table 45 Comparison of the respondent groups AC and ANC: Have you encountered this issue?

The issues encountered by the respondents over the entire survey		
AC	ANC	T-test
74.2 %	69.4 %	0.263 $p > 0.05$

AC, EA adoption is completed; ANC, EA adoption is not completed

Table 46 Comparison of the respondent groups AC and ANC: How challenging is this issue?

The issues considered either fairly or highly challenging over the entire survey		
AC	ANC	T-test
72.2 %	72.0 %	0.011 $p > 0.05$

AC, EA adoption is completed; ANC, EA adoption is not completed

Despite of that the differences between the groups are not statistically significant over the entire set of issues presented in the survey, we will next look at those individual issues where the differences between the groups are the great-

est. There are three issues, as shown in Table 47, where the difference between the groups of respondents is greater than 20 percent. The respondents whose organizations have already finished the EA adoption were more commonly able to identify each of these issues. Again, however, it is difficult to find any apparent explanations for the differences that would be caused by the status of the adoption. Furthermore, as none of the differences is statistically significant, we will not spend more time in contemplating these.

Table 47 Comparison of the respondent groups AC and ANC for individual issues: Have you encountered this issue?

Issue		Has encountered the issue			
		AC	ANC	Diff.	T-test
3A	The goals that are set for the enterprise architecture are difficult to understand and poorly reasoned.	87.5 %	62.9 %	24.6 %	1.647 p > 0.05
3B	The entire organization cannot commit itself to the goals that are set for the enterprise architecture.	87.5 %	64.7 %	22.8 %	1.532 p > 0.05
2D	Appointing the accountable leadership and ownership statuses for the enterprise architecture project appears problematic.	85.7 %	64.9 %	20.8 %	1.342 p > 0.05

AC, EA adoption is completed; ANC, EA adoption is not completed

There are five issues, as presented in Table 48, where the difference between the groups in their assessment about the level of challenge of the issues is greater than 20 percent. Again, however, as analyzed with the two-sample t-test, none of the differences between the groups is statistically significant.

Table 48 Comparison of the respondent groups AC and ANC for individual issues: How challenging is this issue?

Issue		Considered the issue challenging			
		AC	ANC	Diff.	T-test
1C	Enterprise architecture has an image problem due to, for example, troublesome implementation and technical representation	62.5 %	84.2 %	21.7 %	1.124 p > 0.05
3B	The entire organization cannot commit itself to the goals that are set for the enterprise architecture.	87.5 %	66.7 %	20.9 %	1.403 p > 0.05
5A	The enterprise architecture method that is being used is inflexible and is not fully suited in modeling the organization's architecture.	12.5 %	33.3 %	20.8 %	1.403 p > 0.05
6D	The organization as a whole has problems in developing its operations in long-termed and planned manners.	62.5 %	83.3 %	20.8 %	1.075 p > 0.05
5B	The enterprise architecture method and modeling techniques focus too much on information systems and technologies, and therefore do not provide proper tools for modeling other functions.	37.5 %	58.1 %	20.6 %	1.024 p > 0.05

AC, EA adoption is completed; ANC, EA adoption is not completed

Four out of the five issues above were considered challenging more often by the respondents whose organization had not yet completed the adoption. Although the differences are not statistically significant, by comparing the numbers of respondents, it seems that the organizations that have not yet completed the adoption consider the issues that relate to EA methods (issues 5A and 5B) more challenging than those that have completed the adoption. Likewise, these respondents regarded the issues that relate to the image of enterprise architecture and their organization's capability to develop its operations in long-term manners more challenging. Both of these issues can stagnate the adoption and therefore it can be argued that they probably are rather a cause than a consequence of the unfinished status of the enterprise architecture adoption.

6.4.12 Respondents grouped according to the organization type

In this section we compare the responses according to the organization types of the respondents. Due to the relatively small number of respondents, the purpose of this comparison is not to present any generalizable conclusions. Rather, we wish to tentatively sketch the possible differences in how the respondents from different organizations experience the problems.

First, Table 49 shows the overall ratio of the confirming answers to the question whether the respondent had encountered the issues presented in the survey. It seems that the respondents from the central government organizations and private companies, most of whom are the consultants experienced in working on the enterprise architecture development of public government organizations, are the most familiar with problems. On the other hand, the respondents from the municipal organizations were the most unlikely to identify the same issues.

Table 49 Respondent groups according to the organization type: Have you encountered this issue?

The issues encountered by the respondents over the entire survey							
Government agency or public utility		**Municipality**		**University or vocational high school**		**Private company**	
Yes	**No**	**Yes**	**No**	**Yes**	**No**	**Yes**	**No**
321	95	103	69	163	107	243	78
77.2%	22.8%	59.9%	40.1%	60.4%	39.6%	75.7%	24.3%

The results of the Chi-Square tests on the responses from different organization types are shown in Table 50. This indicates that the responses from the representatives of the central government organizations are reasonably similar to those from the private companies. Also, the responses from the municipalities are consistent with the responses from the representatives of universities and vocational high schools. On the other hand, all the other comparisons between different types of organizations result in significant statistical differences with p-values less than 0.01.

Table 50 Comparison of the respondent groups according to the organization type: Have you encountered this issue?

Type of organization	χ^2	p-value
Government agency or public utility Municipality	18.006	< 0.01
Government agency or public utility University or vocational school	22.225	< 0.01
Government agency or public utility Private company	0.216	> 0.05
Municipality University or vocational high school	0.01	> 0.05
Municipality Private company	13.389	< 0.01
University or vocational school Private company	16.028	< 0.01

Table 51 shows the numbers of responses from different types of organizations in regard to that how challenging the respondents considered the issues.

Table 51 Respondent groups according to the organization type: How challenging is this issue?

The level of challenge of the issues over the entire survey											
Government agency or a public utility			**Municipality**			**University or a vocational high school**			**Private company**		
NC	**FC**	**HC**	**NC**	**FC**	**HC**	**NC**	**FC**	**HC**	**NC**	**FC**	**HC**
93	197	115	71	77	23	92	115	56	78	153	83
23.0%	48.6%	28.4%	41.5%	45.0%	13.5%	35.0%	43.7%	21.3%	24.8%	48.7%	26.4%

NC, Not challenging; FC, Fairly challenging; HC, Highly challenging

Overall, the differences between the responses from the different types of organizations to the questions how challenging the problems are considered are quite similar to the questions about the encountered problems. Again, the respondents from government organizations and private companies do consider the issues more challenging than the respondents from municipalities and institutions of higher education. Table 52 shows the results of the Chi-Square tests and the respective statistical significances.

Finally, we will look at the issues, which were encountered considerably more often in one type of organization than in the others. As this theme is not our main research interest, we will just briefly indicate the differences between the types of organizations without paying more effort in analyzing or trying to explain them.

The first point of interest is the issue 1D, which deals the excess of managerial and organizational development methods. This issue was identified by all the respondents representing the municipal organizations whereas the same issue was identified by just over half of the respondents from other types of organizations. This issue was also considered challenging by almost all respondents from municipalities.

Table 52 Comparison of the respondent groups according to the organization type: How challenging is this issue?

Type of organization	χ^2	p-value
Government agency or a public utility Municipality	26.081	< 0.01
Government agency or a public utility University or a vocational school	12.283	< 0.01
Government agency or a public utility Private company	0.51	> 0.05
Municipality University or a vocational high school	4.721	> 0.05
Municipality Private company	18.883	< 0.01
University or a vocational school Private company	7.335	< 0.05

Almost all the respondents from private companies had encountered that the project group implementing the enterprise architecture adoption consists mainly of the IT staff, which then would impair the possibilities of other organizational functions to have influence on the work (issue 2E). Approximately just half of the respondents from other organization types identified this problem. Also, the respondents from private companies regarded the level of challenge of this issue to be higher than the other respondents. All the respondents from private companies answered that they have encountered difficulties in transforming the goals of enterprise architecture into the practical tasks (issue 4A) and considered this as a challenging problem. For other types of organizations, this issue was familiar to circa 60 percent of the respondents.

The respondents from government organizations identified two issues relatively more often than the other groups. First, the issue 5A, concerning EA methods' unsuitability for modeling the organization's enterprise architecture, was encountered by almost half of the government representatives, whereas just over 20 percent of the respondents from other types of organizations identified this problem. Although any respondent group did not consider this issue as a major problem, generally it still seems that the experts in government organizations are not as satisfied with the EA methods as the experts in other types of organizations are. Second, the ongoing struggle to justify the expenses of the enterprise architecture function (issue 6B) was encountered by 93.3 percent of the respondents from government organizations, which is noticeably higher than the average of 56.6 percent of agreeing answers from the other organizations types. This issue was also considered challenging by all the respondents from government organizations.

6.4.13 Overall summary of the survey study

Figure 19 presents a visualization of the overall summary of the survey data. The figure shows the means of percentages for the respondents that had encountered the issues present in each part of the survey as well as the means of percentages for the respondents who considered the issues to be either fairly

challenging or highly challenging. As it can be seen, on average, in each part of the survey over half of the respondents had met the issues and considered them to be challenging. Therefore, it can be assumed that the survey succeeded in identifying issues that appear problematic during the enterprise architecture adoption. We do not intend to argue that this would be an inclusive list of the problems but as the survey was created according to a literature review on enterprise architecture as well as the data from our case studies, it should give at least a pretty extensive overview on the potential problems.

Two stages stand out in Figure 19. First, the issues presented in the Scouting stage appear to be the most commonly encountered and are also considered to be the most challenging. On average, these issues were encountered by over 80 percent of the respondents and they were considered challenging by over 80 percent of the respondents, as well. Therefore, in order to establish favorable conditions for the success, it can be concluded that it is very important to spend enough time preparing the organization and the overall atmosphere for the enterprise architecture adoption prior to launching the actual project.

On the other hand, the Action seems to be the least challenging stage of the adoption project. On average, the issues presented in this part of the survey were encountered by over 50, but less than 60, percent of the respondents and they were considered challenging by the same number. This is especially due to the respondents' satisfaction with the EA methods. As discussed above, less than one out of four respondents thought that the EA method they are using would not meet their needs. Also, almost 70 percent of the respondents considered this issue to be not challenging at all. Still, at the same time, over 80 percent of the respondents thought that the skills of modeling the enterprise architecture are lacking. In many organizations, there is an evident need for training the method, modeling techniques, and tools used in modeling prior to moving to the Action stage of the adoption project.

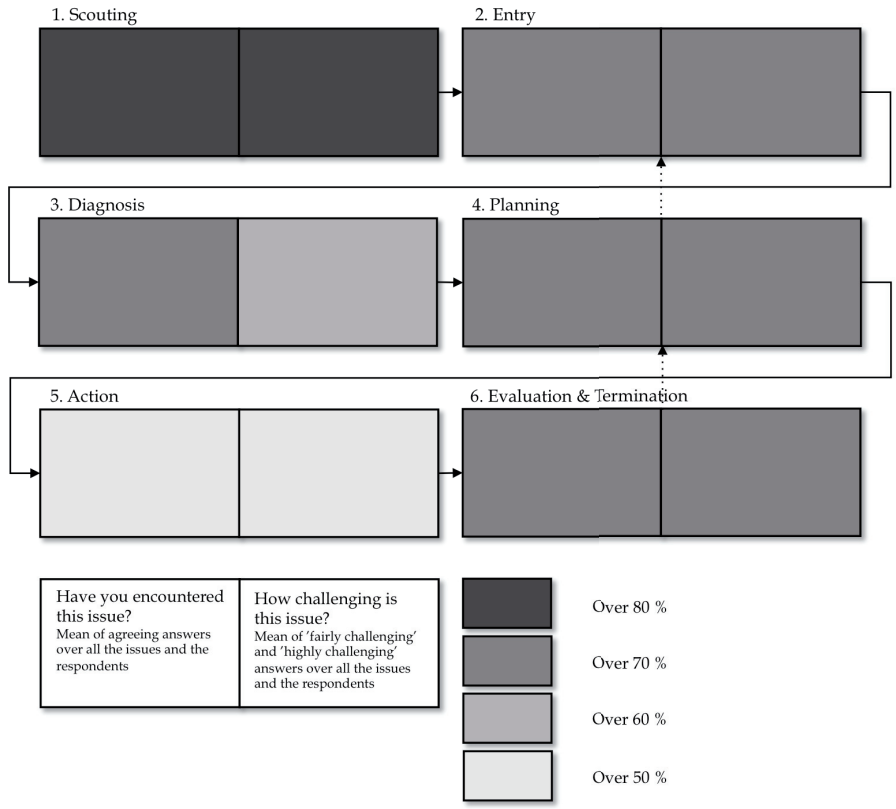

Figure 19 Overall summary of the survey results

The answers on the other four stages are spread quite evenly. The issues presented in Entry, Planning, and Evaluation and Termination stages were encountered by over 70, but less than 80, percent of the respondents. On average, they were also considered to be either fairly challenging or highly challenging by over 70, but less than 80, percent. The issues presented in the Diagnosis stage were encountered by over 70 percent of the respondents but their level of challenge was considered to be either fair or high by over 60, but less than 70, percent of the respondents.

Finally, Figure 20 details the above visualization to show the percentages of respondents who had encountered the individual issues presented in each stage of the survey and considered them as fairly or highly challenging.

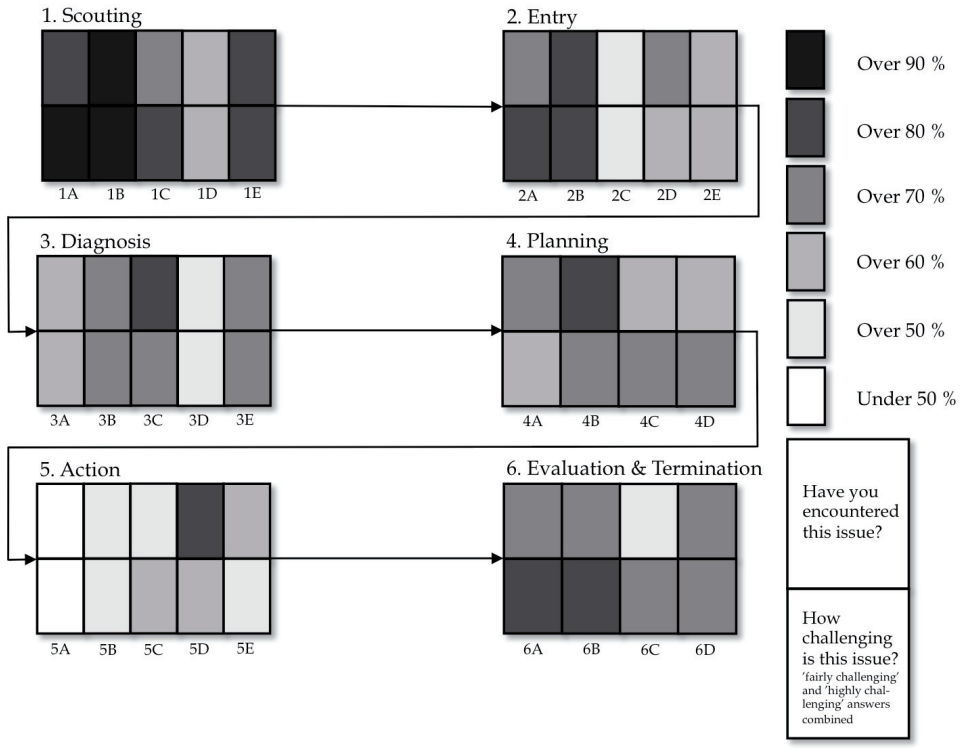

Figure 20 Detailed summary of the survey results

7 DATA ANALYSIS: SELECTIVE CODING

This chapter presents the selective coding process that we conducted as the third stage of the grounded theory research. The selective coding results in formulation of theory and the aim is to create inferential and predictive statements about the phenomenon that is studied. According to Urquhart et al. (2010), this can be achieved by specifying relationships between individual interpretive constructs in form of associations, influences, or causal relationships. Thus, a theoretical code can be seen as the relational model through which all categories are related to the core category (Hernandez, 2009).

Using the findings of the practitioner survey and the complementary cases as additional slices of data, the selective coding continues our grounded theory coding process from where it was left after the axial coding took place (Section 5.2). These additional sources of data allow us to enrich the comparative analysis that follows next. Selective coding also serves as the final development of the grounded theory and is only followed by the comparison of the emergent theory with the extant literature, whose purpose is to improve the construct definition, and therefore the internal validity, and to increase external validity by establishing the domain to generalize the findings of the study (Pandit, 1996).

Figure 21 details how the selective coding process was executed. This highly iterative process of coding included the comparison and reanalysis of different data and the concepts and categories that were created during the open and axial coding, and emphasized the interpretative approach to take advantage of richness of the data and to allow the emergence of core categories that would not necessarily be explicitly available. A series of interrelated questions that were answered throughout the cyclic process was used to facilitate the interpretation and to pursue a deeper understanding of the data.

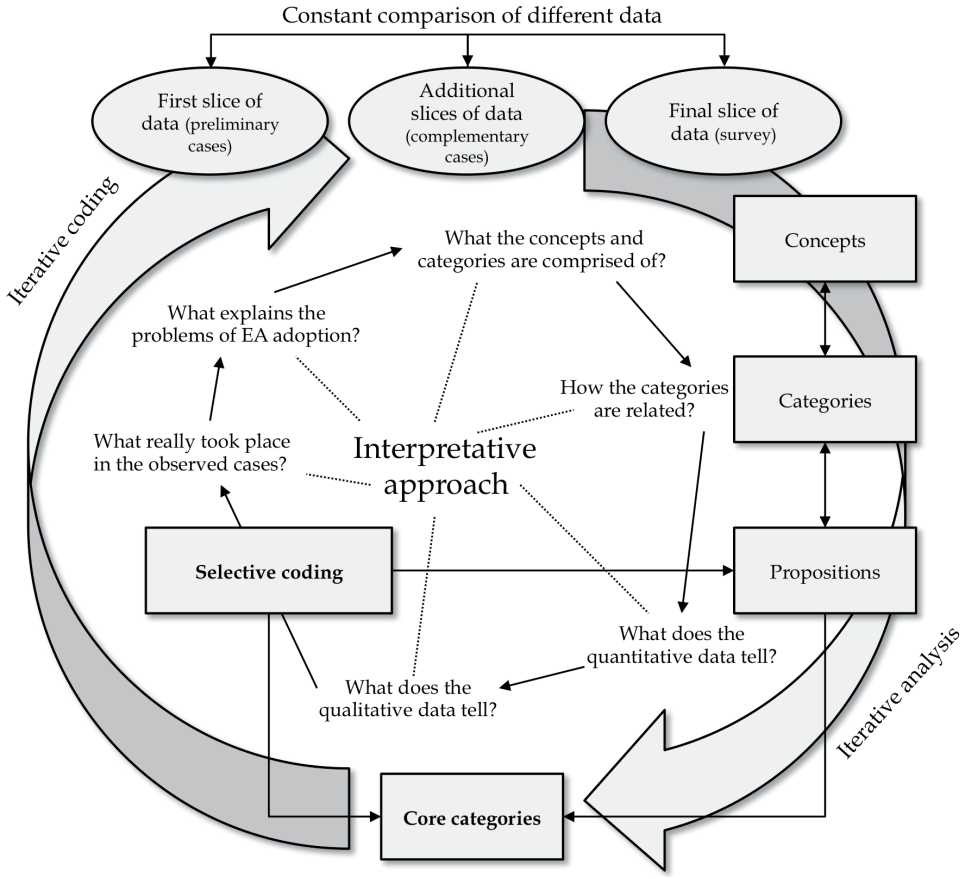

Figure 21 Selective coding process

7.1 Comparative analysis of the axial categories and the survey data

We begin the process of selective coding by connecting the issues presented in the practitioner survey with the conceptual categories that were created during the axial coding of our data. Each of the 28 issues that were included in the survey can be positioned to one or more of the axial categories. According to Charmaz (2006), constant comparison of data is the core to the grounded theory method. This advantages conceptual understanding of the studied phenomenon and also makes the analysis more explicitly theoretical as it guides the researcher to analyze to which theoretical categories data can be positioned in (Charmaz, 2006; Urquhart et al., 2010;).

7.1.1 Issues on Competence

First, Table 53 shows the five issues that relate to the category Competence. Three of them (1B, 1E, and 5D) directly mention a lack of skills or poor general understanding about the enterprise architecture. The fourth issue 3E, communications, is often mentioned as a critical factor to a functional enterprise architecture practice (Armour et al., 1999b; Shah & Kourdi, 2007; Wang et al., 2008; Espinosa & Boh, 2009; Seppänen et al., 2009). However, this issue is more ambiguous than the other four. It also could be so that the audience is well identified and targeted by the communications strategy but still unable or unwilling to receive the message. Yet, we believe that learning and respecting the organization-specific qualities and characteristics of the intended audience can always further improve the communications strategy. Finally, the issue 4A again can be more easily traced back to the competence. First, it requires a certain set of skills to define the goals so that they are attainable given the organizational circumstances and other contextual issues. Second, transforming the goals that are often quite abstract into the practical tasks necessitates a good knowledge about the EA method and tools that are being used as well as the advanced practice of enterprise architecting in general.

Table 53 Problems related to Competence

Category	Issue	
Competence	1B	The understanding about the purpose and goals of enterprise architecting is lacking in the organization.
	1E	The organization lacks the practical skills required in enterprise architecture development.
	3E	The informing and communications related to the enterprise architecture are dysfunctional and/or do not reach the right audience.
	4A	There are difficulties in transforming the goals set for the enterprise architecting into the practical tasks.
	5D	The skills related to modeling the enterprise architecture are lacking.

7.1.2 Issues on EA Method and Tools

Three of the issues that relate to the category EA Method and Tools explicitly target the enterprise architecture method (5A, 5B) and the models and other deliverables to be produced (5C). Likewise, the issue 1C pertains to the representation of the deliverables and also the troublesome enterprise architecture implementation, which is often at least partly due to the EA method. The Finnish government EA Method, for example, presents a multi-step workflow for modeling and analyzing the baseline and target stages of the organization's enterprise architecture. Although this workflow is nearly impeccable in its detail and therefore can provide a good assistance for the public organizations with varying experience and knowledge on enterprise architecture development, it can also easily appear overwhelming. The issue 1D relates to the EA method's incompatibility with the other development methodologies that are used in an organization. As discussed earlier, the chosen EA method should be adjustable

so that it can be aligned with various development practices and methodologies and be able to feed them with relevant information to support the decision-making. Finally, the issue 6A can be seen to relate to the enterprise architecture deliverables and other produced documentation. There should be traceable connections between the deliverables and the benefits they provide the organization with. Currently, it seems that enterprise architecture deliverables are often created by the numbers without questioning or justifying the purpose of doing so. The issues related to the category EA Method and Tools are summarized in Table 54.

Table 54 Problems related to EA Method and Tools

Category	Issue	
EA Method and Tools	1C	Enterprise architecture has an image problem due to, for example, troublesome implementation and technical representation.
	1D	There has been an excess of different management and organizational development methodologies. Enterprise architecture gets lost among these or may not be compatible with them.
	5A	The enterprise architecture method that is being used is inflexible and is not fully suited in modeling the organization's architecture.
	5B	The enterprise architecture method and modeling techniques focus too much on information systems and technologies, and therefore do not provide proper tools for modeling other functions.
	5C	The enterprise architecture models and deliverables do not produce real benefits for the organization.
	6A	There are difficulties in evaluating the benefits of enterprise architecting, for example, by using concrete measures.

7.1.3 Issues on Governance

Table 55 shows the issues that relate to the category Governance. To briefly summarize the previous discussion regarding the Finnish EA Governance Model (Section 1.2.2), the governance contains the processes, structures, and organizational traditions that determine how power is exercised, how stakeholders are involved in decision-making, and how decision-makers are held accountable (Gill, 2002). This, in the context of enterprise architecting, means that the governance deals with the architecture management and its organizational aspects such as goals and priorities, allocated resources, roles and designated accountabilities (Baker & Janiszewski, 2005; van der Raadt et al., 2005). Thus, the purpose of the governance model is two-fold. It guides the internal development efforts and other activities to ensure that they are in line with the organization's goals and are compatible with the existing structures, processes, and information systems. Second, it aims at controlling and directing the foundation of the government-level architecture by ensuring the consistency and interoperability across the administrative sectors.

Table 55 Problems related to Governance

Category	Issue	
Governance	2D	Appointing the accountable leadership and ownership statuses for the enterprise architecture project appears problematic.
	4B	There are difficulties in delegating the enterprise architecture development related decision-making rights and responsibilities.
	4C	Due to a narrow mandate, the enterprise architecture cannot have a true influence on activities of organizational development.
	4D	There are difficulties in integrating the enterprise architecture governance model with the present practices of the organization.

Quite straightforward, the issues 2D, 4B, and 4C deal with the above-mentioned roles, responsibilities and rights related to the enterprise architecting. The issue 4D, on the other hand, tries to cover the problem of implementing new governance structures within the organization and integrating those with the existing practices.

7.1.4 Issues on Managerial Support

For the most part, the issues relating to the category Managerial Support are derived from the managerial role within an organization (Table 56). In this, a manager is treated as a role entitled to make both operative and strategic decisions representing the organization. Only the issue 2A addresses managers as individuals. Because of the premise of managers having power and responsibility over the organizational decision-making, the issues in this category are partly overlapping with those in the Governance and Strategy Linkage categories.

Table 56 Problems related to Managerial Support

Category	Issue	
Managerial Support	1A	The organization responds reluctantly to new ways of working and the changes they necessitate.
	2A	The managers are not adequately engaged in the development of enterprise architecture.
	2D	Appointing the accountable leadership and ownership statuses for the enterprise architecture project appears problematic.
	4B	There are difficulties in delegating the enterprise architecture development related decision-making rights and responsibilities.
	4C	Due to a narrow mandate, the enterprise architecture cannot have a true influence on activities of organizational development.
	5E	The information that is needed to define the target state for the enterprise architecture is difficult to obtain or is not available at all.

7.1.5 Issues on Operational Personnel Involvement

There were only two issues presented in the survey that relate to the category Operational Personnel Involvement (Table 57). The issue 2C addresses the operational personnel's autonomic decision to not to participate in the activities related to enterprise architecture development whereas in the issue 2B this situation is forced by external reasons.

Table 57 Problems related to Operational Personnel Involvement

Category	Issue	
Operational Personnel Involvement	2B	The employees cannot participate in the development of enterprise architecture due to lack of time or other resources.
	2C	The employees are unwilling to participate in the development of enterprise architecture due to other reasons.

7.1.6 Issues on Organizational Issues

The survey presented nine issues that relate to the category Organizational Issues (Table 58). Most of these issues do overlap with other categories but are included here as they describe sweeping organizational characteristics, or rather frailties, as prominently as those that address the organizational issues in a more direct manner (1A, 3B, 6D).

Table 58 Problems related to Organizational Issues

Category	Issue	
Organizational Issues	1A	The organization responds reluctantly to new ways of working and the changes they necessitate.
	1D	There has been an excess of different management and organizational development methodologies. Enterprise architecture gets lost among these or may not be compatible with them.
	2D	Appointing the accountable leadership and ownership statuses for the enterprise architecture project appears problematic.
	3B	The entire organization cannot commit itself to the goals that are set for the enterprise architecture.
	3E	The informing and communications related to the enterprise architecture are dysfunctional and/or do not reach the right audience.
	4B	There are difficulties in delegating the enterprise architecture development related decision-making rights and responsibilities.
	4D	There are difficulties in integrating the enterprise architecture governance model with the present practices of the organization.
	5E	The information that is needed to define the target state for the enterprise architecture is difficult to obtain or is not available at all.
	6D	The organization as a whole has problems in developing its operations in long-termed and planned manners.

7.1.7 Issues on Resources

Table 59 shows the four issues that are related to the category Resources. Although the lack of resources was not a prominent problem during our preliminary case studies, we still decided to treat it as one of the key problems of enterprise architecture adoption. While the studied pilot projects were allocated with fairly adequate resources, which was at least partly due to their special pilot status, the both projects were still troubled by the lack of the human resources devoted and skilled in enterprise architecture, as discussed in Section 5.3.7.

The decision to appoint Resources as one of the problem categories was, it seems, foresighted. The survey respondents had commonly encountered most

of the issues in this category and their challenge was also estimated reasonably high. Now, as the use of enterprise architecture is made mandatory by the Act on Information Management Governance in Public Administration, all the public organizations are required to arrange the needed resources or to tolerate their lack of.

Table 59 Problems related to Resources

Category	Issue	
Resources	2B	The employees cannot participate in the development of enterprise architecture due to lack of time or other resources.
	3C	The goals that are set for the enterprise architecture are too ambitious to be achieved with the allocated resources.
	6B	There is a continuous struggle to justify the expenses of enterprise architecture function, which is challenging due to the difficult verification of the benefits.
	6C	The enterprise architecture is being developed in short-termed projects and it is difficult to establish the enterprise architecting as a continuous process.

7.1.8 Issues on Strategy Linkage

Finally, Table 60 shows the issues that relate to the Strategy Linkage, which is probably the most ambiguous of the problem categories. Therefore, it is necessary to discuss each of these issues in more detail.

Table 60 Problems related to Strategy Linkage

Category	Issue	
Strategy Linkage	2E	The project group that executes the enterprise architecture adoption project is primarily staffed by the employees of IT department and the influence of other organization functions to the work is lacking.
	3A	The goals that are set for the enterprise architecture are difficult to understand and poorly reasoned.
	3D	The goals that are set for the enterprise architecture do not solve real problems and therefore cannot yield any real benefits for the organization.
	4A	There are difficulties in transforming the goals set for the enterprise architecting into the practical tasks.
	4B	There are difficulties in delegating the enterprise architecture development related decision-making rights and responsibilities.
	4C	Due to a narrow mandate, the enterprise architecture cannot have a true influence on activities of organizational development.
	5E	The information that is needed to define the target state for the enterprise architecture is difficult to obtain or is not available at all.
	6A	There are difficulties in evaluating the benefits of enterprise architecting, for example, by using concrete measures.

First, the issue 2E is based on an assumption that the enterprise architecture should cover a larger area in organizational development than only the domain of information technology. Although it is fully possible to use enterprise architecting just as a tool for the IT governance, it is quite common to pursue more

comprehensive approach to business-IT alignment with it. This, naturally, necessitates that the EA function must be able to connect also with the business side of an organization. Themes related to the issue 2E did come up quite frequently in the interviews with representatives of the preliminary case organizations and two out of three survey respondents had encountered the issue 2E, as well. Therefore, it can be argued that in most of the Finnish public organizations the enterprise architecture is supposed to have a broader role than a mere aid for the IT governance, and hence the issue 2E is entitled to have its position in this category.

The issues 3A, 3D, and 4A are all related to the goals of enterprise architecture. Whether the focus of enterprise architecting is on IT governance or somewhere else, the goals should be derived from the organization strategy. Should the goals be poorly reasoned or such that they do not provide an organization with real benefits, it is evident that the enterprise architecture is not aligned with the strategic perspective. Likewise, if the enterprise architecture is being developed towards the sound and strategy driven goals, it should be quite easy to evaluate the results (issue 6A).

The issue 5E speaks for that some of the public organizations in Finland lack behind in their strategy work in terms of deconstructing the organizational vision into the tangible goals. Fortunately, however, this issue was not highly regarded by the survey respondents. Finally, the issues 4B and 4C are more closely related to the categories of Managerial Support and Governance but due to their direct effect on relationship between the organizational strategy and the enterprise architecture development, they are included also in this category.

7.2 Analysis of the axial categories and the related issues

During the analysis of data from the preliminary case studies, we used the frequencies the themes were referenced to by the interviewees to identify and formulate the eight categories for problems of enterprise architecture adoption. This method was based on the assumption that the frequency with which the informants referred to different themes would correlate with the significance of challenge they pose to the adoption.

In order to make the findings from the case studies (i.e., the axial categories) commensurable with the findings that originate from the survey study (i.e., the individual problems and their weightings), we adjust the frequencies in different data so that they range in between the minimum value of 0 and the maximum of 1. First, Figure 22 shows the comparable values for the axial categories. As the themes that relate to the category Competence were mentioned the most frequently with 55 references in negative contexts, this category is given the value 1. The most rarely referenced category Resources is given the value 0.22, which is relative to its 12 references.

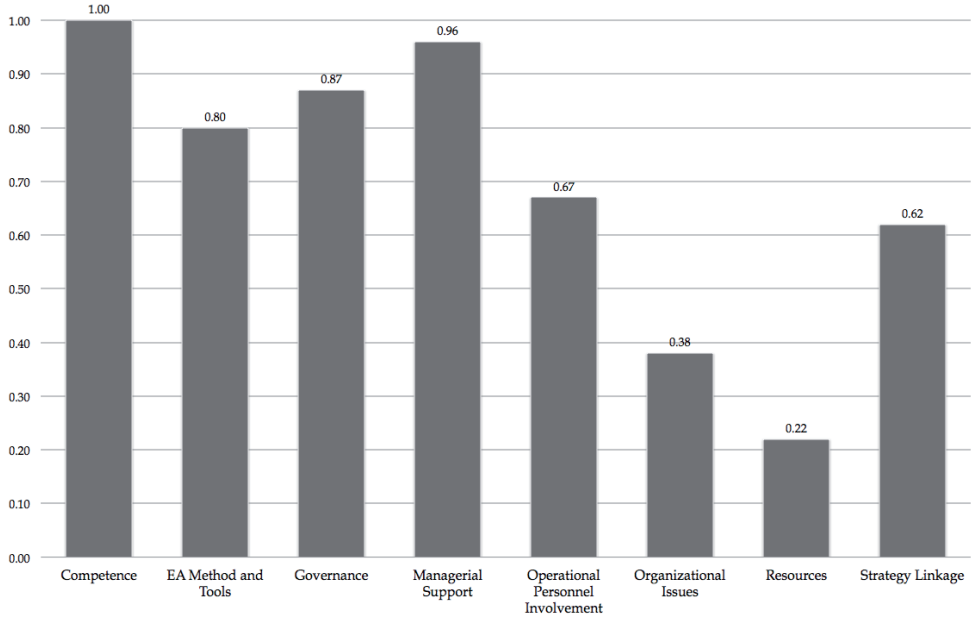

Figure 22 Commensurate values for the categories according to the preliminary case studies

Next, Figure 23 presents the commensurate values for the average percentages of the survey respondents who had encountered the issues related to the each problem category (Table 53 – Table 60).

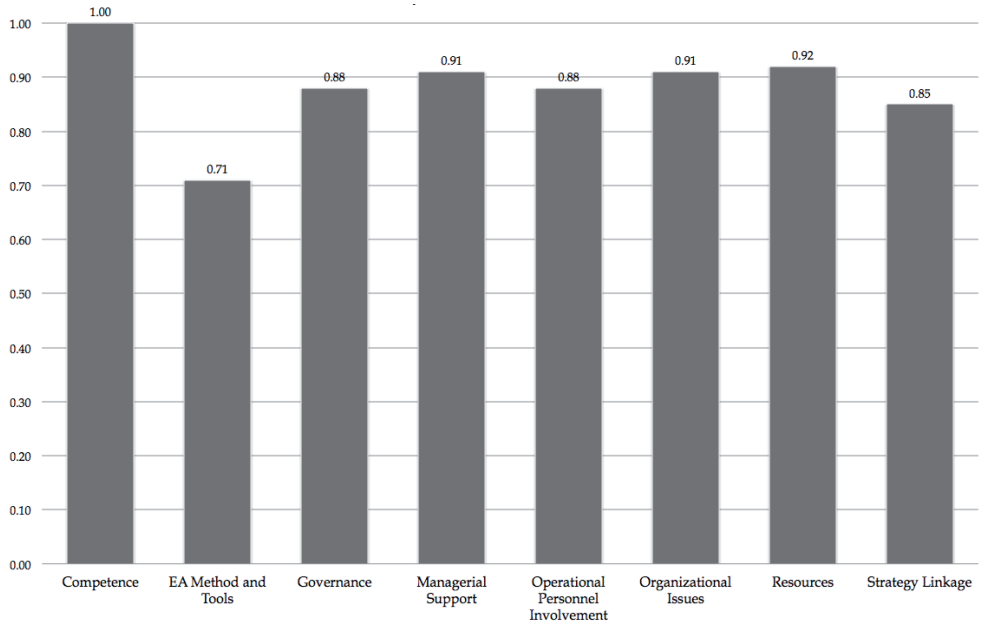

Figure 23 Commensurate values for the categories according to the survey encounter rate

Figure 24 shows the commensurate values for the average percentages of the survey respondents who regarded the issues related to the problem categories as fairly challenging.

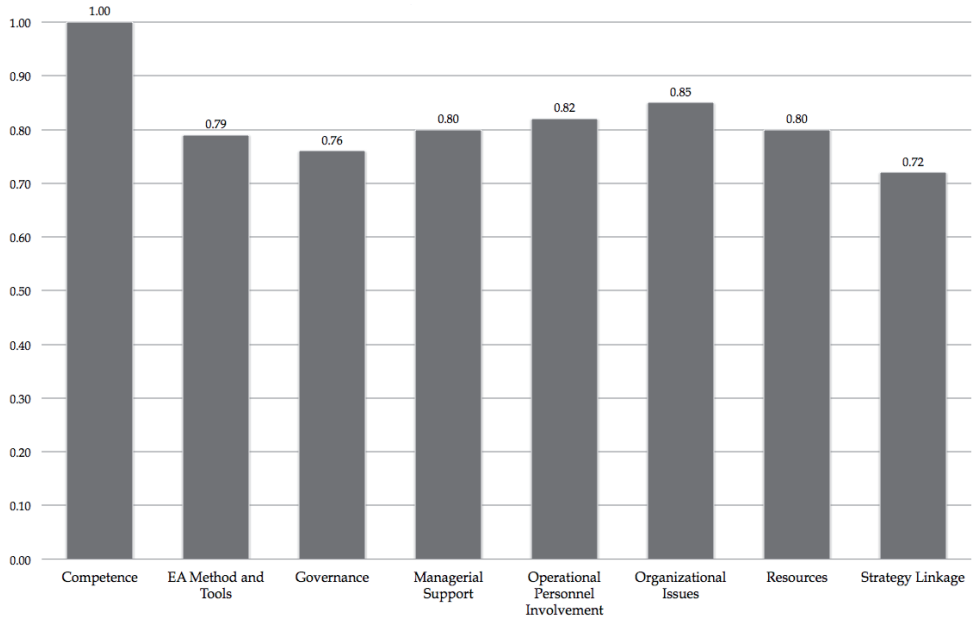

Figure 24 Commensurate values for the categories according to the respondents who regarded related issues as 'Fairly challenging'

Figure 25 shows the commensurate values for the percentages of the survey respondents who considered issues positioned in the problem categories as highly challenging.

In these comparisons, the category Competence gets the highest value three times. The issues related to the lack of know-how, experience and skills in enterprise architecture were referred to most frequently in the preliminary case study data. Also, the competence-related issues were most commonly encountered by the survey respondents and were most often considered as fairly challenging. These issues were, however, quite rarely regarded as highly challenging (Figure 23). As some of the respondents commented, organizational and individual competences can be fairly easily developed with due training, while resolving many of the other issues require more profound efforts.

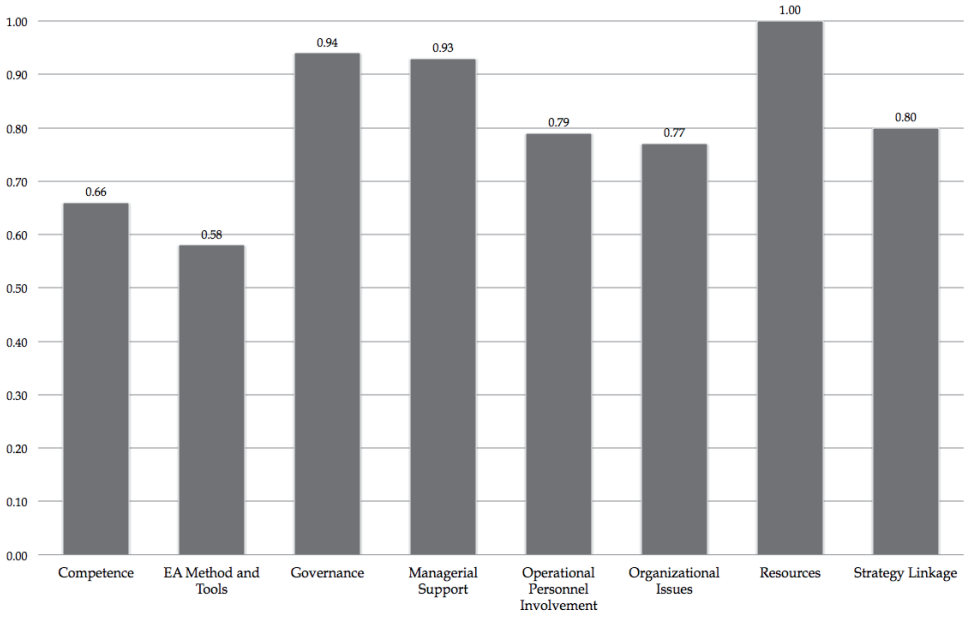

Figure 25 Commensurate values for the categories according to the survey respondents who regarded related issues as 'Highly challenging'

Figure 26 combines the frequencies of references in the case study data with the encounter rate and the number of times the issues were considered to be either fairly challenging or highly challenging by the survey respondents. According to our data, the competence-related issues seem to present the most critical challenge in a successful adoption of enterprise architecture with the overall value of 3.66. This is followed by the categories Managerial Support and Governance with the respective values of 3.60 and 3.45. On the other hand, of the eight categories, the issues related to EA Method and Tools have caused the least problems and also their challenge is regarded to be the lowest.

Finally, Figure 27 shows the comparison of the categories using the commensurate values from only the survey study data. Given that the projects of the preliminary case studies were special pilot projects, this comparison may give a more generalizable view to the problems of an average enterprise architecture adoption project in Finnish public organization. Now the most dominant problem category is Resources with the commensurate value of 2.72, followed by the categories Competence and Managerial Support with the values 2.66 and 2.64, respectively. Again, the category EA Method and Tools appears to be the least significant one with the overall value of 2.08.

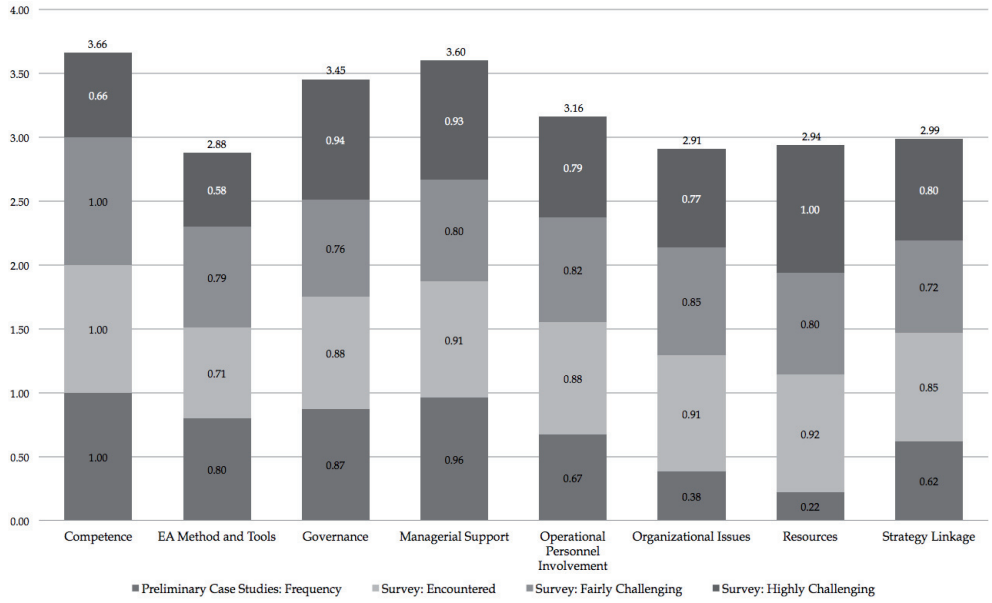

Figure 26 Commensurate values of the axial categories combined from the preliminary case studies and the survey study

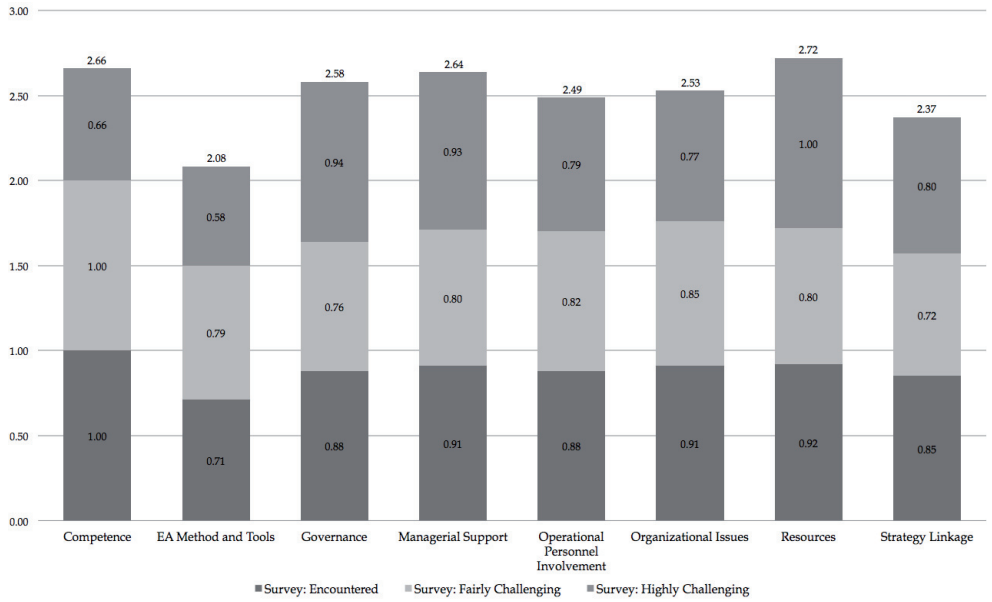

Figure 27 Commensurate values of the axial categories from the survey study only

7.3 Core categories

Selective coding in grounded theory research is a "process of integrating and refining the theory (Strauss & Corbin, 1998, 143). Selective coding is the final stage of data analysis and its goal is to integrate the developed discrete categories so that an emerging theory can be formed. Selective coding results in selecting the core categories and relating all the other categories to them. By refining and further developing the previously identified categories, the core concepts of the study are identified and then abstracted to form an empirically grounded theory (Price, 2010). Corbin and Strauss (1990) describe the core category as the central phenomenon and the analytic idea presented in the research. The core category should conceptualize the findings of the research in a few sentences, explain what all the observed action and interaction are about, and help rationalizing the variation between and among the categories (Corbin & Strauss, 1990).

This research has been studying problems that obstruct the adoption of enterprise architecture. However, the decisive goal of the study is not only to learn about the problems but also to help organizations in creating favorable conditions for a successful adoption. Therefore, during the selective coding, we focus on themes that are necessary preconditions for a success in this effort. This necessitates us to return to our original data and memos from the preliminary case studies as well as the data obtained from the complementary cases and the practitioner survey study. By building on the categories that were created during the axial coding, we continue to further abstract the data in order to establish the core categories that, we argue, can explain a success in the enterprise architecture adoption or, the lack of which, on the other hand, will result in a failure.

Strauss and Corbin (1998) advise that the central category presenting the main theme of the research should be identified. The central concept of interest for this research is the enterprise architecture adoption, either successful or unsuccessful depending on whether an organization can implement the necessary conditions for the work. These conditions will be described in terms of the three core categories, namely 1) Determination, 2) Destination, and 3) Dexterity, each of which will be discussed in detail in the following sections.

First, the categories that were identified during the axial coding are related with the core categories via causal relationships. This is to encapsulate our findings at the more abstract level so that different data will be linked together as a cohesive whole. We will also point out some issues from the survey that we see to be characteristic for each core category. However, as the issues were already positioned in one or more axial categories in the previous chapter, we will mainly operate here by referencing to the axial categories and omit most of the individual issues from the survey. Each core category is also connected with the stages of the enterprise architecture adoption process (as discussed in Section 6.1) that carry the most significant role in relation to them. These comparisons are presented not only to conceptualize the findings further but also to accentuate that the issues at the axial category level must be solved in order for an or-

ganization to attain the advantageous attributes of the related core category or categories in a full effect.

We argue that each of the three core categories alone can offer a sufficient starting point for a successful enterprise architecture adoption. These conditions can arise from quite different origins and one may be better suited for some organization and intended objectives of enterprise architecture than another. Furthermore, the existence of any of the conditions can be used to establish and reinforce the other two. We will discuss these characteristics of the model based on the core categories in the Chapter 8.

7.3.1 Determination

> *A quality that makes you continue trying to do or achieve something that is difficult. ("Determination," 2013)*

Determination is first of the three core categories. It refers to the organization's decisive dedication and will to start pursuing the planned and methodical management of their enterprise architecture – whatever the reason or reasons may be. Of the three core categories, the Determination is the most self-sufficient, and it can greatly help in obtaining the other core categories, Destination and Dexterity.

Several axial categories and related issues impact on the formation of Determination in either positive or negative manner. Ideally, Determination should be built on the organization's internal motives but also the external pressure can push it forward. For example, the recently instituted Act on Information Management Governance in Public Administration is such an external factor that currently necessitates public organizations in Finland to adopt practices of enterprise architecture. However, such an external pressure can make the adoption of enterprise architecture appear as a necessary evil. If an organization does not understand or is unable to find the ways to take an advantage on enterprise architecture, the effort of adoption will be solely driven by the obligation. In this case, the enterprise architecture management can be seen to be a waste of resources and it is likely that the results will be moderate at the best. On the other hand, a positive peer pressure, good experiences of other organizations and shared best practices also have a great potential in supporting the shaping of the organization-level determination to start developing the enterprise architecture. We believe that factors external to an organization – whether coercive or encouraging – serve a dominant role in attaining Determination.

The first stage of the enterprise architecture adoption process, Scouting, is critical in creating that favorable and determined atmosphere. Of the five issues that were presented in this stage of the survey study, four have an immediate negative effect on establishing Determination (the issues 1A[16], 1B[17], 1C[18], and

[16] The organization responds reluctantly to new ways of working and the changes they necessitate.

[17] The understanding about the purpose and goals of enterprise architecting is lacking in the organization.

1D[19]). In addition to a common and widespread resistance towards change, especially the lack of understanding about what enterprise architecting is about, why an organization should start applying the practice of enterprise architecture, and what it could help an organization with are the key obstacles here. The lack of understanding leads to inadequate commitment of both management[20] as well as the operational personnel[21]. Finally, it is necessary that an organization is willing and able to develop its operations in well-planned and long-termed manners (6B[22], 6C[23], 6D[24]). If it is not, there are practically no other reasons to try to start pursuing the systematical management of enterprise architecture but the Act on Information Management Governance in Public Administration.

Of the categories identified during the axial coding, Managerial Support is arguably the strongest driver in initiating the determined atmosphere. Senior executives, as the primary organizational decision-makers, should take the decisive step towards the change and communicate it throughout their organizations. This is not to say, of course, that a head of an office or a municipal manager should start practicing as an enterprise architect but they still need a decent understanding about the key concepts of enterprise architecture and to let their organization see that they are committed to it. As argued by Waterman et al. (1980), a skillful manager can signal what is on his or her mind, and can reinforce a certain message and nudge people's thinking in a desired direction. Unfortunately, according to our data, attaining the managerial support is one of the most common and challenging problems of the enterprise architecture adoption.

Although the management should be able to affect the overall attitude in their organization, our data indicates that several organizational issues can make it difficult to establish a shared will and determination. As commented by our interviewees in Section 5.3.6, it is not uncommon that divisions within the same government agency have very heterogeneous core functions not to mention their process structures and specific information systems. Even though these issues relate more directly to our next core category, at the practical level they seem to make it difficult to give a well-argued reason for establishing the organization-wide determination for the adoption of enterprise architecture. Likewise, if an organization sees the enterprise architecture as something that does not fit into or does not support its strategy, achieving the determination

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[18] Enterprise architecture has an image problem due to, for example, troublesome implementation and technical presentation.

[19] There has been an excess of different management and organizational development methodologies. Enterprise architecture gets lost among these or may not be compatible with them.

[20] The managers are not adequately engaged in the development of enterprise architecture.

[21] The employees are unwilling to participate in the development of enterprise architecture due to other reasons.

[22] There is a continuous struggle to justify the expenses of enterprise architecture function, which is challenging due to the difficult verification of the benefits.

[23] The enterprise architecture is being developed in short-termed projects and it is difficult to establish the enterprise architecting as a continuous process.

[24] The organization as a whole has problems in developing its operations in long-termed and planned manners.

can be nearly impossible. Arguably, there is a noticeable incoherence between the concepts here, as the enterprise architecture by several definitions, including the one given with the Finnish Government EA Method (cf., Figure 1), should serve as a tool to support the implementation of the organization's strategic goals. However, it seems to be easy to bypass the enterprise architecture by leaving it out of the organization strategy, the operating plan or the economic plan. At the same time, an enterprise architecture adoption project without the strategic support is most likely to end up in a failure.

Finally, the ongoing municipal mergers and structural changes in the public services delivery can make it difficult for a public organization to launch any burdensome projects that are not believed to produce immediate benefits. On the other hand, enterprise architecture is often promised to have a great potential in helping the successful implementation of these kinds of undertakings. From the very beginning of the enterprise architecture development in the Finnish public administration, one of the key goals of the work has been to support the structural change throughout all the levels of administration. For some reason, however, this message has not been always conveyed very well. Several of our survey respondents argued that the enterprise architecture is still often seen as something that belongs only to the interest of the IT management and therefore fails in attaining its full potential, and its commissioning in the municipalities has not produced desired results due to the lacking coordination by the state authorities.

7.3.2 Destination

The purpose for which something is destined. ("Destination," 2013)

An organization needs to take a time to carefully consider the purpose and the direction of their enterprise architecture development. From the beginning, it should be clear why an organization starts practicing the enterprise architecture management and what it wants to accomplish with it. Although the concept of Destination as one of the core categories is much broader than just the first goals of the enterprise architecture adoption project, they must be set in relation to each other. In the previous sections, we have encouraged choosing easily manageable domains for the enterprise architecture development, which can produce quick and tangible benefits. Here, however, this should not be the key focus. Quick benefits are still essential for selling the enterprise architecture in an organization and gaining the organization-wide commitment, but the planning period should be longer and its scope wider while the Destination is being defined. The large-scoped enterprise architecture does not have to be in contradiction with well-focused projects. As researchers (e.g., Armour et al., 1999b; Armour & Kaisler, 2001; Pulkkinen & Hirvonen, 2005; Bernard, 2008; Liimatainen et al., 2008; Zink, 2009) as well as EA method literature (e.g., The Open Group, 2013, 473-477) often advise, it is recommended to divide wide-scaled development efforts into the manageable and iterative segments.

Practitioners have reported enterprise architecting to produce good results when it is adopted as a tool to guide and structure mergers, development of

organization-wide information systems and other such considerable change projects. This is because these can spontaneously set the concrete direction and goals for the enterprise architecting. It can be highly advantageous if it is possible to start the adoption of enterprise architecture in conjunction or in close proximity with such an endeavor. Surprisingly, once an organization has decided to launch the adoption project, it often appears to be unclear what are the actual steps that should be taken first. Therefore, any undertaking that provides enterprise architecture function with concrete early goals, for example, by defining the information needs and setting requirements for the deliverables to be produced, can push the work forward. This helps enterprise architects to understand how their work can produce tangible value for their organization and to specify what activities should be performed in order to create this value.

The issues in the Diagnosis and Planning stages of the enterprise architecture adoption process cause the most negative effect on the Destination. In addition to the overall lack of understanding about the purpose of enterprise architecting (1B[25]), four issues presented in the Diagnosis stage directly relate to the goals set for the enterprise architecture. Goals that are poorly reasoned and do not target real, substantial problems of an organization (3A[26] and 3D[27]), or are such that an entire organization does not see them being beneficial (3B[28]) are clear indicators of that the effort is wrongly destined. In addition, the goals that are impossible to achieve (3C[29]) also imply the poorly set Destination.

The Planning stage involves the operationalization of the goals set for the adoption project (4A[30]). The organization's determination to start managing its enterprise architecture should be manifested here so that the purposeful implementation of the plans is possible. This involves the creation of favorable conditions for attaining the objectives that are derived from the aspired destination, which can be seriously obstructed by the presence of the problems in the Planning stage (4B[31], 4C[32], 4D[33]).

In addition to the issues discussed above, the survey's themes that relate to the EA methods and the composition of the project group can arguably also affect the Destination. Several researchers have criticized enterprise architecture for its inability to provide a language that would be understood by both busi-

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[25] The understanding about the purpose and goals of enterprise architecting is lacking in the organization.
[26] The goals that are set for the enterprise architecture are difficult to understand and poorly reasoned.
[27] The goals that are set for the enterprise architecture do not solve real problems and therefore cannot yield any real benefits for the organization.
[28] The entire organization cannot commit itself to the goals that are set for the enterprise architecture.
[29] The goals that are set for the enterprise architecture are too ambitious to be achieved with the allocated resources.
[30] There are difficulties in transforming the goals set for the enterprise architecting into the practical tasks.
[31] There are difficulties in delegating the enterprise architecture development related decision-making rights and responsibilities.
[32] Due to narrow mandate, the enterprise architecture cannot have a true influence on activities of organizational development.
[33] There are difficulties in integrating the enterprise architecture governance model with the present practices of the organization.

ness and IT people (Armour et al., 2003; Dreyfus, 2007; Asfaw et al., 2009; Espinosa & Boh, 2009; Lucke et al., 2010) and for a poor comprehension or even an ignorance of actual business requirements (Armour et al., 1999a; Lam, 2004; Wang et al. 2008; Seppänen et al., 2009). These were considerable challenges also in our case organizations but apparently not that much a few years later in the organizations of the survey respondents (5A[34], 5B[35], 5C[36]). Finally, the capability to meaningfully evaluate the benefits of enterprise architecting (6A[37]) is essential in assessing the set destination and taking well-guided adjustments to it, if that is needed.

We can find themes from all the eight axial categories that can either impede or facilitate setting the Destination by steering it towards certain tracks. It is alike whether an organization is trying to adopt the enterprise architecture or, for example, to develop and implement a new domain level strategy. First, the strategy formulation is guided and restricted by several issues such as the existing organizational strategy, management style, organizational structure, and availability of resources. These set certain limitations to the implementation capability. In essence, while defining the Destination, it is critical that the purpose set for the enterprise architecture is found truly appropriate. Due to the Act on Information Management Governance in Public Administration, it is easy to see that several public organizations will start adopting enterprise architecture only because they are required to do so. In other words, the work is solely extrinsically motivated and in the worst case may completely lack the goals that would be grounded on the organization's own interests. Even though most EA methods and development processes give stepwise instructions for how the work should be started, how it should be done, what artifacts should be created, etc. we argue that for the best results the Destination should be defined in close relation with the organization-specific needs and so that it has a true potential to fulfill the value proposition that is the key motive for establishing the Determination.

Lastly, the decision about the Destination should be aware about the limitations and the realistic possibilities of the enterprise architecting itself, as well as the organization's capability to execute in this regard (in other words, the Destination should be defined in correlation with the Dexterity). It is not uncommon that the enterprise architecture is being sold with unrealistic promises. This might be due to that the realization of value and benefits of enterprise architecture (Wan, Luo, Johansson & Chen, 2013) has not yet been thoroughly studied. Tamm, Seddon, Shanks and Reynolds (2011) note that although many studies make claims about the benefits, the explanations are often fragmented, incomplete, and not grounded in theory. This was also noticed by survey re-

[34] The enterprise architecture method that is being used is inflexible and is not fully suited in modeling the organization's architecture.

[35] The enterprise architecture method and modeling techniques focus too much on information systems and technologies, and therefore do not provide proper tools for modeling other functions.

[36] The enterprise architecture models and deliverables do not produce real benefits for the organization.

[37] There are difficulties in evaluating the benefits of enterprise architecting, for example, by using concrete measures.

spondents, who commented that the goals and benefits of enterprise architecture are often communicated using so abstract and unclear terms that it is almost impossible to evaluate whether they were reached or not. Therefore, while setting the Destination, an organization should be able to distinguish the following three topics.

1. What an organization can achieve with the EA? That is, an organization should have informed and realistic expectations about the possibilities.
2. What an organization wants to achieve with the EA? That is, an organization should have a clear purpose and goals set for its enterprise architecture.
3. What an organization needs to do with the EA in order to carry out these expectations? This should also include a truthful evaluation of the current capabilities, available resources, etc.

As previously discussed, it is possible for any of the three core categories to serve as a sole starting point for the adoption and each of them can be used to support the composition of any other given category. Especially the three above questions, each of which should be considered while forming the ideas for the Destination, can bridge the core categories together. The answer to the first question, i.e., the promise of value and benefits that enterprise architecture can bring about, will supposedly have a prominent role in forming the determination to start using the enterprise architecture in an organization. The second question should be the primary focus while defining the Destination as it gives the directions for the work. Finally, the third question leads to the third core category, i.e., what skills and competences are needed to support the successful adoption. However, by considering the circumstances, it needs to be evaluated should the Destination only feed requirements towards the Dexterity or instead, should an organization to try to proactively adapt to the its existing capabilities – or their lack of – and either maximize their use or to scale down the level of ambition, accordingly.

7.3.3 Dexterity

The ability to think and act quickly and cleverly. ("Dexterity," 2013)

Dexterity relates not only to Competence as it was defined as one of the axial categories but the use of the term dexterity aims specifically at extending this category to include the capability to adapt to a situation at hand and to act and react accordingly. For example, in order to successfully communicate the enterprise architecture for the stakeholders, it takes more than just an adequate level of EA-related knowledge and communication skills. To deliver the message in the right way, communications may need to be formal or informal, different stakeholders with varying backgrounds must be addressed using different language, representational techniques and boundary objects (e.g., Buckl et al., 2008), and a great deal of context-aware organizational knowledge is required. According to Walker (2007), the role of an enterprise architect is multi-faceted and dynamic, and therefore, in addition to technology skills, it necessitates

skills such as critical thinking, problem solving, motivational skills, negotiation skills, and people skills. Also Strano and Rehmani (2007) note that the role of an enterprise architect is multi-dimensional and usually enterprise architects must serve in the roles of change agent, communicator, leader, manager, and modeler.

Several informants in our complementary case organizations who had recently took part in enterprise architecture training courses commented how important it is to know the organization where one is going to put those lessons learned in practice. They argued that without a context it is very difficult to utilize a plethora of book learning regarding the enterprise architecting. In a similar spirit, the study of Wan et al. (2013) implies that the best practices of enterprise architecture are difficult to reproduce and to transfer from one context to another due to differences in organization cultures and their business models.

The survey presented several issues that relate to the Dexterity as one of the core categories. Most of these issues, however, can be considered as technical skills and relate to practices and practicalities of enterprise architecting (1E[38], 4A[39], 5D[40]). Although the lack of such practical skills is a commonly encountered problem by the respondents, arguably the viewpoints involving "soft skills" should have deserved more attention during the data collection. Of such issues, only the communications (3E[41]) were directly addressed in the survey study as this theme is quite regularly noted as a challenge of enterprise architecture work (Armour et al. 1999a; Armour et al., 1999b; Lam, 2004; Shah & Kourdi, 2007; Wang et al. 2008; Asfaw et al., 2009; Seppänen et al. 2009; Lucke et al. 2010). Especially, establishing the enterprise architecture as a common language that would be shared by different stakeholders was deemed difficult in our case organizations and several researchers have also identified this problem (Armour et al., 2003; Dreyfus, 2007; Espinosa & Boh, 2009; Lemmetti & Pekkola, 2010).

Many of the issues presented in the survey are due to lack of skills or competence, at least indirectly. For example, poorly regarded value of the enterprise architecture deliverables (5C[42]) can either be due to unsuited models suggested by the EA method (5B[43]) or, on the other hand, due to enterprise architects' incapability to create and communicate the models so that they would respond the organization-specific needs and objectives. Also, problems related to acquiring a mandate for the enterprise architecture function (4C[44]) or estab-

[38] The organization lacks the practical skills required in enterprise architecture development.
[39] There are difficulties in transforming the goals set for the enterprise architecture into the practical tasks.
[40] The skills related to modeling the enterprise architecture are lacking.
[41] The informing and communications related to the enterprise architecture are dysfunctional and/or do not reach the right target audience.
[42] The enterprise architecture models and deliverables do not produce real benefits for the organization.
[43] The enterprise architecture method and modeling techniques focus too much on information systems and technologies, and therefore do not provide proper tools for modeling other functions.
[44] Due to narrow mandate, the enterprise architecture cannot have a true influence on activities of organizational development.

lishing the enterprise architecture management as an ongoing process (6C[45]) can be caused by various reasons, one of which definitely is the inability to sell the idea of enterprise architecting to the influential audience in a right way (e.g., 1A[46], 1B[47], 1C[48], and 2A[49]). Although it may look like taking an easy way out to assume that anything is possible if it is done right, we must not underrate the importance of the enterprise architects' "ability to think and act quickly and cleverly" during all the stages of the enterprise architecture adoption process. As discussed above, first the dexterity is needed in creating a favorable atmosphere for the adoption and then in negotiating the proper entry points and feasible yet beneficial objectives for the project. During the actual project implementation, the architects need situational awareness to apply enterprise architecture in specific organizational contexts and to adapt to varying situations they will encounter. Finally, during the closing stage of the adoption project, the architects must to be able to show and communicate the accomplished goals (6A[50], 6B[51]) and also the prospective value of their work in order to ensure the continuity and goal-directedness of the future development of enterprise architecture (6C[52]).

[45] The enterprise architecture is being developed in short-termed projects and it is difficult to establish the enterprise architecting as a continuous process.
[46] The organization responds reluctantly to new ways of working and the changes they necessitate.
[47] The understanding about the purpose and goals of enterprise architecting is lacking in the organization.
[48] Enterprise architecture has an image problem due to, for example, troublesome implementation and technical representation.
[49] The managers are not adequately engaged in the development of enterprise architecture.
[50] There are difficulties in evaluating the benefits of enterprise architecting, for example, by using concrete measures.
[51] There is a continuous struggle to justify the expenses of enterprise architecture function, which is challenging due to the difficult verification of the benefits.
[52] The enterprise architecture is being developed in short-termed projects and it is difficult to establish the enterprise architecting as a continuous process.

8 3D MODEL FOR SUCCESSFUL ADOPTION OF ENTERPRISE ARCHITECTURE

As the final outcome of the grounded theory research, this chapter proposes an empirically grounded theoretical model of the critical challenges as well as the success factors of the enterprise architecture adoption. The model aims at presenting an easily perceivable summary of the multi-staged analysis that has been carried out throughout our research process. The practical purpose of the model is to give an organization a blueprint upon which it is possible to start outlining a more detailed execution plan for the adoption project. Therefore, the model tries to help an organization to identify the possible pitfalls as well as the capabilities that can be used as leverage.

As an abbreviation of the three core categories of the grounded theory data analysis, namely Determination, Destination, and Dexterity, this suggested theoretical model is called the 3D model. These core categories also serve as the fundamental components of the model and each of them can provide an organization with a starting point for their enterprise architecture adoption. The components can also be perceived as the classes of critical success factors (Rockart, 1979; Bullen & Rockart, 1981) of the enterprise architecture adoption. We hypothesize (see Table 61) that all the components (presented as vertices in Figure 28) are interdependent so that the existence of one will help in establishing the other two, cf., the dynamic model of critical success factors presented by King and Burgess (2006). On the other hand, the lack of one also affects negatively to the others. The optimal conditions for the enterprise architecture adoption would include all three. However, we will explain how it is possible to generate positive feedback between the classes of critical success factors in case some of them are weak or missing.

Bullen and Rockart (1981, 7) defined critical success factors (CSF) as "the limited number of areas in which satisfactory results will ensure successful competitive performance for the individual, department or organization. Critical success factors are the few key areas where 'things must go right' for the business to flourish and for the manager's goals to be attained." CSFs cardinally help managers to gain better understanding of the situation at hand in order to support the attainment of organizational and strategic goals. However, several

researchers have broadened the focus of CSFs to include also elements that are beyond the direct control of managers (Dobbins & Donnelly, 1998). As such, CSFs still "should receive constant and careful attention from management" and "the current status of performance in each area should be continually measured" (Rockart, 1979, 85).

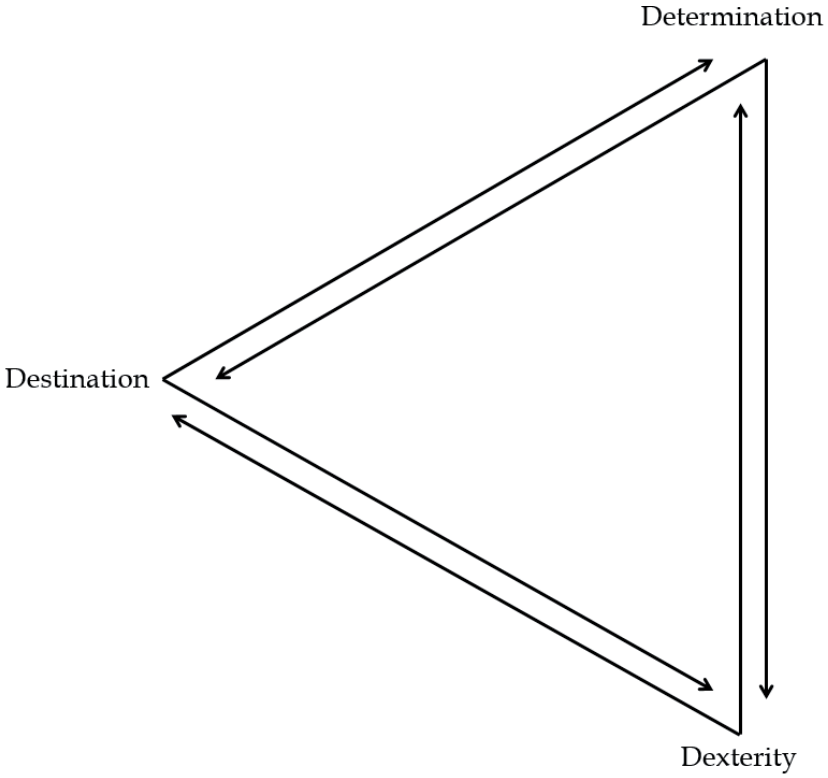

Figure 28 Skeleton of the 3D Model – The classes of critical success factors of enterprise architecture adoption

Bullen and Rockart (1981) argue that critical success factors are related to the specifics of a particular situation. Therefore, CSFs should be tailored to the industry, the company, and the individual manager, considering, for example, his or her place in the organization's hierarchy. Despite of that, the later research on CSFs has commonly focused on identifying generic success factors that – given certain necessary preconditions – can be related to several if not all reasonably similar cases. However, given the premise of Bullen and Rockart (1981), when the success factors are first identified and then prioritized, it is important to sufficiently clarify the contextual and environmental issues that may contribute to the specific success factors and their applicability in other contexts. Similarly, as Nikpay, Selamat, Rouhani and Nikfard (2013) reviewed studies on critical success factors of enterprise architecture implementation (Ylimäki, 2006; Kamogawa & Okada, 2008; Aier & Schelp, 2010; van der Raadt, Bonnet, Schou-

ten, van Vliet, 2010; Schmidt & Buxmann, 2010), they concluded that although there are factors that influence all implementation projects, due to particular characteristics of different projects, there are specific success factors to each of them.

In a slight contrast with the above, we argue that each of the classes of critical success factors presented in the 3D model can alone provide adequate grounds for a successful enterprise architecture adoption due to their interrelated and synergic nature. Also, because of generality of the proposed CSFs, and the coverage and heterogeneity of our data that resulted in them, we believe that they are not specific to a type of an organization or an industry. However, as each of our classes of CSFs encapsulates a variety of data and observations made during the grounded theory research process, their very nature and that how they can be best put in practice in different organizations and enterprise architecture adoption projects must be further detailed case by case.

8.1 Characterization of the developed theory

Prior to presenting our theoretical model in more detail, we will briefly discuss the nature of theory in information systems research by following Gregor (2006) and position the theory developed during this research accordingly. Gregor (2006) distinguishes the five different types of theory. The first, theory for analyzing, aims at describing the studied phenomenon through the analysis without making any predictions or specifying causal relationships between the components of the phenomenon. Therefore, a theory for analysis "says what is" (Gregor, 2006, 10). Theory for explaining extends the theory for analysis by answering also the questions how, why, when, and where. By this means, instead of just analyzing the phenomenon under the study, this type of theory aims at deeper and more comprehensive understanding about the studied phenomenon, i.e., the explanation. Neither does it, however, try to predict or suggest testable propositions. The third type of theory, according to Gregor (2006), is theory for predicting. As the name implies, theory for predicting aims at providing predictions and testable propositions. This type of theory builds on the analysis of phenomenon and continues by predicting what will be next, given that certain preconditions hold. However, theory for predicting does not have well-developed causal explanations that could fully justify the predictions. Theory for explaining and predicting combines the characteristics of two previous types of theory. By strengthening the analysis towards the explanation (how, why, when, where), the predictions suggested by this type of theory have stronger grounding and therefore it will be also to provide causal explanations to support the predictions. Finally, by presenting explicit prescriptions (such as methods, techniques, principles of form and functions), theory for design and action advises how to do something. (Gregor, 2006) Each of the different types of theory has their purpose and it could be argued that it is necessary to go through the development of theory for analysis before it is possible to develop

valid theories of other types. Gregor (2006) also notes that it is advocated to build integrated bodies of theory that encompass all the theory types.

The grounded theory developed in our research builds on the thorough analysis of the empirical data. This also defined the primary terms that were used for the data collection. We have not explicitly targeted the questions how, why, when, and where while trying to understand the problems of enterprise architecture adoption. However, through the analysis, especially the causal correlations and therefore the explanations for the relationships between the phenomena started to emerge. Our resulting theory consisting of the three core categories strongly builds on the causal explanations on how the categories affect each other and by this means aims at providing predictions given certain contextual conditions. Ultimately, our theory aims at giving advises on how to successfully implement the adoption of enterprise architecture. However, given that the characteristics of the studied phenomenon are highly dependent on the context and can vary from organization to organization, our theory for design and action is presented in a form of an abstract blueprint without giving particularly explicit prescriptions. Therefore, the presented model must be detailed before it is put in use.

In her paper, Gregor (2006) also presents the structural components of theory. Four of these components are common to all theory (Means of representation, Constructs, Statements of relationship, Scope) while three of them are contingent on the purpose of theory (Causal explanations, Testable propositions (hypotheses), Prescriptive statements). Before we move on to discussing our theory, we will characterize its structure and purpose according to these components in Table 61.

Table 61 The components of our theory for enterprise architecture adoption

Components common to all theory	
Means of representation	Words, diagrams
Constructs	• Three classes of critical success factors of the adoption of enterprise architecture (core categories); • Problems of the enterprise architecture adoption (axial categories); • Motivational factors affecting the enterprise architecture adoption.
Statements of relationship	• Bidirectional causal relationships between the core categories; • Unidirectional compositional relationships from axial categories to core categories; • Bidirectional negative associative relationships between core categories and axial categories.
Scope	The adoption of enterprise architecture. The theory focuses on, but is not strictly limited to, Finnish public organizations.
Components contingent on theory purpose	

(Continues)

(Table 61 continues)

Causal explanations	Suggested causal reasoning for the relationships between • The core concepts (i.e., categories) of the theory; • The success of the enterprise architecture adoption, the encountered problems (axial categories), and the classes of critical success factors (core categories).
Testable propositions (hypotheses)	• Hypothesis 1-1: "Determination gives acknowledged directions for Destination", i.e., the more determined to the adoption of EA an organization is, the easier it is to set beneficial goals that an entire organization can commit to. • Hypothesis 1-2: "Determination supports the development of Dexterity", i.e., the more determined to the adoption of EA an organization is, the more able and willing it is to support the development of necessary skills and capabilities. • Hypothesis 2-1: "Destination motivates the establishment of Determination", i.e., tangible goals and practical reasons for the adoption of EA will help an entire organization to commit to the process. • Hypothesis 2-2: "Destination specifies the need for Dexterity", i.e., tangible goals will help in specifying what kind of skills and capabilities must be developed in order to attain these goals. • Hypothesis 3-1: "Dexterity inspires the formation of Determination", i.e., skilled and motivated individuals have a great influence on an entire organization's willingness to commit to the EA. • Hypothesis 3-2: "Dexterity guides the specification of Destination", i.e., skilled and motivated individuals help in defining the goals that are beneficial yet attainable. • Hypothesis 4-1: The more success factors (Determination, Destination, Dexterity) exist and the stronger they are, the more successful the adoption of EA will be. • Hypothesis 4-2: Due to the reinforcing relationships between the success factors, the strong existence of any given factor can gradually result in the successful adoption of EA. • Hypothesis 4-3: The enterprise architecture adoption project that builds on Destination and Dexterity driven approaches in tandem is the least prone to problems. See following sections for the discussion on the hypotheses.
Prescriptive statements	Although not giving explicit prescriptions due to their possible contextual variation, the theory presents an actionable blueprint for developing organization-specific plans for the adoption of EA.

8.2 Axial categories in relation to 3D model

Next, we examine how the axial categories of problems of enterprise architecture adoption relate to the three core components of the theoretical model. This inductive reasoning is mostly based on qualitative data and our observations regarding adoption projects. Therefore, the spatial relations shown in the Figure 29 must not be taken as the definitive results but rather as a building material for the following more elaborated discussion on the 3D model.

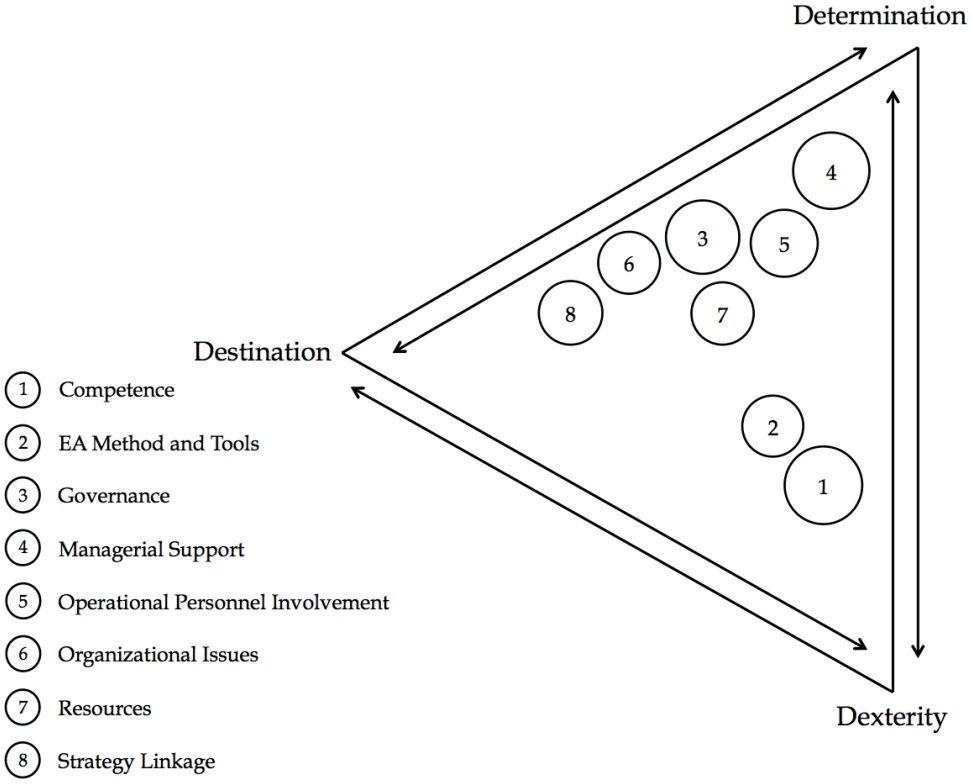

Figure 29 Axial categories in relation to core categories

In Figure 29, the closer an axial category (presented by the numbers from 1 to 8 with the size relative to the weights shown in the Figure 26) is located to each of the vertices, the stronger its effect on the core category is. For example, the axial category Managerial Support is located close to Determination. This indicates that the lack of managerial commitment will make it difficult to establish the determined atmosphere for the enterprise architecture adoption in an organization. Naturally, these dyadic relationships also indicate that the stronger the managerial commitment towards the enterprise architecture is, the easier it is to build the determination. This means that Figure 29 can be used to outline the approach that is potentially the best suited for the adoption process in a specific

organizational context. For example, if the management is committed towards the adoption, the organization should consider the approach that is driven by Determination or, on the other hand, if there are individuals who are highly competent in enterprise architecture and who master the EA methods and tools, it might advisable to start the adoption using the approach that is driven by Dexterity.

Finally, as the core categories of the model are all interconnected, there are chained relationships between any axial category and any core category. This means that, for example, through Determination the axial category Managerial Support will also affect the core categories Destination and Dexterity.

Because the relationships between the axial categories and the core categories were already discussed in the Chapter 7, we will revisit their positions in Figure 29 only briefly.

1) Competence is in close relation to Dexterity. The lack of skills and knowledge regarding enterprise architecture affects the most an organization's capability to successfully operationalize the enterprise architecting. However, as it has been discussed earlier, Dexterity adds capabilities such as soft skills, contextual awareness, and cleverness (which were unfortunately paid little attention to during the data collection expect for the complementary case studies) to the mostly hard skills that were regarded to belong to the category of Competence. Although Competence is the most closely related to Dexterity, the lack of it makes it also more difficult to reach the determined atmosphere and to define the purposeful direction for the work in terms of clearly set goals.

2) Although, according to the data from the survey study, the issues related to the axial category EA Method and Tools no longer seem to pose a considerable challenge to the success of enterprise architecture adoption in Finnish public organizations, they, however, have a significant role in that how efficiently the enterprise architects can put their skills in practice and how well they are able to communicate their work for the stakeholders using enterprise architecture deliverables as the boundary objects. Complicated methods and unfit tools can hamper the work of even the most capable enterprise architects. Also, as survey respondents reported, the practical skills of modeling enterprise architecture are still inadequate in many public organizations.

3) Inability to implement the EA governance model and to construct the governance structures that would involve not only technical but also organizational and cultural infrastructures (Kaisler et al., 2005) has been identified in previous studies and was also a familiar problem to most of our survey respondents. Janssen and Hjort-Madsen (2007) argue that not enough attention is paid to the role of institutions and capabilities critical in enabling the governance, adoption and diffusion of enterprise architecture. As discussed in Section 5.3.3, the weak or lacking EA governance makes it difficult to set the direction for the development programs and to establish an acknowledged position for the enterprise architecture function as a whole. Therefore, Determination and Destination are affected the most by problems in the category of Governance.

4) Management's commitment towards the enterprise architecture is arguably one of the most important issues for a successful adoption. The topic has

been identified in several studies (cf., Lucke et al., 2010) and it is also a consistently occurring theme in our data that is collected from different sources and through the timespan of several years (see Figure 26). Managerial Support impacts the most the organization's ability to reach Determination. Unlike the other two core categories, the strong Determination unconditionally necessitates that the decisive powers of an organization are backing up the enterprise architecture adoption.

5) Also the category Operational Personnel Involvement is most closely related with Determination as the lacking support from the personnel affects negatively to the organization-wide commitment. It is almost equally related to the other two core categories. As discussed previously, the enterprise architecting is often perceived as a tool of the IT management with no direct connection to the organization's core businesses and the daily routines of its personnel. Recently, however, this misconception has been actively addressed with debates on the role and policies of enterprise architecture in Finnish public organizations. Probably due to this, according to the survey respondents, operational personnel's unwillingness to participate the enterprise architecture related activities is not a very common problem. However, almost 90 percent of the survey respondents still answered that the operational personnel is unable to contribute due to lack of time or other resources. As one of the key premises of the enterprise architecting is that it can help the rationalization of the operational functions throughout the entire organization, the personnel's inability to contribute by participating in the work is a widespread problem that equally influences all components of the 3D model.

6) The axial category Organizational Issues is strongly characterized by the topics such as the organization-wide resistance to change, problems of developing operations in long-termed manners, and the inability to find goals that an entire organization would be able to commit to. Therefore, the Organizational Issues equally affect the Determination and Destination. Our survey data indicates that especially the first two of the problems mentioned above are seriously hampering the adoption of enterprise architecture.

7) Almost 90 percent of the survey respondents argued that the personnel's inability to participate in the enterprise architecture related activities is rather due to lack of resources than lack of interest or confidence in enterprise architecture. In regard to the managerial support, a respondent commented that "the overwhelmed managers do not want take 'extra burden' and therefore they are not eager to participate in the EA work". Hence, the lack of resources affects the most directly an organization's capability to fully engage in enterprise architecting, i.e., the Determination. As a secondary effect, it also affects negatively on the individuals' possibilities to develop skills and capabilities that are necessary for a successful adoption. This, however, is more related to the hard skills whereas the constituents of Dexterity that relate to personal motivation and soft skills are less affected.

8) Organization's strategic foundation should serve as the guiding principle for the development and maintenance of enterprise architecture (Parker & Brooks, 2008). Therefore, the close linkage between the processes of enterprise architecture management and the organization's strategic management is ex-

tremely important. This will make it easier and more efficient to implement the enterprise architecture adoption starting with Destination, as the objectives for the work are reasoned and guided by the organizational strategy. This, however, does not imply that the Destination driven approach would definitively necessitate a tight-knit linkage between the enterprise architecture and the strategy. The first objectives to be supported with the enterprise architecting do not necessarily have to be strategic per se, or even highly prioritized on an organization-wide scale. In many cases, while introducing new and probably not yet fully mastered instruments like the enterprise architecture, it may be even advisable to try to first tackle some easier issues. Finding areas where quick and tangible results can be reached is also important to demonstrate the potential value of enterprise architecting for the stakeholders. However, it will help the establishment of Determination, if the adoption of enterprise architecture is appointed with objectives that are derived from and acknowledged by the organization's strategic goals.

According to the above rather intuitive and approximate analysis, it seems that most of the problems of enterprise architecture adoption are prone to affect Determination. Of the three most dominant problem areas, Competence (1) is closely related with Dexterity, whereas Governance (3) and especially Managerial Support (4) have most impact on Determination. Figure 30 shows the overall visualization of the axial categories in their relation to the core categories.

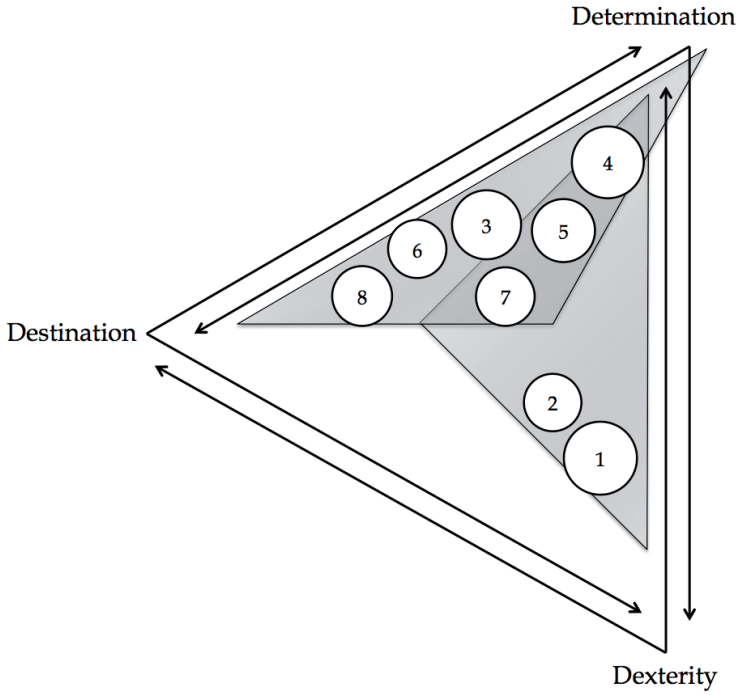

Figure 30 Overall view to the axial categories in relation to the core categories

The edges between the vertices of Determination and Destination, and Determination and Dexterity comprise most of the axial problem categories. On the other hand, the edge between Destination and Dexterity appears to be the least prone to problems. Therefore, we can hypothesize (Hypothesis 4-3 in Table 61) that in many cases the easiest and the most risk free option to start the adoption of enterprise architecture would be to design the project so that it builds on the existing capabilities and is driven with a strong goal-oriented focus. The first objectives should be defined so that it is possible to exploit and to capitalize on the available competences. This provides the best possibilities to reap some benefits that will later on help in establishing the organization-wide commitment towards the enterprise architecture.

8.3 Motivation dimension of 3D model

In order to support the context-dependent implementation of the 3D model, we add another dimension to the model to characterize the types of motivation and incentives that may drive the enterprise architecture adoption in different situations. Conforming to Asfaw et al. (2009), our data indicates that motivation or lack thereof is one of the key issues that currently characterize the enterprise architecture adoption in Finnish public organizations. In many organizations, enterprise architecture still struggles showing its value. Although it is commonly agreed that enterprise architecture management is an ongoing process that can produce tangible benefits only over the time, it seems that value propositions located in distant future can only carry so far in motivating organizations in investing in enterprise architecture management. Also, several of the problems of enterprise architecture adoption discussed above could be mediated by providing value propositions with a stronger warrant. Therefore, we argue, that it is of the utmost importance to understand the means to shape the motivation.

We will use the concepts of intrinsic and extrinsic motivation to understand the relationship between the 3D model and possible motivational drivers behind the adoption of enterprise architecture. In the context of supporting organizational creativity and innovation, Amabile (1997) defines intrinsic and extrinsic motivation as follows. Intrinsic motivation is driven by deep interest and involvement in the work, by curiosity, enjoyment, or a personal sense of challenge. Extrinsic motivation, on the other hand, is driven by the desire to attain some goal that is apart from the work itself – such as achieving a promised reward or meeting a deadline. Thus, extrinsic motivation may be build up by external incentives as well as an avoidance of potential sanctions.

Intrinsic motivation is commonly regarded more valuable in tasks that are difficult, and require creative input and personal development. A highly intrinsically motivated individual is likely to go through great efforts to acquire skills necessary to perform and also to draw skills from other domains. In relation to the enterprise architecture, an intrinsically motivated person is more likely to adopt the roles of change agent, leader, communicator, or so-called enterprise architecture evangelist or champion. Hugoson, Magoulas and Pessi (2012),

however, argue in their study that architectural excellence necessitates both intrinsic and extrinsic dimensions, which are continuously aligned in a harmonious way.

Drawing from several of the motivational theories, Dixon, Kouzmin and Korac-Kakabadse (1998) identified four forces that drive individuals towards the practice of new behaviors in their study on organizational change in public organizations. These are 1) need; 2) expected attractiveness of outcome; 3) goal setting; and 4) social comparison. Although traditional motivation theories tend to focus on individuals, these drivers can be transferred also into the organizational context and match well with typical initiating pushes to start utilizing enterprise architecture in an organization.

Currently in Finland, the need to adopt the enterprise architecture is visibly driven by the Act on Information Management Governance in Public Administration. Although the Act in its current form is not directly enforced and it is mostly on the responsibility of the ministries to oversee that the agencies and offices operating on their branch of administration follow the regulations, this change in legislation easily appears as a negative extrinsic motivator. Especially in the case an organization has not digested the reasons and purpose for enterprise architecture management, the only apparent need for adopting enterprise architecture is that it just must be done. On the other hand, the need may also be identified internally in organizations, for example, due to a merger or another considerable change or development project (i.e., Destination) that can be supported with the use of enterprise architecture.

Internally identified need closely involves the expected attractiveness of outcome. In this case, an organization believes that the enterprise architecture will produce benefits, appearing as extrinsic motivators, which are comparable to or exceed the effort and investment the work related to the adoption will require. These types of motivators are great tools to reinforce Determination.

A number of studies have identified various benefits that can be realized with the enterprise architecture. Yet, as argued in Wan et al. (2013), it is still difficult to realize the benefits due to various conditional and scenario-dependent issues. A recent study also indicated that understanding about the enterprise architecture in the Finnish public sector is quite confused (Lemmetti & Pekkola, 2012), which generally makes it difficult for organizations to form well educated expectations about the viable outcomes of the enterprise architecting. If the decision-makers are not able to foresee the potential value of the effort, it is unlikely that they are willing to commit to it. On the other hand, if the expectations are unrealistic and cannot be achieved, an organization will probably reject the enterprise architecture after a short trial period or, at the best, continue to carry out the work on a minimal level required by the law. It appears that to some level the latter has happened in many U.S. government agencies that are mandated by Clinger-Cohen Act (e.g., GAO, 2012). Despite the difficulties that relate to the concept of expected attractiveness, it is unarguably one of the key drivers of the enterprise architecture. Therefore, a great deal of effort should be put in establishing the value proposition that is attractive enough but still realistically achievable. In this sense, Destination appears as the key critical success factor. Establishing Destination in a manner that is guided by well-argued and

concrete enough organization-specific needs that can be answered with a meaningful value proposition can be an effective way to induce extrinsic motivational factors to attract Determination. However, Destination must be aware of the organization's capabilities and competences (i.e., Dexterity) or lack thereof, so that they can be truthfully aligned with the goals of the enterprise architecting. We recommend that, in many cases, organizations should define Destination in terms of Dexterity (cf., Hypothesis 4-3). If there are no pressing issues that would provide an acute starting point for the adoption of enterprise architecture, the areas where the project group that is implementing the adoption project has the best domain-specific knowledge should be focused. The purpose of this is to chase quick results even if it would mean compromises in their absolute importance on the scale of an entire organization. This approach, however, involves a commonly reported risk that the enterprise architecture programs tend to limit themselves to technology standardization and other purely IT-specific themes (Zink, 2009; Saha, 2010). Therefore, the domain to be first focused on should preferably be a vertical business area or a function, and the treatment should cross different dimensions of enterprise architecture, instead of focusing just one dimension, such as the technology architecture, that is used horizontally across several business areas. This will better help the stakeholders to grasp the idea of enterprise architecting and the nature of deliverables. Locke (1968) stated in his article that conscious goals and concrete feedback provide a major source of motivation. Therefore, although Destination goes beyond the first goals of the enterprise architecture adoption, it is very important that these early goals are tangible, easily understandable and that their attainment can be clearly assessed. To summarize, Destination is driven by both extrinsic and intrinsic motivational factors. It requires the promise of reward in form of the tangible organizational benefits that can be attained with the enterprise architecture. On the other hand, it also involves a factor of personal intrinsic motivation that comes in form of satisfaction of making right decisions, a possibility to innovate and to contribute towards the organizational goals.

Although our data does not allow us to dig deep into the social comparison theory, as presented by Festinger (1954) and then further developed by several other researchers, there indeed is a potential in this theory to understand and explain the intrinsic details of the process of enterprise architecture adoption. This theory also can be used in both intra- and extra-organizational contexts. The instruments such as the enterprise architecture maturity models can provide an organization tools to measure their efforts regarding the enterprise architecture development and to make the results more tangible[53]. This can especially affect Determination and Dexterity, as the former is driven by the rewards and actualized benefits, and the latter by the personal sense of achievement and satisfaction. Also, the peer pressure[54] can provide plausible motiva-

[53] "There exists, in human organisms, a drive to evaluate his opinions and his abilities." (Festinger, 1954, 117)

[54] "To the extent that objective, non-social means are not available, people evaluate their opinions and abilities by comparison respectively with the opinions and abilities of others." (Festinger, 1954, 118)

tional drivers affecting Determination on an organizational level and Dexterity on an individual level.

Figure 31 shows the motivational factors in relation to the core categories of the 3D model according to the above discussion. Finally, we suggest that the organizations should try to identify the driving motivational factors while designing the objectives and implementation strategies for their enterprise architecture adoption projects. Intentional use of positive feedback can support different approaches to the adoption by strengthening the corresponding types of motivation.

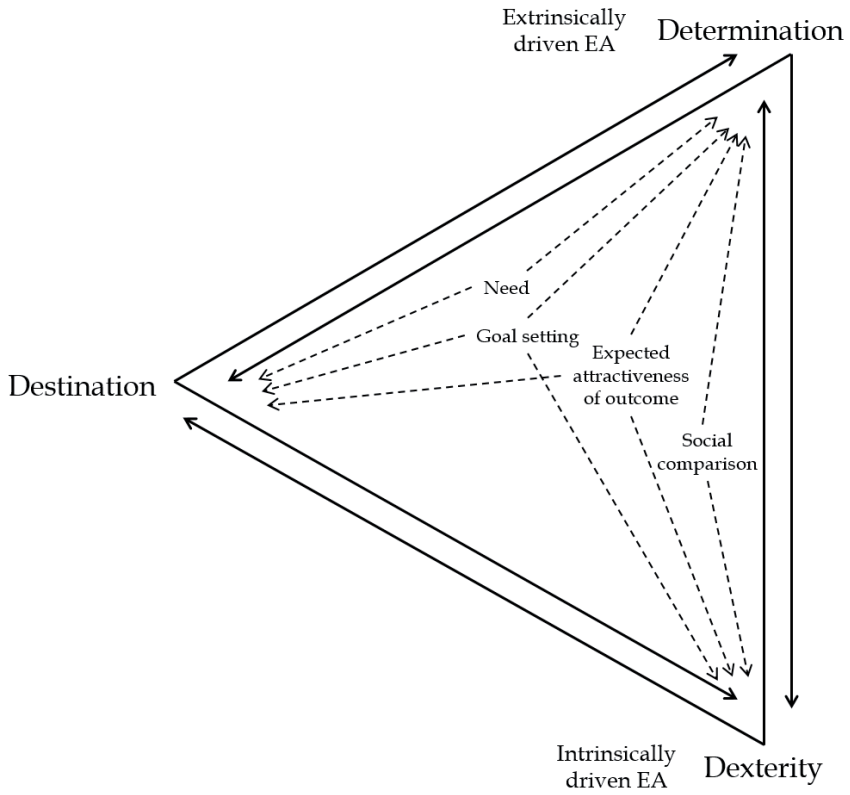

Figure 31 Motivational factors in relation to the core categories

8.4 Relationships between the components of 3D model

Our 3D model suggests that the core categories, i.e., three classes of critical success factors, are interrelated. The existence of one can help an organization to establish the other two and, on the other hand, the lack of one will affect negatively to the others. In this section, we focus on the strengthening interplay between the categories as it was formulated to the Hypotheses 1-1 to 3-2 in Table

61. Figure 32 shows the overall structure of the relationships between the core categories. These will be elaborated in the following sections.

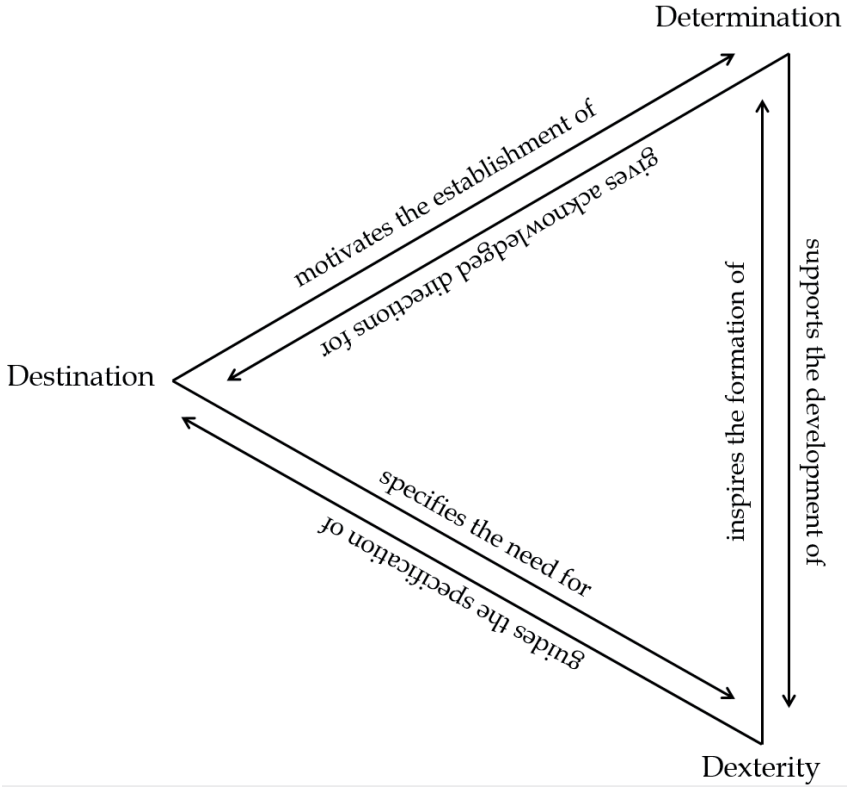

Figure 32 Strengthening interplay between the core categories

As the core category Determination was derived from the organization's commitment and dedication towards the enterprise architecture, it is arguably the strongest sole starting point for the adoption. As a driver, Determination enables and supports the development of both Dexterity and Destination. However, our research indicates that Determination is also the most difficult to attain and the most troubled by the issues identified in our data.

Dexterity, on the other hand, should be used as a sole starting point only when Determination and Destination cannot be used. Just a few intrinsically motivated individuals can start building a Dexterity driven approach to the adoption of enterprise architecture. However, in one way or another, these individuals must then work the way up to support the establishment of other classes of CSFs. This includes the assumption of that the Dexterity driven adoption usually takes place in a 'bottom-up' manner. Of course, it is possible that those individuals who are intrinsically motivated towards the enterprise architecture also hold such senior managerial positions that they can make decisions

to encompass the entire organization[55]. In such case, however, it can be seen that Dexterity transforms in the direction of Determination and the adoption occurs in a combination of these two. Currently, though, IT departments own most enterprise architecture projects and therefore it is uncommon that their strongest sponsors would be able to make decisions encompassing entire organizations.

Finally, as a sole starting point, we claim that Destination offers the best starting point for the enterprise architecture adoption project. In addition to giving the project clear objectives, a highly goal-oriented approach has more leverage to encourage Determination. While Dexterity driven approach can try to affect Determination with a skillful and context-aware sweet talk, tangible value propositions of the Destination driven approach have more ability to influence the extrinsic motivational factors. Also, Destination as a core category is the least affected by the identified problems (cf., Section 8.2). We will discuss each core category and their influence on other categories in the following sections.

8.4.1 Determination

> *Hypothesis 1-1 Determination gives acknowledged directions for Destination, i.e., the more determined to the adoption of enterprise architecture an organization is, the easier it is to set beneficial goals that an entire organization can commit to.*
>
> *Hypothesis 1-2 Determination supports the development of Dexterity, i.e., the more determined to the adoption of enterprise architecture an organization is, the more able and willing it is to support the development of necessary skills and capabilities.*

Literature on enterprise architecture and handbooks of EA methods, including the Finnish Government EA Method, often advise that the development of enterprise architecture should be driven by the organization's vision and strategy process. Determination as a starting point for the adoption of enterprise architecture can be seen to be best suited for supporting, and possibly also a necessity of, this top-down managed approach. Determination is the most self-sustained of the core categories and can greatly support the actualization of the other classes of critical success factors. The organization that is determined towards the adoption should be able to find a means to overcome most of the immediate problems. In relation to Destination, the wide-scaled commitment of an organization can help the adoption project to find the goals that are deemed important and worth of pursuing. Of course, it can still be uncertain whether these goals are such that it is possible to implement them with the available capabilities or by a means of enterprise architecting, at all (see Section 7.3.2 for the

[55] This actually was the case in one of our complementary case organizations, where the president of the educational organization was quite competent in and enthusiastic about the enterprise architecture and capable of seeing its possibilities in organizational development. Now, this enthusiasm had to be disseminated top-down in order to establish Determination throughout all the levels of the organization.

questions an organization must answer while setting Destination). In addition, some survey respondents commented that the strategy driven approach to adoption sometimes render the objectives of the work so abstract that it is difficult to get a grasp of them and to understand what they actually require from the practical implementation.

Determination and the following commitment towards the enterprise architecture also support the development of Dexterity. Now, the organization will see it being worthwhile and worth the expenses to provide their personnel with the training, and the dedicated personnel is reciprocally willing to try to make the most of this opportunity. In Finland, enterprise architecture training that covers a wide range of topics is currently being offered for the government organizations as well as the organizations of the higher education system. However, this type of a formal training tends to focus more on the development of hard skills and practical competences. Although our data indicates that there is an urgent need in public organizations to develop these skills, they are only the other half of the concept of Dexterity. People skills, communication skills, and other context-aware skills, and especially the individual characteristics that are affected by intrinsic motivational factors are at least as important in regard to a successful adoption of enterprise architecture. Still, indeed the organizational atmosphere that is determined towards the enterprise architecture will boost the curiosity, interest and involvement, and thus strengthen the individuals' intrinsic motivation on the topic.

Our data implies that, of the three classes of critical success factors, Determination is the most challenging to achieve and is the most prone to problems. Overall, the top-down managed Determination driven approach necessitates strong commitment from the senior management as well as the operational personnel, and possibly new organizational structures and revised job descriptions (cf., Armenakis, Harris & Field, 1999) to enable the EA governance, the linkage between the organization's strategy and the practice of enterprise architecture, and a great deal of architectural competence in order to implement the strategic objectives that are set for the development of enterprise architecture.

8.4.2 Destination

> *Hypothesis 2-1 Destination motivates the establishment of Determination, i.e., tangible goals and practical reasons for the adoption of enterprise architecture will help an entire organization to commit to the process.*
>
> *Hypothesis 2-2 Destination specifies the need for Dexterity, i.e., tangible goals will help in specifying what kind of skills and capabilities must be developed in order to attain these goals.*

As already discussed in the Section 7.3.2, a situation where the use of enterprise architecture is motivated by pressing events, such as a need to support an organizational change process, often give a good basis for the adoption. In this case, there is an identifiable purpose for which the practices of enterprise archi-

tecting will be used at first. This also helps in finding purposeful ways to use a variety of tools proposed by different EA methods. Instead of needing to try to figure out what are the questions that should be answered with the enterprise architecture, the questions are already there and the organization just needs to determine how (and if) they can be answered with a means of enterprise architecture.

Appointing the enterprise architecture adoption project with topical, high priority goals renders the work immediately as something substantial and something of a real value for the organization. This, again, can feed both extrinsic and intrinsic motivation on both organizational and individual levels. The promise of value that naturally follows the Destination driven approach helps to motivate the establishment of Determination by a means of need, goal setting, and the expected attractiveness of outcome (Dixon et al., 1998). On the other hand, intrinsically motivated individuals will find it rewarding to use their capabilities to solve the problems and to achieve the objectives defined by Destination. A strongly goal-oriented approach to the adoption also specifies the skillsets that are urgently needed and the domains these skills must be applied on. This can further motivate already intrinsically driven individuals to develop their knowledge and capabilities regarding the enterprise architecture. By making the skillsets to appear as acknowledged assets in an organization, Destination as an approach to the adoption can promote their appreciation and diffusion among the wider audience, as well. The goal-driven development of enterprise architecture points to the exact areas of an organization, whether they are located on the area of business architecture, information architecture, information systems architecture, technology architecture, or a union of any of these, and can stir up the interest of experts of these domains.

We propose that Destination gives the best qualification for a successful adoption of enterprise architecture. With the assumption that the applicability of enterprise architecture for the purpose of appointed goals can be plausibly reasoned, it should be less effortful to motivate Determination. This approach also directly indicates the need for development of required skills and competences, and therefore will support Dexterity. Destination as a starting point is also the least affected by the predominant problems of adoption (Figure 29) and provides the best means to overcome most of the issues included in the axial categories. We will next explain this argument.

Although the approach to the adoption of enterprise architecture that is driven by the urgent goals may only attract skills that are specific for this particular effort, many of these 1) Competences should be transferable and give a starting point for their further development. In regard to 2) EA Method and Tools, the specified goals set the explicit requirements for the use of the EA method as well as the models and other deliverables that must be produced. If the principal objectives for the deliverables are clear, it is also easier to define guidelines for their management, distribution, and representation techniques. It may be necessary to adjust these practices should the nature or scope of the work later change but overall, again, the Destination driven approach will provide a good starting point for the further development of enterprise architecture practices. Destination also provides an organization with the basic understand-

ing about how the 3) EA Governance should be established and integrated with the existing responsibilities and structures. The specific goals help in identifying the relevant stakeholders, their roles and responsibilities, and the inputs that the governance of enterprise architecture requires, as well as the outputs it must produce for, for example, the current project management practices. As the prioritized goals improve the visibility and recognition of enterprise architecting, Destination driven approach therefore helps in attaining 4) Managerial Support and will strengthen 5) Operational Personnel Involvement. The tangible objectives also help the specification of the needed 7) Resources and justify the need. In regard to 8) Strategy Linkage, the Destination driven approach gives assets to establish a concrete and visible connection between the organization's strategic endeavors and the operative enterprise architecture work.

Finally, in relation to the 6) Organizational Issues, our data indicates that organizational silos and resistance to change are among the most critical challenges of successful adoption of enterprise architecture in public organizations. Although the latter hinders the attainment of all classes of critical success factors, the inter- and intra-departmental silos affect especially the attainment Destination. The inability to find shared goals for the development of enterprise architecture and, on a larger scale, to define the target state to which an entire organization could commit to are the issues that were referred to by interviewees in our preliminary case organizations and survey respondents in their open comments. Therefore, as discussed earlier, in many cases it is not advisable to try to pursue overly grandiose goals early on. Instead, in alliance with Dexterity, the goals of the Destination driven approach can be scaled down, if necessary, and directed to provide the common good on the areas where it can be done without breaching the silos, be they political, organizational, or technological, and without inducing excessive resistance to change.

8.4.3 Dexterity

Hypothesis 3-1 Dexterity inspires the formation of Determination, i.e., skilled and motivated individuals have a great influence on an entire organization's willingness to commit to the enterprise architecture.

Hypothesis 3-2 Dexterity guides the specification of Destination, i.e., skilled and motivated individuals help in defining the goals that are beneficial yet attainable.

If the acknowledged goals and the organization's commitment towards the adoption of enterprise architecture are lacking, it is possible to try to build the favorable conditions for the adoption bottom-up with the use of Dexterity. In such case, the adoption gets personified to a few intrinsically motivated and enterprise architecture savvy individuals. The role of change agents or 'evangelists' has often been deemed extremely important for any change process. Even though the importance of change agents is the prominent for the Dexterity driven adoption, also the projects that are implemented with Determination and Destination driven approaches will benefit from such individuals.

It can be argued that bottom-up approach allows more creative thinking and development of solutions that are oriented in practical requirements of the actual operations rather than abstract notions. The latter is a risk when the adoption is being implemented top-down and is possibly guided by rather vague goals derived from the strategy. For example, as noted by one of our survey respondents, the objectives and hence also the possible benefits of enterprise architecting are often expressed in so abstract terms that it is almost impossible to evaluate their actual realization.

However, there is a risk that in case of the Dexterity driven approach the enterprise architecture remains as a tinkering tool of a few dedicated individuals who only have a say on their own domain of expertise, and thus the enterprise architecture fails to reach the larger penetration in an organization. We believe that studies that have criticized the overly emphasized focus to the technology domain (e.g., Ross, 2003; Zink, 2009; Saha, 2010) reflect this observation. Therefore, the greatest challenge of the Dexterity driven approach is to find the instruments that can be used to work the way up towards the strategic levels of an organization. For the enablement of organizational transformation, Kotter (1995) has recommended actions for change agents to take. Of these, we will cover those that we believe to be the most important and the best applicable with the Dexterity driven approach. First, Kotter (1995) advices change agents to establish a sense of urgency. This includes examining the market and competitive realities and identifying and discussing crises, potential crises, or major opportunities. Establishing the need to change by presenting the opportunities that the management of enterprise architecture can bring about and, on the other hand, communicating the potential long-term injurious effects that may follow if an organization fails to do so, should be used as a means to inspire the organization's commitment towards the enterprise architecture and, thus, the formation of Determination. Second, creating a vision to help direct the change effort and developing strategies for achieving that vision as well as planning for and creating short-term wins, such as visible performance improvements (Kotter, 1995), are the areas where Dexterity should be exploited in interaction with Destination. Finally, both Judson (1991) and Kotter (1995) argue for the importance of communicating the vision of change. Kotter (1995) emphasizes the use of wide variety of communication channels and teaching new behavioral patterns by the example to demonstrate the value of change. Communications and the ability to show quick and tangible benefits come back to the themes discussed various times in previous sections. Boster et al. (2000) were among the first to highlight the role and importance of the enterprise architecture communication plan. Unfortunately, studies indicate that it can be difficult to establish the channel of communication between the enterprise architecture and individual development projects (Kaisler et al., 2005) as well as the influential audiences in an organization (Zink, 2009). Both of these problems are often referred to in our data, as well. The former relates to the relationship between Dexterity and Destination, while the latter affects more the relationship towards Determination. However, we claim that it is possible to overcome both of these challenges with a clever and context-aware exploitation of Dexterity. Still, although Dexterity as a class of critical success factors is a great asset

when it can be used on a side of either Determination or Dexterity, or both, as a sole starting point for the adoption, it is the weakest one and should mainly be used as a supporting function.

8.4.4 Example of interplay between core categories

In this section, we will present some of the observations on a chain of events that took place in one of our complementary case organizations (University 4, cf., Appendix 2). The purpose of this is to give a brief illustrating example about the strengthening interplay between the components of 3D model.

In University 4 that stages the following events, the senior management was aware of the enterprise architecture as a concept but was not fully committed to it. The majority of the work aiming at the organization-wide adoption was taking place at the grass roots levels and was mostly driven by the intrinsic motivation. Those individuals, who had learned about the enterprise architecture due to their personal and professional interests and heard positive comments about its use from their colleges in other organizations, started the local adoption process by assessing their organization's current capabilities. They already had a decent understanding about the overall potential of enterprise architecting (cf., Section 7.3.2 "What an organization can achieve with the EA?"), which was followed by the evaluation of ability to execute ("What an organization needs to do with the EA in order to carry out these expectations?"). This evaluation included the identification of the current strengths and weaknesses, and gave the forthcoming formulation of value proposition for the work a realistic and well grounded standing[56].

Next followed the identification of the development areas that could be potentially first supported with the enterprise architecture[57]. These areas were evaluated in terms of available capabilities and by trying to avoid making any exaggerated promises while still keeping the overall tone positive and inspired. Based on the discussions with the specialists on these domains, it was decided to prioritize a few of them at the early stages of the enterprise architecture adoption project. This dialogue resulted in the domain experts' promise to support the enterprise architecture development on domain-specific areas where their help was needed[58,59].

The proposal for action was then developed and submitted to the chosen managers in the organization. Both Destination and Dexterity were used as the approaches while the proposal was being formulated. The highly regarded development areas were chosen to be the first organizational domains where the target state planning and modeling would be introduced while for the baseline modeling the areas that were known to be in the most acute need of it were chosen[60]. Again, these decisions were made according to the capabilities of the participating personnel, which resulted in that some domains were decided to

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[56] Figure 33, 1: Assessment of capabilities
[57] Figure 33, 2: Identification and assessment of development areas
[58] Figure 33, 3a: Specification of the need for domain-specific capabilities
[59] Figure 33, 3b: Asesement of capabilities
[60] Figure 33, 4a: Needs-based proposal for action: What should be done first?

be left untouched due that the required expertise was not easily available at this time[61]. By this means, the chosen approach to the adoption was not systematically implemented by the book (cf., for example, Figure 1 and Figure 7) but instead it built on Dexterity, i.e., the careful consideration about the capabilities and available resources. Finally, by purposefully favoring terminology and phrases that was known to be something that the decision-makers liked to read, context-aware skills and knowledge in terms of Dexterity were also used while the proposal for action was written.

Some specifications that were deemed necessary in order to attain the wider commitment towards the enterprise architecting were made to the proposal, after which it was transformed into the action plan for the enterprise architecture adoption[62]. This was followed by the provision of resources that would allow the purchase of enterprise architecture modeling tools as well as the participants to allocate their working hours to the enterprise architecture related activities and to participate in additional training to further develop their enterprise architecture related capabilities[63].

To summarize this example, we will refer to the different motivational factors that served as the drivers as well as hypotheses regarding the relationships between the core categories (cf., Section 8.1). The chain of events started from Dexterity, which we argue to be the weakest sole starting point of the three classes of critical success factors (cf., Section 8.4.3). In this case, certain individuals were intrinsically motived towards the enterprise architecture, i.e., they were interested in enterprise architecting, felt a personal sense of challenge and believed that they could achieve something personally rewarding by practicing it. In accordance with their personal competences, these individuals identified the areas that they believed to be able to benefit from this practice (cf., Hypothesis 3-2[64]). With the support of the domain experts, they managed to communicate their ideas and helped in attaining a wider, although not yet organization-wide, commitment towards the enterprise architecting (cf., Hypotheses 3-1[65] and 4-2[66]). The proposal for action that was developed from the viewpoints of Destination (cf., Hypothesis 2-1[67]) and Dexterity (cf., Hypothesis 3-1[68]) did reach its audience by building on the expected attractiveness of outcome and the promise of tangible benefit. At this point, the intrinsically motivated individuals translated their motivation (e.g., personal sense of challenge and achievement) so that they could address extrinsic motivational factors, such as a promise of reduced costs and more effective and well aligned IT functions. Finally, as a

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[61] Figure 33, 4b: Capabilities-based proposal for action: What we can do best?
[62] Figure 33, 4c: Specifications to the action plan
[63] Figure 33, 5: Allocation of resources: Support for the development of capabilities
[64] "Dexterity guides the specification of Destination", i.e., skilled and motivated individuals help in defining the goals that are beneficial yet attainable.
[65] "Dexterity inspires the formation of Determination", i.e., skilled and motivated individuals have a great influence on an entire organization's willingness to commit to the EA.
[66] Due to the reinforcing relationships between the success factors, the strong existence of any given factor can gradually result in the successful adoption of EA.
[67] "Destination motivates the establishment of Determination", i.e., tangible goals and practical reasons for the adoption of EA will help an entire organization to commit to the process.
[68] "Dexterity inspires the formation of Determination", i.e., skilled and motivated individuals have a great influence on an entire organization's willingness to commit to the EA.

result of this, the newly attained Determination helped in shaping the preliminary goals of enterprise architecting so that they could attract larger audiences (cf., Hypothesis 1-1[69]) and did support the further development (cf., Hypothesis 1-2[70]) of necessary (cf., Hypothesis 2-2[71]) skills and capabilities.

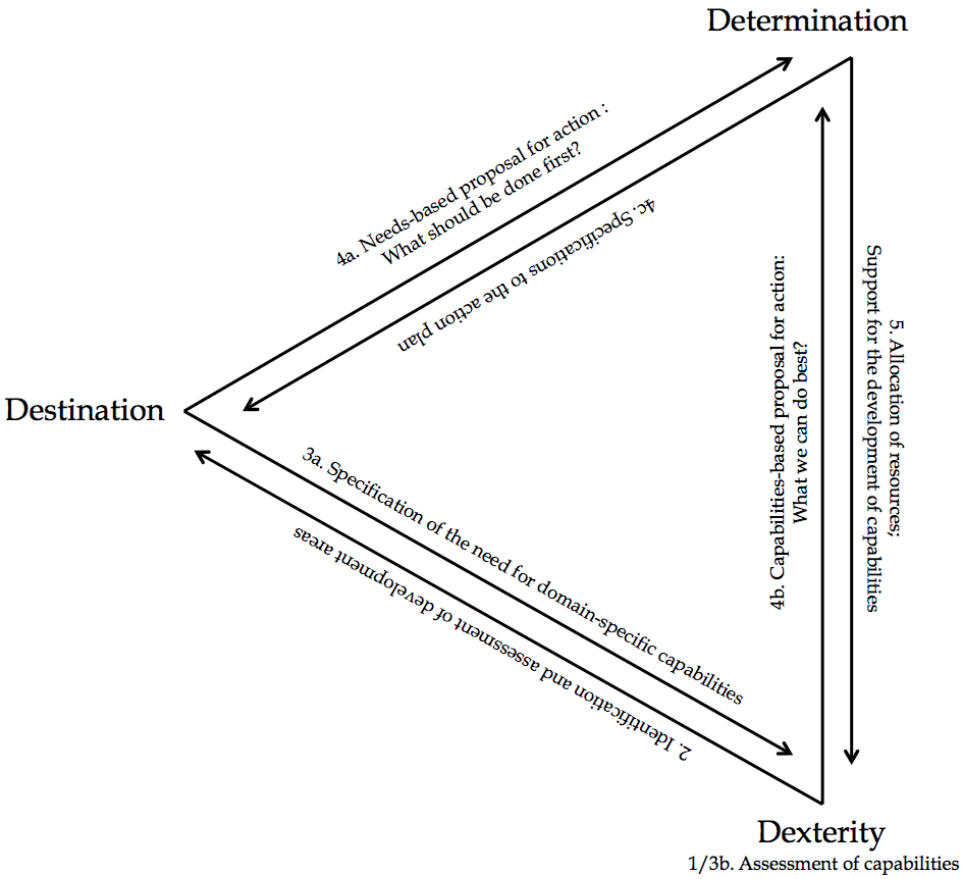

Figure 33 Example of the interplay between the core categories

As the above example aims at showing, the structure of 3D model is quite multifaceted and there are several ways its components may, or may not, interact with each other depending on the organizational context. For this reason, as discussed earlier, the model is rather presented in a form of blueprint instead

[69] "Determination gives acknowledged directions for Destination", i.e., the more determined to the adoption of EA an organization is, the easier it is to set beneficial goals that an entire organization can commit to.

[70] "Determination supports the development of Dexterity", i.e., the more determined to the adoption of EA an organization is, the more able and willing it is to support the development of necessary skills and capabilities.

[71] "Destination specifies the need for Dexterity", i.e., tangible goals will help in specifying what kind of skills and capabilities must be developed in order to attain these goals.

trying to give stepwise instructions. This makes it also difficult to create conditions that would allow the exact hypothesis testing. Therefore, we suggest that the hypotheses can be best evaluated in settings where it is possible to observe the enterprise architecture adoption projects without excessively influencing their natural courses of action and to support the analysis with a wide variety of data, as it was also done during our research.

8.5 Evaluation of 3D model

According to Strauss and Corbin (1990), a grounded theory must satisfy four conditions: fit, understanding, generality, and control. To complete the presentation of our theoretical 3D model, we will evaluate it by using these criteria. Fit denotes that the developed theory must fit the substantive data, i.e., the theory should be able explain the data set according to which it was constructed. Understanding entails that the theory is comprehensible to those involved in the area of study. Generality is to ensure that the theory is applicable in a variety of contexts. However, as most of the grounded theory studies are conducted by explaining a set of data, they often produce theories that are context specific, i.e., substantive theories (Strauss & Corbin, 1998). Therefore, as noted by Shannak and Aldhmour (2009), in case of a substantive theory, the confirmation of its generality can (or should) be done with further studies and by other researchers who can test its applicability in other settings. This agrees with Glaser and Strauss (1967, 79), according to whom the substantive theory provides a stimulus and an initial direction for the development of formal (or general) theory. Control, as the final criterion, refers to that the theory should provide control over the actions toward the phenomenon and it should be able to hold its validity in real-life situations. Next, we will assess the fulfillment of each of these criteria and provide evidence to support this argumentation.

The level of abstraction at which the theory is presented should find a right balance between hiding the unnecessary specifics of data to allow the generality and, on the other hand, being specific enough to allow practical implications. As discussed in Section 8.1, the theory presented in this study gives causal explanations for the relationships between its core components, proposes an actionable blueprint for developing organization-specific plans for the adoption of enterprise architecture, and suggests hypotheses with which the propositions can be tested. Therefore, the 3D model, although it was originally developed on the basis of theory for analysis, achieves many of the requirements of the more advanced types of theories as presented by Gregor (2006), and ultimately approaches the structure of theory for design and action. Likewise, although the 3D model was created primarily targeting the form of substantive theory, its good fit to the data obtained from a wide range of different organizations indicates that it can be developed towards the form of formal theory (Glaser & Strauss, 1967).

There are several pieces of evidence that attest to the fit of the 3D model. First, the key findings from both major sources of data (i.e., the preliminary case

studies and the survey study) were summarized as the work-in-progress reports that were sent to all the interviewees and respondents for the review. The acquired comments were used to revise and particularize our interpretation about the nature of data. By this means, we could ensure that our understanding was fair and that the interpretation explained the data in the correct way. After that, when we abstracted the theory towards its final form during the selective coding, we used the data triangulation setting in order to ensure that the resulting theory would fit the variety of data in the best possible way.

In order to improve understandability of the 3D model, we first abstracted the representation as much as possible (cf., the skeleton structure, Figure 28) and then added layers to it to allow representation of the additional information that support the examination from the different viewpoints. Figure 29 shows the axial categories of the problems of enterprise architecture adoption in relation to the core categories (i.e., the critical success factors) of the model. This allows the observation and evaluation of the potential of existing problems to complicate the adoption process and, on the other hand, to identify favorable approaches to the adoption based on the areas that are the least prone to problems in their organizations. Figure 30 continues this analysis by providing visualization about the approach that appears to be the least prone to problems according to the generalization of our data. Then, Figure 31 shows the 3D model in relation to different motivational factors that can be used to support the design of the context dependent implementation of the model. By examining Figure 29 and Figure 31 side by side, one can conclude how motivational factors can be used to affect the overcoming of the problems (cf., Figure 34). However, for the representational parsimony, we decided to present the different layers of the 3D model separately.

The understandability was also tested several times by presenting early versions of the emerging theoretical model to reviewers experienced in enterprise architecture, i.e., those who are involved in the area of study, as well as reviewers who were not. This feedback was taken notice of and used to improve the understanding. Finally, especially during the selective coding process, we relied on the approach of abductive inference, which aims at 'making sense' of the phenomenon under the examination. By this means, we took an effort to identify the core categories that would abstract and link the axial categories together so that the best possible explanation – as elementary as possible yet expressive – about the nature of incidents found in our quantitative and a variety of rich qualitative data could be given.

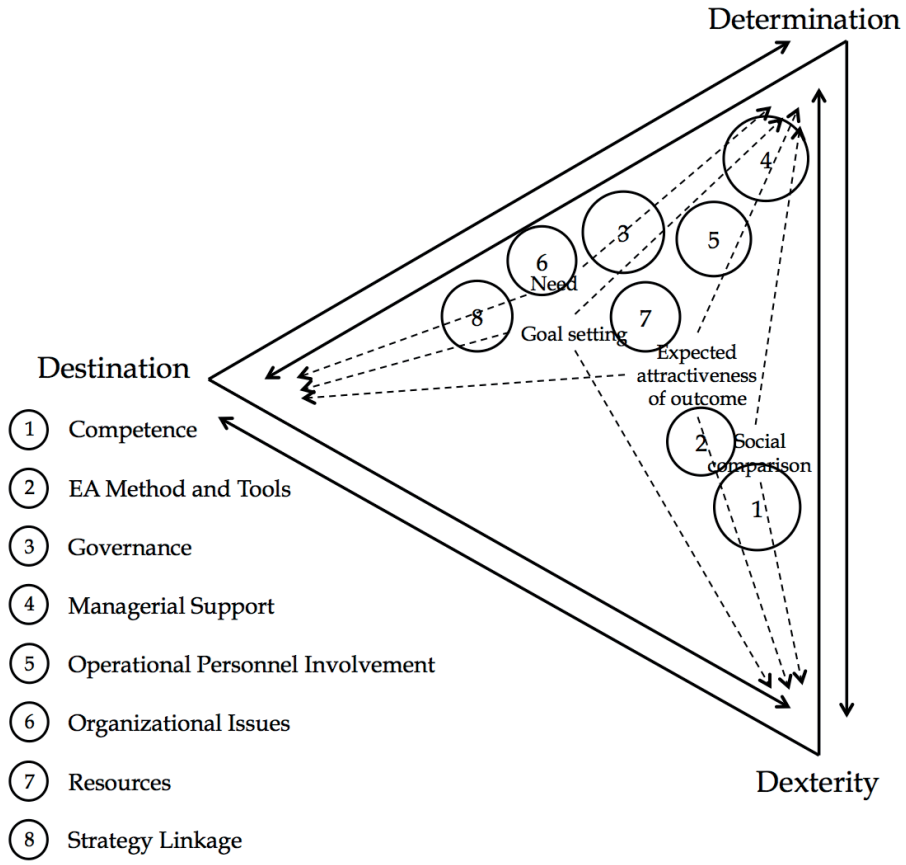

Figure 34 An optional representational dimension to the 3D model: Motivational factors in relation to the axial categories

The argument for the generality of our findings and the 3D model can be based on both method and data triangulation that were used during the research process. Throughout the research process, we used the data that originates from various sources. Because it can be claimed that the findings based on unique events that take place during a case study may not be generalizable (e.g., Hitchcock & Hughes, 1989; Lee, 1989; Walker, 1993), we used our preliminary case studies to obtain a bulk of data that gave the emerging theoretical model its overall guidelines. In addition, the preliminary case study setting gave us an access to two simultaneous cases, which allowed us to develop the emerging concepts (i.e., the axial categories) based on case comparisons. Next, we performed the literature review in order to compare our findings with the previous studies on enterprise architecture. Although the literature on the exact topic of our research is lacking (cf., Table 3), this comparison strengthened the categories of problems of enterprise architecture adoption that we had identified. The complementary cases were also used to evaluate these categories in terms of substance and their relationships. Finally, the survey study whose respondents represented a number of both public and private organizations was used to test

our preliminary findings and to assess their generalizability outside the case organizations. This allowed us to pass the limitations regarding the generalizability of case studies. Then, during the selective coding process, the necessary adjustments were taken to the resulting theoretical model according to the quantitative analysis of the survey study data to improve its generality.

The 3D model does not propose exact prescriptions for the implementation of the enterprise architecture adoption. This is a deliberate decision due to that the detailed characteristics of the model's components will vary in different organizational contexts. Nevertheless, the model gives an actionable blueprint for this purpose, which is supported by the causal relationships between the core categories as well as a number of proposed hypotheses, some of which were also tentatively tested and confirmed by observations on complementary case studies. However, further research will be needed to assess the fulfillment of the control criterion.

Table 62 summarizes the above discussion on the characteristics of fit, understanding, generality, and control of the 3D model and the actions that were taken to strengthen each of these during the research process.

Table 62 Summary of the actions taken to improve fit, understanding, generality, and control of the resulting theory

Criterion	**Actions taken**
Fit	• Representatives of the preliminary case organizations evaluated the preliminary results of our data analysis (case study data). • The survey respondents evaluated the preliminary results of our data analysis (survey study data). • The emerging theory was constantly compared with a variety of data (preliminary case study data, complementary case study data, survey study data) in the triangulation setting.
Understanding	• Early versions of the emerging theory were presented to several reviewers both experienced and not experienced in enterprise architecture. • Use of highly abstracted and multi-layered representation technique that allows examination of the 3D model from different perspectives at a time.
Generality	• Method and data triangulation were used throughout the research process. • The emerging theoretical concepts were developed according to case comparisons. • The supporting and deviating aspects highlighted during the observations on the complementary case studies allowed us to strengthen the generalizability. • The survey study further allowed us to extend the generalizability outside the case organizations.
Control	• The 3D model provides an actionable blueprint with causal explanations and proposed hypotheses, some of which were tentatively tested with complementary case studies. • Further studies are needed to assess and strengthen the control.

9 CONCLUSIONS

This thesis has presented our research on the adoption of enterprise architecture in public organizations. Even though the adoption process is often hindered by a variety of difficulties, the studies on this subject have been lacking. Therefore, it is important to gain better understanding about the early stages of the enterprise architecture life cycle, as a failure to successful adopt the practices of enterprise architecting effectively precludes organizations to achieve any of their potential benefits.

At first, our research focused on identifying and analyzing the problems of adoption projects. Then, during the course of the grounded theory research process, the emphasis was moved towards the general critical success factors of the enterprise architecture adoption. The research data were collected over a time span of several years from multiple sources and by using different techniques in a triangulation setting. During this time, some significant changes also took place in the field of enterprise architecting in Finnish public sector, the most notable of which was the enactment of the Act on Information Management Governance in Public Administration. The longitudinal characteristics of the research gave us an interesting perspective to the studied phenomena, as it was possible to observe also their unfolding over the time.

As the final result of this research, we developed an empirically grounded theoretical model that combines the key challenges and the classes of critical success factors of enterprise architecture adoption. The main components of this 3D model consist of the categories and their interrelationships that resulted from the data analysis process conducted according to our adaptation of the grounded theory method. The model can help organizations to identify the potential problems hampering the adoption and, on the other hand, the strengths and capabilities that can help its success. Therefore, the model can also be used to predict and guide the outcomes of adoption projects in different organizational contexts. Regarding the problem area that is currently very topical and little studied, this research produced interesting empirical findings presented in the form of a grounded theory. The findings have also practical implications that can benefit those who are planning and working with enterprise architecture adoption projects.

In the following sections, we first summarize the answers to our research questions. Then we will discuss the scientific contributions and the practical implications of this research in more detail. Finally, we examine the limitations of the research, and suggest corresponding topics for the further studies.

9.1 Summary on answers to the research questions

This section proposes the answers to our research questions. However, the section only presents the summary of the research results that were produced during the iterative research process and, therefore, the reader is advised to refer to the previous chapters for the detailed information. In the following, we will proceed through the research questions one by one and discuss each of them individually.

1) What are the most common and the most challenging problems of enterprise architecture adoption?

In order to answer the first research question, we first formulated categories to classify the problems of enterprise architecture adoption. These categories were grounded in the empirical data that was obtained from our preliminary case studies. The majority of the problems that were identified during the preliminary case studies as well as the subsequent complementary case studies fit into the following eight categories: 1) Competence, 2) EA Method and Tools, 3) Governance, 4) Managerial Support, 5) Operational Personnel Involvement, 6) Organizational Issues, 7) Resources, and 8) Strategy Linkage. The categories are the outcome of the open and axial coding. The number of references to different themes in the data was originally used as a decisive instrument while concluding which classes of problems were given the status of axial category. The later rounds of data collection did result in changes in the weightings of some individual categories. However, it was not seen necessary to eliminate any of the existing categories or to create new ones.

The survey study allowed us to extend the reach of the research outside the case organizations and thus to improve the generalizability of our results. In addition, the data obtained from the survey study made it possible to more precisely evaluate the commonness and the level of challenge that different problems pose during the enterprise architecture adoption. It also provided us with the evidence that the problem categories we had identified during the preliminary case studies still hold their relevance some years later.

The comparative statistical analyses of the survey data grouped according to the demographic details of the informants, e.g., the experience and expertise on enterprise architecture, the current status of the enterprise architecture adoption, and the type of the organization they represent, did only reveal a few differences that do not challenge the overall generality of our results. However, these analyses did show the following. The respondents with weak or intermediate experience on enterprise architecture had more often encountered the

problems relating to that their organization responds reluctantly to the new ways of working and the changes they would necessitate (issue 1A). On the other hand, the respondents with good expertise identified more often the problems that relate to the poor capability of enterprise architecture to truly affect the activities of organizational development (4C) and the integration of the EA governance model with the present practices and structures of their organizations (4D). In regard to the level of challenge the problems pose, there were statistically significant differences between the respondent groups for the issues 4C and 4B, which deal with the difficulties of delegating the decision-making rights and responsibilities of enterprise architecture development. Both of these problems were considered to be more challenging by the respondents with good expertise.

As the respondents were grouped according to the current status of enterprise architecture adoption in their organizations, none of the differences were statistically significant.

All the respondents representing the local government organizations (i.e., the municipalities) identified the problem of the excess of managerial and organizational development methods or 'isms', and the tendency of enterprise architecture to get lost among them (1D). At the same time, this issue was considered as a problem by just over the half of the respondents representing the other types of organizations. On the other hand, all the respondents representing private companies answered that they have encountered problems in transforming the goals of enterprise architecture into the practical tasks (4A) and considered this as a challenging issue. Also, almost all the respondents from private companies had encountered the problem that the project group implementing the enterprise architecture adoption mainly consists of IT staff, which impairs the possibility of other organizational functions to influence the work (2E). Only half of the respondents from other organization types identified this issue.

Approximately half of the respondents representing central government organizations considered that the EA method they are using is unsuited for modeling the enterprise architecture of their organization (5A), whereas only 20 percent of the respondents from other types of organizations identified this problem. This issue was not considered as a major problem by any of the respondent groups but it still indicates that the enterprise architecture experts in government organizations are less satisfied with the current EA methods than the experts in other types of organizations are. Finally, almost all the respondents representing the central government organizations identified the problem of justifying the expenses caused by the enterprise architecting (6B) and all of these respondents regarded this as a challenging issue. For a comparison, only over half of the respondents from other organizations had encountered this problem.

Overall, the answers in relation to the commonness and the level of challenge of the problems obtained from the central government organizations were consistent with those of the representatives of private companies. On the other hand, the views on the problems were consistent in the municipal organizations and the institutions of higher education system.

Because there are not particularly large differences in the significance between the eight problem categories, and the individual issues that the informants regarded to be common and challenging were divided quite evenly across the categories, we argue that each of them must be considered in order to answer the first research question. However, overall the problems that are caused by the inadequate Competence on enterprise architecture are the most commonly encountered and the problems that are related to Resources currently appear to be the most challenging.

2) What are the critical success factors of enterprise architecture adoption?

During the research process it was noticed that the traditionally worded 'static' critical success factors do not quite meet the requirements of enterprise architecture adoption. This process and what defines its success appear to be highly context-dependent and vary in different organizations. Therefore, the critical success factors must be of dynamic nature and their applications and effective interrelationships must be examined case-by-case and specified in a capability-driven manner. The answer to the second research question was found during the process of selective coding. The three core categories 1) Determination, 2) Destination, and 3) Dexterity were developed not only to integrate the discrete axial categories but also to acknowledge what our data indicate are the classes of critical success factors of the adoption of enterprise architecture. These critical success factors can be summarized as follows.

Determination ("A quality that makes you continue trying to do or achieve something that is difficult.") refers to the organization's decisive dedication and willingness to start pursuing the planned and methodical management of their enterprise architecture. In practice, such an organizational commitment necessitates that the key decision-makers are willing to invest in the adoption process and are involved in it. As it was discussed earlier, ideally the organization's internal motives should drive the establishment of Determination but also external factors affect this decision. Currently in Finland, the Act of Information Management Governance in Public Administration is a strong external stimulus that drives public organizations to adopting the enterprise architecture. On the other hand, a positive peer pressure and encouraging experiences of other organizations can also strengthen Determination.

Destination ("The purpose for which something is destined.") refers to the idea why an organization starts using the enterprise architecture and what it wants to accomplish by this effort. It is greatly advantageous if the adoption of enterprise architecture can be combined with other organizational development projects or, for example, enterprise IT development activities. Such projects can appoint the enterprise architecture function with goals and objectives that support their completion and are also highly regarded in the organization. This helps enterprise architects to understand how their work can produce value for their organization and specifies the concrete tasks that are needed to advance the enterprise architecture development. Finally, the interplay with organizational development activities also strengthens the organization's commitment

towards the enterprise architecture, as it is seen as something with a clear purpose.

Dexterity ("The ability to think and act quickly and cleverly.") as the third class of critical success factors extends the contents of the axial category Competence with the capability to adapt to a situation at hand and to react and act accordingly. Therefore, in addition to the competence on enterprise architecture and hard, technical skills such as the EA method related knowledge, the enterprise architects must be able to apply critical thinking, different problem solving techniques, motivational skills, negotiation skills, and a variety of other soft skills. As noted by Strano and Rehmani (2007), an enterprise architect must serve in the roles of change agent, communicator, leader, manager, and modeler. It is especially important to understand the organizational context, in which the enterprise architecture is being adopted, to know the relevant stakeholders, and to be able to read the different situations accordingly and correctly.

The classes of critical success factors were developed inductively by analyzing the empirical data. These data, however, primarily concern the problems of adoption and do not directly address the success factors nor were the proposed classes of critical success factors evaluated outside the context of our research. Although these were deliberately made design choices, some further studies are needed, as discussed in Section 9.3.

We suggest that the classes of critical success factors we have identified are not specific to the field, individual organizations, or situations (cf., Bullen & Rockart, 1981), i.e., they are generic. However, due to the intricacy of enterprise architecting efforts, it appears that standard lists of static success factors do not fully meet the requirements. Therefore, it is necessary to specify their content for a given organizational context.

Also, because the recognized classes of success factors are interrelated and synergic, it is argued that they can strengthen each other. Therefore, it is possible for an organization to successfully implement the adoption process by building on just one class of critical success factors, should it be strong enough, as further discussed in Section 9.2. However, the more success factors there exist in an organization, the more successful the adoption will be. Finally, we did hypothesize that the adoption project that builds on both Destination and Dexterity driven approaches is the least prone to problems, as our data also indicates.

3) How can the recognized critical success factors be turned into drivers of enterprise architecture adoption?

To answer to the third research question, the 3D model was created as the final outcome of the grounded theory research process. The model characterizes the relationships between the core categories, i.e., the classes of critical success factors, in order to explicate how their synergic nature can advance the adoption process. The model also relates the axial problem categories with the critical success factors, and therefore gives suggestions for choosing the approach that potentially is the best applicable in a certain organization. As discussed in the previous chapter, it is advisable to choose the approach that appears to be

the strongest in a specific organizational context, i.e., that is the least affected by the related problems. Finally, the 3D model also suggests that motivational factors can be used to strengthen the different success factors and to support the adoption process. If the adoption of enterprise architecture is mainly motivated by the extrinsic factors, it is possible to take a top-down approach and to try to implement the adoption by means of administrative actions. On the other hand, if the motivation appears to be mainly intrinsic, the adoption process can be started bottom-up by exploiting individual capabilities and to try to reach the quick, and probably less ambitious, objectives that can prove the benefits of enterprise architecting to wider organizational audiences.

In regard to the third research question, an organization should first carefully evaluate its current situation and capabilities by using the different layers of the 3D model in relation to the classes of critical success factors. This information provides the starting point for the formulation of a detailed organization-specific plan for the enterprise architecture adoption project that uses the existing capabilities as leverage. The enterprise architecture adoption project should be founded on the classes of critical success factors that appear to be the strongest in the organizational environment. If none of them are available, however, deliberate efforts should be taken for their establishment. As discussed above, our data indicates that the approach that is based on both Destination and Dexterity is the least prone to problems. Therefore, in the most cases, it might be advisable to prefer these two.

In relation to the chosen approach to the adoption of enterprise architecture, it should be considered how to strengthen the remaining weaker areas. We discussed the strengthening interplay between the classes of critical success factors and proposed a series of hypotheses about how the components of the 3D model affect each other, according to our data. In addition, we also gave an example of the interplay between the classes of critical success factors by referring to one of our complementary case studies.

The proposed 3D model is rooted in the empirical data collected from a number of organizations with experience in enterprise architecture adoption. The model was developed by iteratively interpreting these data in order to identify what are the essential components and characteristics of the studied phenomenon, i.e., the enterprise architecture adoption process. The model provides a set of tools that can be used to develop context-aware adoption strategies that take advantage of organization's present situation and capabilities. Thus, the 3D model explains how the classes of critical success factors can serve as drivers of enterprise architecture adoption.

9.2 Contributions and practical implications

To our knowledge, neither the problems of enterprise architecture adoption nor its critical success factors have been systematically studied before. Most of the studies on critical issues of enterprise architecture have focused on the enterprise architecture function that has already established its position in the organ-

izational environment, i.e., the time period after the adoption project. However, according to our observations, the adoption process and especially its early stages appear to be the most challenging phase in the enterprise architecture life cycle.

Firstly, based on both the literature review and our empirical data, this research gives an overview of the problems that organizations may encounter during the adoption of enterprise architecture. This information generally contributes to the common body of knowledge of enterprise architecture and gives practitioners a checklist of issues that they need to prepare themselves for. The research also provides an empirically grounded theoretical model of the problems and the critical success factors of the enterprise architecture adoption and proposes a basis for the subsequent studies. The generality of the 3D model can be further tested using the provided hypotheses. Although it was not possible to thoroughly test the hypotheses during this research, they are based on our observations on the empirical data. As such, they are as much the description of the data as they are hypotheses and, therefore, they hold true at least on the substantive area of this research. Practitioners can apply these hypotheses as the guidelines to arrange their enterprise architecture adoption projects, while the researchers can use them as working hypotheses to be tested and further developed, and to formulate the research designs.

On the field of information systems research, there are a plethora of studies that focus on critical success factors of enterprise-wide information systems (such as the enterprise resource planning software, ERP) implementation. Also, constituents of success in total quality management, business process reengineering and management, and business-IT alignment have been studied. Some scholars have even reviewed the literature on these areas that are "closely related to EA" (Ylimäki, 2006, 30) in order to find the potential critical success factors for enterprise architecture. However, in order to emphasize the importance and implications of our research, we want highlight some characteristics of enterprise architecture and its adoption process that advocate the need for the specific studies on this field.

First, the enterprise architecting is an ongoing function that must constantly adapt to the changing requirements of the organizational environment in order to produce sustained benefits. Therefore, none of the areas where something can be assumed to be done or finished once that 'something' has been successfully implemented or adopted can provide the sufficient understanding regarding the enterprise architecture adoption process. Even though the generic critical success factors such as the top management support or the organizational commitment can be applied at the conceptual level to ERPs as well as to enterprise architecture, their meanings in these contexts are very different. Once the ERP has been implemented, the project is done and the success can be measured. On the other hand, once the practices of enterprise architecting have been adopted by an organization, almost nothing is done. There is no guarantee that the produced deliverables would not soon become "shelfware" or that the enterprise architecture would not lose its place in the management's interest. We will quote again some of the previous informants to support the argumentation.

> *I have seen that the executive managers are favorable to enterprise architecting and participate in it in the beginning. However, this soon goes astray as they think that they have successfully delegated the issue* […] (Respondent 33)

In order to ensure the persistent change and continuity of the enterprise architecture process, these matters must be acknowledged. Second, even though the enterprise architecture often deals with the issues that encompass the entire organization, the number of enterprise architects per organization is surprisingly low. According to Hanschke (2010, 100), medium sized companies often have a single enterprise architect. In the organizations of our case studies it was uncommon to find even one person who could dedicate most of his or her working hours to the enterprise architecture. Therefore, in practice, currently the responsibilities related to the planning, development, and maintenance of enterprise architecture is often the burden of the dedicated few.

> *Organizations are not willing to appoint anyone for the EA permanently as it is thought that it can be done in addition to other duties, with no additional resources* […] (Respondent 17)

Therefore, the critical success factors must put emphasis on the capabilities of individuals, their continuing motivation, and how these can be supported. During the early stages of the enterprise architecture adoption process, there might be just a few intrinsically motivated change agents who must be able to draw the entire organization towards the desired change. Third, the skills and competences required in enterprise architecting are often out of the ordinary.

> *Many of us can draw process models and do such a planning work but it is still challenging to step outside of our own silos and to transfer these skills into the context of enterprise architecting.* (Interviewee A)

Although the maturity of the enterprise architecture related standards and practices have improved over the years, the adoption of enterprise architecture still to this day remains a little studied area. As a consequence, the adoption projects are often weakly planned and uncontrolled. Also the ideas regarding the purpose and content of enterprise architecture seem to vary from organization to organization. The adoption projects are highly situational and take place in environments that appoint them with very different and multifaceted objectives. Therefore, as noted by an experienced enterprise architecture consultant above, enterprise architecting requires contextual awareness and adaptive competences. The above characteristics of enterprise architecture adoption place particular requirements towards its critical success factors. We argue that the findings of our research and the produced classes of critical success factors can respond to these requirements.

Despite (or because of) these characteristics of enterprise architecture, we believe that it is possible to use the 3D model to outline, evaluate and reinforce the critical success factors on a variety of organizational change efforts from strategy adoption processes to enterprise information systems implementation efforts. The 3D model itself provides new perspectives to theories and applica-

tions of the critical success factors and, therefore, our study contributes to the generic theoretical body of knowledge regarding the success factors and organizational change.

We proposed the classes of critical success factors as something that can and should be utilized in a context-dependent manner as each of them individually as well as their different combinations provide alternative approaches towards the same objective, i.e., the successful adoption. The classes of critical success factors proposed in this study are rather dynamic than static. King and Burgess (2006) have presented a dynamic model of ERP success factors by linking the success factors with causal chains. Our definition of the dynamic critical success factor extends this idea. Also the context-dependent specifications for each class of the critical success factors must be adjusted to best exploit the available capabilities. As the specific contents of the classes are not fixed a priori, also the nature of interplay, or causal chains, between them must be identified and defined dynamically for a given context.

Because of the strengthening relationships between the classes of critical success factors, they do not form an indivisible array of the areas where 'things must go right' (cf., Bullen & Rockart, 1981). Instead, we suggest that the lack of one success factor can be mended by skillfully exploiting another. We present the critical success factors not as a checklist of necessary preconditions but rather as a collection of tools to be actively and adaptively used throughout the adoption process, each with its own purpose in different organizational environments and contexts. Hypotheses regarding the nature of relationships between the classes of critical success factors were proposed and we gave an example referring to one of our complementary case studies that characterized how these relationships can work in practice.

For the practitioners, the 3D model gives a blueprint and a set of tools that can support the decision-making during the formulation of organization-specific plans for the enterprise architecture adoption, and the implementation of these plans. The model does not propose explicit prescriptions for its use because it is acknowledged that there can be considerable contextual variation to the specific characteristics of its components and their relationships in different organizational environments. In addition, the objectives of enterprise architecting vary in different organizations. Some organizations pursue substantial functional transformations while others use enterprise architecture only as a tool to systematize their IT governance. Our findings build on the data collected from a number of different organizations with different objectives regarding their enterprise architecture, and the 3D model was created to acknowledge this diversity. Therefore, we argue that the 3D model is wide and flexible enough to support a variety of adoption projects.

9.3 Limitations and topics for further research

Overall, the major challenge of this research was the diversity and heterogeneity of the topics that the concept of enterprise architecture currently encom-

passes. This may limit the generality and the applicability of our findings in certain cases, should there be views that strongly conflict with our premises. However, because this issue was acknowledged throughout the research process, we tried to address it with any possible means.

First, we did not strictly engage to any single definition of enterprise architecture. Although the Finnish Government EA Method and the Kartturi Method aimed for the higher education institutions have a strong presence in the organizations from where the majority of our data were collected, both of these methods allow different adaptations and they can be used for a number of different purposes. Therefore, we generally approached the enterprise architecture as an instrument that locates in between the domains of business and IT and is used to improve the alignment of these areas, albeit organizations may choose to emphasize these areas differently in their architecting efforts.

The research exclusively focused on the enterprise architecture adoption process regardless of what the exact definition of the enterprise architecture might be in a given organization. The 3D model was formulated to recognize the diversity of different adoption projects, in which we believe the research succeeded reasonably well. However, this also forced the generality of the model, which limits its control capability (cf., Strauss & Corbin, 1990) and the possibility to define exact prescriptive statements (cf., Gregor, 2006) for its use.

Second, we collected the research data over a period of time, from a number of organizations, and by using several data collection techniques. This allowed us to gain a wide variety of data that provided us with different perspectives to the studied phenomena. Especially the quantitative analysis of the survey data indicates that the problems of enterprise architecture adoption are reasonably similar in different organizations despite of, for example, their field of operations or the maturity of their enterprise architecture processes.

Because the theory presented in this thesis was developed during the final stage of the grounded theory research process, it was not possible to further test it. Although the theory fits our data well, i.e., it is a substantive theory (cf., Strauss & Corbin, 1994, 281; Urquhart et al., 2010), its applicability in other contexts still remains unseen. Due to these reasons, we suggest the following topics for the further research.

1) Testing of the generality of the 3D model outside of our substantive area to allow its development towards the formal theory.

2) Testing of the hypotheses of the 3D model with the cases that allow the passive participant observation and make it possible to analyze the data in relation to the success of adoption after the adoption project is completed.

3) Elaboration of the control capability of the 3D model for the purposes of specific use cases.

The data and the analyses, upon which the findings of this research were developed, almost exclusively focused on the problems of enterprise architec-

ture adoption. The selective coding process, during which the proposed classes of critical success factors were inductively created, purposefully avoided making the assumption that the lack of problems would automatically result in the desired outcome. Thus, the core categories were formulated so that they are broader in scope than the sum of related axial categories and they also acknowledge themes that were not paid much attention to during the data collection. This is especially the case with the core category Dexterity. For example, while the category Competence did mostly deal with the hard skills of enterprise architecting during the axial coding, Dexterity was created to also take into account skills that are specific to certain organizational environments as well as the soft skills, such as communication and negotiation skills, problem solving, and a variety of social skills. By this means, Dexterity can be used to reconcile the issues that relate to several axial categories, such as to increase the organizational commitment and to help negotiating the linkage between strategic objectives and enterprise architecting. The themes related to soft skills, however, were not our key interest during the earlier stages of the research process and they gained more emphasis only in the retrospective data analysis. Therefore, we also suggest that the following topics should be further studied.

4) Systematic evaluation of the proposed inductively developed classes of critical success factors, their contingencies, and possible subclasses in different organizational contexts outside of our substantive area.

5) Thorough observation of the influence of soft skills and social processes in relation to the 3D model.

Finally, we started to focus on the motivational factors affecting the success of enterprise architecture adoption only at the late stages of the research process. This theme emerged through the immersion into the data but it was not explicitly regarded during the data collection. However, it seems that the motivational factors, and therefore, the motivation theories, play an important role in the success of adoption and they may also be a key component in practical applications of the 3D model. Further studies on the roles of change initiators, change sponsors, and change agent in relation to the success of the adoption process are needed.

Each of the motivation theories we referred to during the research deal with the motivation of individuals. However, the unit of analysis of our research was an organization. For example, some of the survey respondents who enquired whether they should assess the problems from their personal point of view or from the perspective of their organization were advised to do the latter. As discussed earlier, the 3D model, and especially Dexterity as one of the classes of critical success factors, on the other hand, strongly emphasizes the individual capabilities. Although we do think that these definitely constitute some of the essential components of the successful enterprise architecture adoption, an organization can be regarded as the formal structure of delegation and control, and the structure in which individuals interact as wholes (e.g., Selznick, 1948). Therefore, the further studies may also consider the following theme.

6) Thorough observation of the influence of motivational factors in relation to the 3D model and their implications in an organizational context.

Although, in our opinion, we were able to sufficiently accomplish the goals of this research, the process also revealed that the research area and the questions we wanted to tackle are far from being simple. The management of enterprise architecture, also as per definition, ranges from the organization's strategic ambitions to the individual technology artifacts, and everything in-between. Therefore, it was surprisingly challenging, yet extremely interesting, to try to find out what are the critical problems and the critical success factors of enterprise architecture adoption. As discussed above, some of the themes that we believe to be quite important in regard to these questions emerged only towards the end of the research process. There are still a lot of questions to be answered, by both academics and practitioners, before the enterprise architecture can reach its full potential. At the same time, it has been inspiring to see that the enterprise architecture, as a discipline and a practice, is constantly going forward.

YHTEENVETO (FINNISH SUMMARY)

Tieto- ja viestintäteknologiat ovat toimineet keskeisinä ajureina julkishallinnon uudistuksessa. Julkiset organisaatiot ympäri maailman ovat ryhtyneet käyttämään kokonaisarkkitehtuurimenetelmiä parantaakseen julkisten palvelujen laatua ja tehokkuutta sekä kehittääkseen tietojärjestelmäratkaisujen tarjoamaa tukea organisaatioiden toiminnalle. Suomessa syksyllä 2011 voimaan tullut laki julkisen hallinnon tietohallinnon ohjauksesta edellyttää mm. valtion virastoja, laitoksia ja liikelaitoksia sekä kunnallisia viranomaisia suunnittelemaan ja kuvaamaan kokonaisarkkitehtuurinsa sekä noudattamaan laadittua kokonaisarkkitehtuuria. Lain merkitys ja ohjeet siitä, kuinka sitä tulisi toteuttaa, ovat kuitenkin jääneet monille epäselviksi. Edelleenkin useimmat julkiset organisaatiot ponnistelevat kokonaisarkkitehtuurin käyttöönoton ja suunnitelmallisen soveltamisen kanssa.

Kokonaisarkkitehtuurin tuottamia hyötyjä on tutkittu varsin paljon. Toisaalta siihen liittyviä ongelmia ja erityisesti menettelytavan käyttöönottoa organisaatioissa on tutkittu huomattavasti vähemmän. Tämä aihe on kuitenkin erityisen tärkeä, sillä käyttöönoton epäonnistuessa myös mahdolliset hyödyt jäävät saavuttamatta.

Tämän tutkimuksen tavoitteena oli ensin tunnistaa keskeiset ongelmat, joita organisaatiot kohtaavat ottaessaan käyttöön kokonaisarkkitehtuurin sekä kehittää sitten ongelmia analysoimalla malli menestystekijöistä, joiden avulla käyttöönoton onnistumista voidaan tukea. Tutkimuksessa yhdistellään erilaisin menetelmin kerättyä laadullista ja määrällistä aineistoa, joka koottiin vuosien 2008, 2012 ja 2013 aikana. Tutkimusprosessin aikana käytettiin *Grounded Theory* -lähestymistapaa, jonka avulla muodostettiin induktiivisesti empiiriseen aineistoon perustuva teoreettinen malli. Tutkimuksen tuloksena esiteltävä ”3D”-malli määrittelee kokonaisarkkitehtuurin käyttöönoton menestystekijät kolmen toisiinsa kytkeytyvän ydinkategorian (*Determination*, *Destination*, *Dexterity*) avulla. Koska kokonaisarkkitehtuuri on toimintatapana jatkuva prosessi, jonka täytyy säännöllisesti mukautua ympäristön muuttuviin vaatimuksiin ja jonka toteutustavat ja tavoitteet voivat vaihdella huomattavastikin käyttäjäorganisaatiosta toiseen, ovat esitellyt menestystekijät luonteeltaan dynaamisia. Mallin dynaamisuudella tarkoitetaan, että menestystekijöiden merkitys tarkentuu niistä lähtökohdista ja siihen ympäristöön, jossa kokonaisarkkitehtuuria ollaan ottamassa käyttöön. Tässä tulee arvioida organisaation nykyistä tilannetta, lähitulevaisuuden näkymiä sekä sen vahvuuksia ja heikkouksia. Lisäksi tutkimuksessa luotu malli painottaa menestystekijöiden välistä vuorovaikutusta ja niiden kykyä tukea toinen toistensa kehittymistä. Käyttöönottostrategia onkin suositeltavaa rakentaa sellaisten menestystekijöiden varaan, jotka tarjoavat nykytilanteessa siihen parhaat edellytykset ja joihin liittyy vähiten tunnistettuja ongelmia.

Tutkimuksen tulosten voidaan olettaa kiinnostavan sekä kokonaisarkkitehtuurin ja tietoteknisen kehityksen aikaansaaman organisaatiomuutoksen tutkijoita että kokonaisarkkitehtuurin parissa työskenteleviä.

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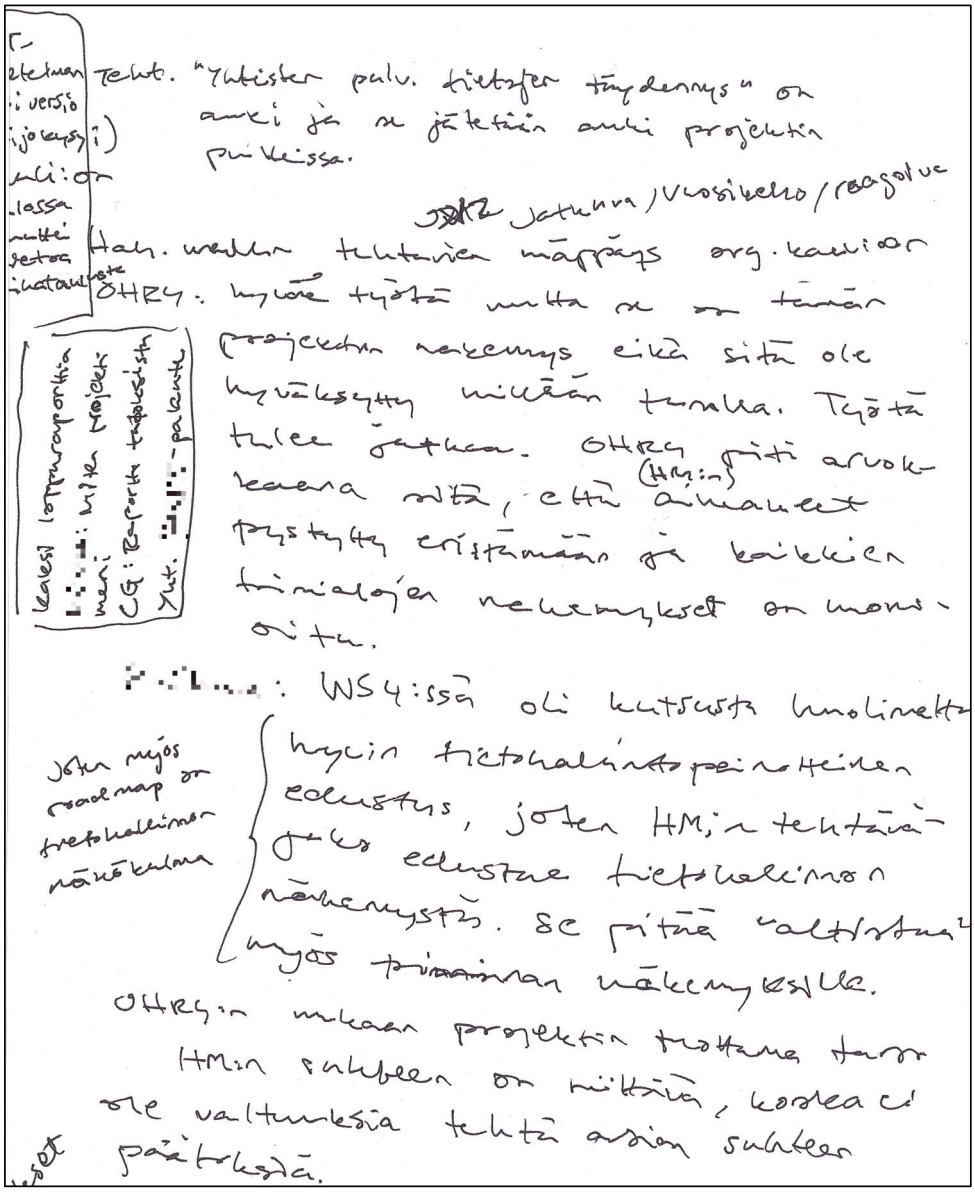
APPENDIX 1: FIELD NOTE EXAMPLE

Below is a clipping from the field notes that were taken during the observation of the research cases.



APPENDIX 2: COMPLEMENTARY CASE DATA

The agenda (Meeting agenda) that was followed in the small group meetings with representatives of the complementary case organizations:

1) Background information and motivation to start enterprise architecting.
2) Action plan for enterprise architecting.
3) Goals of enterprise architecting.
4) Present results of enterprise architecting.
5) Overall opinions and experiences on enterprise architecting.

Organization	**Data collection techniques, information sources, themes**
Municipality 1	Notes on the small group meeting (2h, 5 representatives) - Meeting agenda - Special theme o Practices and challenges of enterprise architecture development and management
Municipality 2	Notes on the small group meeting (2h, 5 representatives) - Meeting agenda - Special theme o Practices and challenges of enterprise architecture development and management
Municipality 3	Notes on the small group meeting (2h 30min, 2 representatives; Combined meeting with representatives of University 6 and Municipality 3) - Meeting agenda
National service and development center	2 transcribed theme interviews on problems of enterprise architecture adoption (1 representative); Review of the selected enterprise architecture deliverables
Private company 1	Notes on the small group meeting (2h, 1 representative) - Meeting agenda - Special themes o Practices and challenges on enterprise architecture development and management o Enterprise architecture governance Review of the selected enterprise architecture deliverables
Private company 2	Notes on the small group meeting (2h, 2 representatives) - Special theme o Challenges and best practices of enterprise architecture adoption, planning and development from the consultant's viewpoint
University 1	Notes on the small group meeting (2h 30mins, 3 representatives) - Meeting agenda - Special theme o Enterprise architecture and forthcoming joint acquisition of the new research information system
University 2	Notes on the small group meeting (2h 15min, 5 representatives) - Meeting agenda - Special themes o Enterprise architecture adoption and development in Finnish higher education system: the roles of Ministry of Education and Culture and CSC – IT Center for Science o Plans on joint acquisition of EA modeling software tools
University 3	Notes on the small group meeting (1h 45min, 5 representatives) - Meeting agenda - Special themes o Domain-level enterprise architecture for science and re-

	search o Information architecture and master data management
University 4	4 transcribed theme interviews on problems of enterprise architecture adoption (4 representatives); Notes on the enterprise architecture adoption project group meetings; Notes on the enterprise architecture adoption project steering group meetings; Notes on the observations of incidents of enterprise architecture adoption project work; Review of the enterprise architecture deliverables; Notes on 30 small group/stakeholder meetings
University 5	Notes on the small group meeting (2h, 2 representatives) - Meeting agenda - Special theme o Enterprise architecture and lean management
University 6	Notes on the small group meeting (2h 30min, 2 representatives; Combined meeting with representatives of University 6 and Municipality 3) - Meeting agenda
University Consortium 1	Notes on the small group meeting (1h 45min, 3 representatives) - Meeting agenda - Special theme o Challenges of enterprise architecture adoption, planning, development, and management in a consortium environment
University of Applied Sciences 1	Notes on the small group meeting (2h 30min, 5 representatives) - Meeting agenda - Special themes o Organization of the enterprise architecture governance and management structures o Enterprise architecture and strategic development of organizational services o Enterprise architecture and cloud IT services
University of Applied Sciences 2	Notes on the small group meeting (2h 30min, 1 representative) - Meeting agenda - Special themes o Enterprise architecture planning, development, and management in Federation of Universities of Applied Sciences o Enterprise architecture and project portfolio management o Development of the Kartturi enterprise architecture method
University of Applied Sciences 3	Notes on the small group meeting (2h 15min, 3 representatives) - Meeting agenda - Special theme o Experiences and lessons learned on pilot projects on enterprise architecture adoption and development
University of Applied Sciences 4	Notes on the small group meeting (2h 30min, 3 representatives) - Meeting agenda - Special theme o Enterprise architecture and quality management

APPENDIX 3: THE ORIGINAL PRACTITIONER SURVEY QUESTIONNAIRE IN FINNISH

Arvoisa vastaaja!

Kokonaisarkkitehtuuria (KA) käytetään nykyisin kaikkialla maailmassa yritysten ja julkisen hallinnon organisaatioiden kehittämisen tukena. Sen avulla pyritään ohjaamaan tietohallintotoimintoa siten, että koko organisaation toiminta voi kehittyä entistäkin laadukkaammaksi ja tarkoituksenmukaisemmaksi. KA:n hallittu käyttöönotto on tärkeä ja ajankohtainen, mutta usein varsin haasteelliseksi koettu tehtävä. Tämän selvityksen tarkoituksena on koota kokemuksia ja näkemyksiä KA:n käyttöönottovaiheen ongelmista. Tutkimus keskittyy erityisesti valtion virastojen, kuntaorganisaatioiden sekä korkeakoulujen kokonaisarkkitehtuurityöhön. Kyselyn väittämissä esitetään asioita, jotka ovat osoittautuneet haasteellisiksi KA:n käyttöönotossa ja kehittämisessä. Pyydän Sinua arvioimaan, oletko kohdannut kokonaisarkkitehtuurityössä näitä ongelmia sekä puntaroimaan niiden haasteellisuutta KA:n menestyksekkään käyttöönoton kannalta. Vaikka et olisikaan kohdannut kaikkia esitettyjä ongelmia omassa organisaatiossasi, arvioi siitä huolimatta niiden mahdollista haasteellisuutta. Kyselyssä on 28 väittämää ja niihin vastaaminen kestänee noin 10 minuuttia. Kyselyyn voi vastata nimettömänä eikä vastauksia yhdistetä vastaajan organisaatioon. Kysely liittyy Jyväskylän yliopistolla tehtävään tietojärjestelmätieteen väitöstutkimukseeni. Vastaan mielelläni tutkimusta koskeviin kysymyksiin.

Kiitokset ajastasi!

Vastaajan taustatiedot	
Tehtävänimikkeesi / toimenkuvasi	
Edustamasi organisaatio. Valitse sopivin vaihtoehto.	• Valtion virasto, laitos tai liikelaitos • Kuntaorganisaatio • Korkeakoulu • Yksityinen yritys • Muu
Kuinka paljon Sinulla on kokemusta kokonaisarkkitehtuurin parissa työskentelystä? Valitse sopivin vaihtoehto.	• Ei lainkaan kokemusta • Kokemusta alle vuosi • Kokemusta yli vuosi
Millaiseksi arvioit kokonaisarkkitehtuuria koskevan tieto- ja taitotasosi. Valitse sopivin vaihtoehto.	• Heikko • Kohtalainen • Hyvä
Missä vaiheessa kokonaisarkkitehtuurin käyttöönotto on edustamassasi organisaatiossa? Valitse sopivin vaihtoehto.	• Käyttöönottoa ei ole aloitettu • Käyttöönotto on aloitettu • Käyttöönottovaihe on päätetty
1. Käyttöönottoa edeltävä vaihe	
1A. Organisaatio suhtautuu vastahakoisesti uusiin toimintatapoihin ja niiden edellyttämiin muutoksiin.	

1B. Organisaatiossa ei ole riittävää ymmärrystä siitä, mistä kokonaisarkkitehtuurissa on kyse ja mitä sillä tavoitellaan.
1C. Kokonaisarkkitehtuuri kärsii imago-ongelmista esimerkiksi teknisten esitystapojen, työlään käyttöönottovaiheen tai muiden syiden vuoksi.
1D. Erilaisista johtamis- ja kehittämismenetelmistä on ollut liikatarjontaa. Kokonaisarkkitehtuuri tuntuu hukkuvan näiden joukkoon tai ei ole yhteensopiva niiden kanssa.
1E. Organisaatiossa on puutteita kokonaisarkkitehtuurin kehittämisen edellyttämissä taidoissa.
2. Käyttöönoton käynnistäminen
2A. Organisaation johto ei sitoudu kokonaisarkkitehtuurin kehittämiseen riittävässä määrin.
2B. Henkilöstö ei pysty osallistumaan kokonaisarkkitehtuurin kehittämiseen kiireiden tai resurssipulan vuoksi.
2C. Henkilöstö ei halua osallistua kokonaisarkkitehtuurin kehittämiseen muista syistä johtuen.
2D. Kokonaisarkkitehtuurin omistajuuden määritteleminen on ongelmallista.
2E. Kokonaisarkkitehtuurin käyttöönoton toteuttava ryhmä koostuu pääasiassa IT-toiminnon edustajista ja organisaation muiden toimintojen vaikutusmahdollisuudet jäävät puutteellisiksi.
3. Tavoitteiden asettaminen
3A. Kokonaisarkkitehtuurille asetetut tavoitteet ovat vaikeasti ymmärrettäviä ja puutteellisesti perusteltuja.
3B. Kokonaisarkkitehtuurille ei onnistuta asettamaan tavoitteita, joihin koko organisaatio voisi sitoutua.
3C. Kokonaisarkkitehtuurille asetetut tavoitteet ovat liian kunnianhimoisia saavutettaviksi käytössä olevilla resursseilla.
3D. Kokonaisarkkitehtuurille asetetut tavoitteet eivät ratkaise todellisia ongelmia eivätkä siten tuota organisaatiolle todellisia hyötyjä.
3E. Kokonaisarkkitehtuuria koskeva viestintä ja tiedottaminen ei tavoita oikeaa kohdeyleisöä tai ei ole tarkoituksenmukaista.
4. Käyttöönoton toteuttamisen suunnittelu
4A. Kokonaisarkkitehtuurille asetettujen tavoitteiden muuttaminen konkreettisiksi tehtäväksi on vaikeaa.
4B. Kokonaisarkkitehtuurin kehittämiseen liittyvien päätöksenteko-oikeuksien ja -vastuiden osoittaminen on vaikeaa.
4C. Kapean mandaatin vuoksi kokonaisarkkitehtuurilla ei aidosti voida vaikuttaa organisaation toiminnan kehittämiseen.
4D. Kokonaisarkkitehtuurin hallintamallin sovittaminen yhteen organisaation nykyisten käytänteiden kanssa on vaikeaa.
5. Käyttöönoton toteuttaminen
5A. Käytettävä kokonaisarkkitehtuurimenetelmä on joustamaton eikä täysin sovellu organisaation arkkitehtuurin kuvaamiseen.
5B. Kokonaisarkkitehtuurimenetelmä ja kuvaustekniikat keskittyvät liiaksi tietojärjestelmiin ja teknologiaan, eivätkä tarjoa kunnollisia välineitä organisaation muiden toimintojen kuvaamiseksi.
5C. Kokonaisarkkitehtuurityössä luotavat arkkitehtuurikuvaukset eivät tuota organisaatiolle todellisia hyötyjä.
5D. Kokonaisarkkitehtuurin kuvaamista ja kuvaustekniikoita koskevat taidot ovat puutteellisia.
5E. Kokonaisarkkitehtuurin tavoitetilan määrittelemisessä tarvittava tieto on hankalasti saavutettavissa tai sitä ei ole saatavilla.
6. Käyttöönoton arviointi ja päättäminen
6A. Kokonaisarkkitehtuurityön tuottamien konkreettisten hyötyjen arviointi esimerkiksi mittaamalla on vaikeaa.
6B. Kokonaisarkkitehtuurityön vaatimia resursseja joudutaan jatkuvasti perustelemaan ja

tämä on työn hyötyjen hankalan todentamisen vuoksi vaikeaa.
6C. Kokonaisarkkitehtuuria kehitetään määrämittaisina projekteina ja toiminnan vakiinnuttaminen osaksi organisaation jatkuvia toimintoja on vaikeaa.
6D. Organisaatiolla on ylipäätään vaikeuksia kehittää toimintaansa pitkäjänteisesti ja suunnitelmallisesti.