Kristian Hjort-Madsen

Architecting Government

Understanding Enterprise Architecture Adoption in the Public Sector

Doctoral Dissertation

Abstract

This research examines why and how a new approach to IT planning is adopted in the public sector – the use of enterprise architecture (EA). Around the world, EA has been promoted as a key tool for transformation and modernization of government. By following 'best practices' from the private sector, the claim is that the adoption of EA will ensure that IT resources and business processes are planned, leveraged, and coordinated better in government. In four major qualitative case studies in Denmark, the Netherlands, and the United States these promotional claims were investigated by applying an interpretive perspective. Data was collected semi-structured, and grounded theory techniques were used to analyze the data inductively using existing theory only as prior constructs. The theoretical abstractions and generalizations generated in the research process have been published at three peer-reviewed academic conferences (Publication I, III, and V) and in two scientific journals (Publication II and IV). Across these publications, five contributions to research are summarized: First, public organizations will resist the potential for dramatic efficiency gains from introducing new IT planning initiatives such as EA if they fear the loss of resources (budget and personnel). Second, new IT planning initiatives like EA will tend to appear alike across public organizations when adopted in the same national context because of pressure from the 'organizational field' and the need for legitimacy. Third, the adopted focus in EA programs will be shaped by culture, history, and standard practices in individual public agencies and national governments. Fourth, new IT planning initiatives such as EA will constrain the routines of organizational actors, social structures, norms, and values in public organizations. Finally, the EA adoption process in government must be understood as a social production because cultural and structural institutional forces shape new IT planning initiatives just as much as do rational technical and economic forces. The findings alert researchers and practitioners that EA adoption most often will reinforce existing administrative and political arrangements – and will not automatically lead to transformation and modernization of government. The rhetoric of public sector reform driven by EA adoption seems to ignore the social and technical commitments and social patterns that exist in the public sector. To be more than just another fashion fad, future EA programs in the public sector must understand the politics of government and provide a comprehensive and coherent view across business, information, and technology; this is not just to guide the design of IT systems, but to deliver incremental business change supported and enabled by IT.

Acknowledgements

preoccupied me. My brother, Peder, and my parents, Inga and Knud, have supported me all the way – and I owe them everything. Finally, my wife, Mette, is the best first editor, critic, and all-round supporter one could wish for. Without her help and intellectual input, this dissertation work would never have been finished. I am very fortunate to have her by my side. To my daughters, Nikoline and Frederikke, I send all my love.

Copenhagen, March 2009

Kristian Hjort-Madsen

Contents

1. Introduction

The past several decades politicians, government leaders, and information systems researchers have seen information technology (IT) as a catalyst or instrument of administrative reform (Weiner, 1969; Fountain, 2001). Governments in many countries have pioneered the use of IT to automate government services since the 1960s and 1970s; thus, the importance of government IT systems for societal development continues to grow (Andersen and Henriksen, 2006). Modern IT, especially the Internet and web-related technologies, is seen by many governments to be one of the prime enablers for more efficient operations, better quality of service and easy public access to government information and services (Garson, 2004). As governments around the world are now under pressure to come up with new and innovative solutions to challenges related to aging populations, globalization, increasing security concerns, and fiscal sanity, they often turn to IT as the key to rationalization and modernization changes within a wide range of public service delivery systems (Dunleavy et al., 2006).

As core IT systems in the public sector, such as tax systems and welfare benefit systems, increasingly define the public sphere in economic terms, and as more public services to citizens are brought online, governments face increasing challenges in planning, coordinating, and managing the IT resources distributed across different organizational units (Wimmer et al. 2008). IT systems in government have evolved from delivering point solutions in one or two organizations to a complex, interrelated landscape of applications, interfaces and infrastructure that support the cross-cutting organizational processes of government and the service delivery to citizens. Often this growth of information systems and technology has been uncoordinated (as a result of decentralized decision making) and has resulted in information and systems landscapes becoming complex, costly and difficult to manage (Janssen and Cresswell, 2005). Organizations that are unable to plan and coordinate their IT resources face various problems such as high maintenance costs, lack of critical IT skills, incompatible systems (Perkins, 2000), and inability to share data across systems (Hamilton, 1999; Niederman et al., 1991; Segars and Grover, 1996).

To leverage and manage the public IT systems among and within public sector entities, governments around the world are adopting enterprise architecture (EA) programs as their preferred approach (OECD, 2007). Following 'best practices' in the private industry, public sector practitioners (e.g., Doucet et al., 2008), researchers (e.g., Peristeras and Tarabanis, 2000; Pardo et al. 2004), and standards organizations (e.g., Open Group, 2003) have advocated the adoption of EA to ensure that IT resources and business processes are planned, leveraged, and coordinated *better* in government. By extending traditional IT planning approaches (Segars and Grover, 1998, 1999), the EA approach promises to overcome the IT management and coordination challenges *and* work as a transformational modernization tool in government (Peristeras and Tarabanis, 2000; Pardo et al. 2004; Jansssen and Cresswell, 2005; Doucet et al., 2008).

Countries which are normally ranked very high in international benchmarks on e-government maturity[1] (or electronic government), such as Denmark, the Netherlands and the United States, have continuously promoted EA high on their government's reform agendas. Government reforms traditionally seek to bring about dramatic change or transformation in government (Pollitt and Bouckaert, 2004). By promising to break down the 'traditional bureaucracy' and creating a service oriented and interoperable public sector with citizens and businesses at the centre, these countries pursue rationalization and modernization in government through the application of EA for better IT planning (OMB, 2002; Pechtold, 2006; Digital Taskforce, 2007). As such, EA has become part of a reform paradigm in government where IT is perceived to be a central vehicle in administrative reforms and transformation (Doucet et al., 2008).

Paradoxically, despite the growing adoption of EA in governments around the world, studies show that the actual implementation of EA initiatives in government has been disappointing, and it seems that few public organizations have been able to reap the benefits of adopting EA (Pardo et al. 2004; Jansssen and Cresswell, 2005; Weerakkody et al., 2007; Peristeras et al., 2008). The best way to organize IT among and within organizations has been cited as being critical for IT managers since the 1980s (see e.g., Brancheau and Wetherbe 1987; Niederman et al., 1991), and one must therefore reflect on this cleavage between the EA rhetoric and the reality of the shop floor.

There is no doubt that the EA rhetoric of transformation and modernization is appealing to many public sector managers and their politicians. Announcing reforms, criticizing bureaucracy, praising new management techniques, and promising improved services to citizens and business have become popular in government (Pollitt and Bouckaert, 2004). Adopting EA is 'doing something' and it can attract favorable attention to the politicians and bureaucrats who espouse it. However, past experiences with administrative reforms in the public sector suggest two possible paths in which a reform initiative such as EA can be influential (Dunleavy and Hood, 1993): One is the 'incubated' path where reform ideas do not come into full effect until long after their original instruction; the second path has an 'acute/rapid' innovation pattern, in which reform programs peak early and then break up quickly. This research seeks to understand the patterns of EA adoption in government when the new concept is applied to planning, coordinating, and managing IT resources. The question is whether EA can really be a vehicle for administrative reform in government? Does this new approach improve governments' ability to leverage and manage the public IT systems among and within public sector entities in governments? Or are we witnessing just another management trend that will break up quickly?

This research answers a call for more empirical studies of EA adoption in government (Bernard, 2004; Jansssen and Cresswell, 2005; Ross et al. 2006; Weerakkody et al., 2007; Peristeras et al., 2008). Although a large number of commercial EA frameworks and methods do exist, e-government research has just started documenting how public managers find it

---

[1] See for example: Leadership in Customer Service: Delivering on the Promise (Accenture, 2009) or The Global Information Technology Report 2008-2009 (World Economic Forum, 2009).

difficult to translate these 'generic' EA approaches to specific situations, and how these managers can use these architectures to guide their decision-making and system integration (Pardo et al. 2004; Jansssen and Cresswell, 2005; Peristerass et al., 2008). In general, there are few academic publications in the emerging EA field in electronic government. The contributions available (see e.g., Peristeras and Tarabanis, 2000; Pulkkinen and Hirvonen, 2005) tend to focus on building extensions to existing frameworks like the Zachman Framework (Zachman, 1987) – leading to what has been described as a 'method jungle' in other research areas (Jayaratna, 1994).

Based on four extensive case studies in Denmark, the Netherlands and the United States, this research seeks to understand the organizational uptake and continuous use of the new EA approach to IT planning in the public sector. The goal has been to produce a 'paper model' dissertation that improves our understanding of the adoption of an innovation like EA in government – with contributions to practice as well as to research. By providing a rich descriptive understanding of EA as a process innovation shaped by social norms, values, and organizational processes, the research improves our understanding of EA programs' potential not just to guide the design of IT systems, but also to deliver the proclaimed organizational transformation in government organizations supported and enabled by IT. Across the five publications included in this dissertation, the following overarching research question has guided the research: **Why and how is enterprise architecture adopted for IT planning in the public sector?**

The findings in this research indicate that it is just as important to understand the complex organizational cooperation – and conflicts – in public agencies, as it is to understand the new EA phenomenon in itself. History has shown that the organizational use of IT is complicated. For example, studies show that 53 percent of all information technology (IT) projects end up as failures (Edwards, 1999). Already in 1987, Benbaset et al. pointed out that the implementation of IT is about organizational aspects and not technical ones. As this research illustrates, compliance with government guidelines and imitation of 'best practices' to a great extent drives EA adoption in government, while fundamental transformation to the tasks performed in government are only achieved if institutional norms and values promote transformation. IT and the new EA transformation approach remain useful instruments of incremental administrative change, but they are no more likely to bring about administrative reform today than they did two decades ago.

1.1 Research Setting and Engagement

This research was initiated in a public-private partnership between KMD[2], IBM Denmark, and the National IT and Telecom Agency under the Danish Ministry of Science, Technology and Innovation to better understand how EA was adopted and used in the public sector. The

---

[2] KMD is Denmark's largest domestically-owned IT Company. KMD primarily develops and provides IT solutions for the Danish municipalities, but also offers IT solutions to the state and corporate markets.

project was started in February 2004 in collaboration with the IT University of Copenhagen. The research was conducted in four different settings over a five year period:

- *From February 2004 to October 2006* the research project operated in a fashion similar to a traditional industrial PhD program in Denmark: With no teaching obligations at the IT University, half of the time was spent with the National IT and Telecom Agency, IBM Denmark, and KMD doing practical work, while the other half of the time was dedicated to academic research at the IT University of Copenhagen.

- *From September 2005 to January 2006* research was conducted with IBM's Institute for Electronic Government in Washington DC. Three to four days a week were spent with IBM staff at the Institute for Electronic Government, while the remaining time was spent doing field research in 12 Federal agencies in Washington DC.

- *From October 2006 to September* 2008 the research was used to establish an enterprise architecture program in Denmark's national Digital Taskforce in the Ministry of Finance.

- *From October 2008 to March 2009* the dissertation research was evaluated by the academic supervisors and written up in this dissertation summary at the IT University of Copenhagen.

Based on a series of case studies in Denmark, the Netherlands and the United States, the research has resulted in 12 peer-reviewed conference and journal publications over the five years. The research has benefited greatly from the dynamic interchange with practitioners in the sponsoring organizations in this unique research setting.

To date, many of the dissertation publications have been cited by other researchers in the electronic government (e-government) and information systems (IS) research fields (see www.scholar.google.com). Public agencies and national governments have used the frameworks and findings developed (see e.g., Digital Taskforce, 2007); and the case studies in the publications are also being used for educational purposes at Copenhagen Business School and the IT University of Copenhagen.

Throughout the research project, an active involvement in the emerging e-government and EA research fields has been pursued by involving practitioners and researchers alike in the shaping of the research development and production. Presentations at practitioners' conferences and blog posts on a dissertation website (www.EAGov.org) have been used to communicate back and 'test' some of the findings in the research. And by actively engaging with the emerging e-government and EA researcher communities – via reviewing papers for academic journals and conferences, writing scientific papers with other academics, editing a special journal issue on e-government and EA, etc. – networking with other academics has cultivated the understanding of EA adoption in the public sector greatly. In so doing, the rational EA frameworks and methods normally applied by practitioners have, hopefully,

been supplemented by the organizational understanding of EA adoption for IT planning in practice provided by this research.

1.2 Structure of the Dissertation

The dissertation consists of the five peer-reviewed conference and journal publications in the Appendix and this 80 page summary. Chapter 2 summarizes the theoretical background for the research in the IS literature. This is aimed at giving an overview of the theoretical elements that have been used to inspire and shape the research in the five dissertation publications and the conclusions drawn from the case studies in Denmark, the Netherlands, and the United States. In the research process selected theories about e-government and adoption of innovations, as well as the emerging theory about EA and the IS foundation for this new phenomenon, were used to get a preliminary hold of the field of studies – as seed categories (Miles and Huberman, 1994) – prior to the data collection and analysis in the individual case studies. Chapter 3 details the process that led to the overarching research question and the scientific research process. The chapter illuminates the philosophical underpinnings of the research, the interpretive case study approach used, and the data analysis using grounded theory techniques. Chapter 4 provides a short summary of each of the five publications as an introduction to the full publications in the Appendix. This outline is followed by a digest of the contributions to research and practice presented in chapter 5 across the five publications. Here, five contributions to the research community are first presented by answering the overarching research question. The contributions lead to five recommendations to practice in relation to the adoption of EA as a new and innovative information systems planning phenomenon in the public sector. Finally, chapter 6 summarizes the overall contribution of this research, the limitations of the research, and outlines an agenda for future research topics on the issues of EA uptake and use in government.

Figure 1 illustrates the major elements of the dissertation research and the structure of this summary. The arrows from the two major sources of theory (e-government and adoption of innovations; EA and IS planning) illustrate how the existing body of literature was used as prior constructs to get a preliminary hold of the field of study in the research process. The arrows leading back from the contributions summarized to existing theory illustrate how the multiple sources of evidence collected, analyzed, and reported in the research publications were used to generate theoretical abstractions and generalizations that inform the existing literature about why and how EA is adopted for IT planning in the public sector. Parts of the figure are used throughout this summary to keep readers informed about the progression of the text.
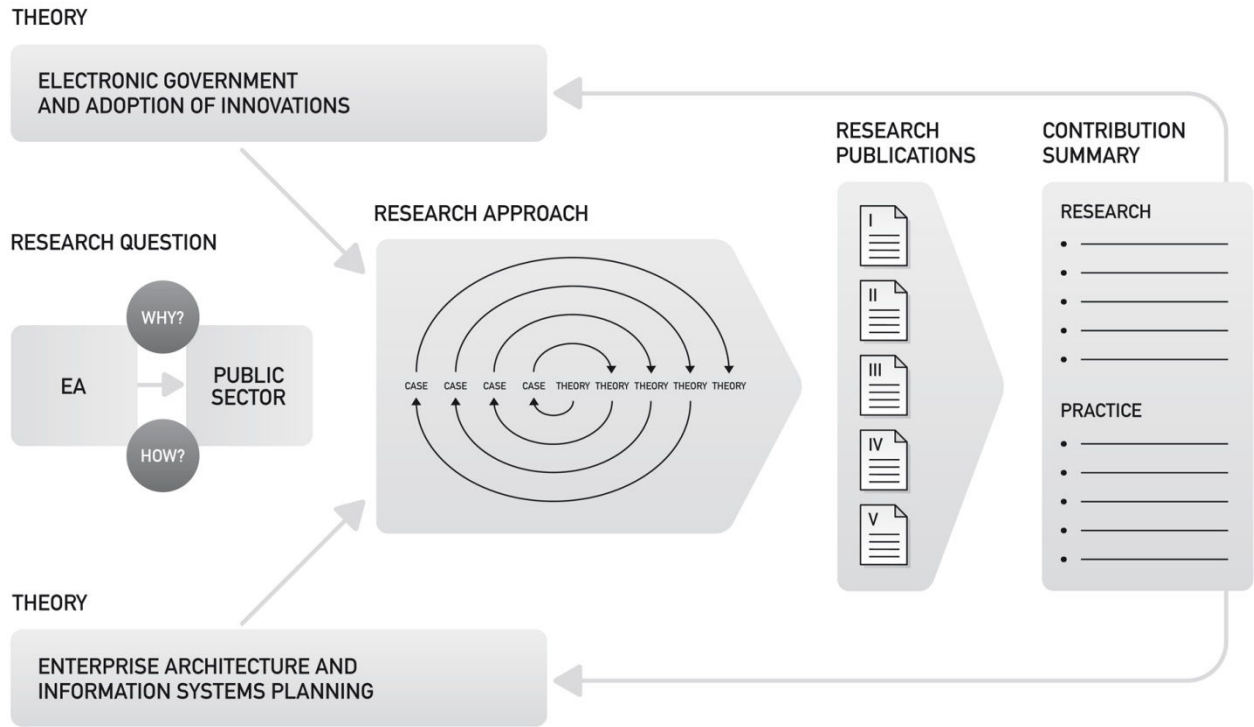
Figure 1: Major research elements

2. Theoretical Point of Departure

"We never think entirely alone: we think in company, in a vast collaboration; we work with the workers of the past and of the present. [In] the whole intellectual world...each one finds in those about him the initiation, help, verification, information, encouragement that he needs. "

(Sertillanges, 1987)

The purpose of this chapter is to explicate and present the theoretical point of departure that has worked as 'seed categories' in the research process to answer the overarching research question. The theoretical contributions discussed here have inspired and shaped the conclusions drawn from the case studies in Denmark, the Netherlands, and the United States and the results presented in the five dissertation publications. The chapter emphasizes the need to consult the existing information systems (IS) literature – using IS also as a reference discipline in its own right (Baskerville and Myers, 2002).

The overview of the research field presented should not be read as a traditional literature review (Webster and Watson, 2002). For each publication included in this dissertation there were independent literature studies performed prior to the publication by searching the Social Sciences Citation Index (Web of Science), the beta version of Google Scholar, and other relevant sources[3]. The short recapitulation presented in this chapter should both embrace and extend the literature outlined in the five publications. However, by highlighting only parts of the literature the overview cannot be seen as a 'complete review.' Thus, a broad historical view of the research field is applied to highlight how elements from the IS discipline have inspired and shaped this research, and documented the gaps in the literature about EA adoption in government that this research contribution has sought to answer.

The chapter is divided into three main parts. Section 2.1 outlines the key contributions in the e-government literature, literature on adoption of innovation theory, and institutional theory with relevance for the study of EA adoption in government. Next, the IS foundation for EA is outlined in section 2.2. Finally, section 2.3 summarizes the chapter and highlights some of the unanswered questions in the theory about EA adoption for IT planning in the public sector.

2.1 Electronic Government and Adoption of Innovations

As noted in the introduction, IT has been viewed as a catalyst or instrument of administrative reform in government for the past several decades (Weiner, 1969;

---

[3] The Internet has been searched to find relevant EA literature published by practitioners. However, the extensive practitioners' oriented research performed for example by the European Commission was not rigorously included.

Reinermann, 1988; Gasco, 2003; Fountain, 2001; Garson, 2004); governments worldwide have embarked on electronic government (e-government) in one form or another (OECD, 2007). The potential of the Internet and web-related technologies to reform the business of government is often inferred from the transformation of business organizations using IT and especially the Internet during and after the dot.com boom (Jorgensen et al., 2003; Brynjolfsson and Hitt, 2003; Dedrick and Kraemer, 2005). However, the adoption of IT in the public sector has lagged behind that of the private sector (Schoeniger, 2000; Scholl, 2005), and what the term 'e-government' means is of considerable debate (Andersen and Henriksen, 2006). There are several definitions of e-government; it sometimes seems as though there are as many definitions of e-government as there are people working with the topic (see e.g., Fountain, 2001; Danziger and Andersen, 2002; Bekkers and Homburg, 2005; Grönlund, 2005; Andersen and Henriksen, 2006). Moon (2002) confirms that e-government "has not been clearly defined and understood."

Today, the terms 'e-governance,' 'online government,' 'digital government,' 'one-stop government,' and 'electronic government' are used frequently as an alternative for e-government (Andersen and Henriksen, 2006). Most contemporary publications on e-government narrowly deal with the Internet and web related 'front-office' technologies (see, for example, Fountain, 2001; Reddick, 2004; Grönlund and Horan, 2005). However, in this research Heeks' (2006) broad definition of e-government is used to include "all use of information technology in the public sector." In the empirical investigations all forms of IT in public organizations were therefore included to understand how and why EA is adopted for improved planning, coordination, and use of all IT systems in the public sector. This broad perspective was applied because large 'back-office' tax systems and welfare benefit systems based on mainframe technology and other legacy applications account for the majority of government IT spending (Dunleavy et. al, 2006), and because the new EA approach to IT planning promises to leverage and manage the entire IT landscape in government – and not just Internet related technologies and services.

In the following three subsections the IS foundation for e-government, the traditional theories of diffusion of innovation, and an institutional understanding of EA adoption in government is presented in brief. The aim is to introduce the theoretical point of departure for this dissertation research and highlight some of the unanswered questions about the uptake and continuous use of EA for IT planning in an e-government context.

2.1.1 Classical and Contemporary E-Government

When including all front and back-office IT systems in this research, it is important first to revisit the IS research on 'computing' in public organizations during the 1960s, 1970s and 1980s (see e.g., Weiner, 1969; Laudon, 1974; King and Kraemer, 1985; Bozeman and Bretschneider, 1986). These early back-office studies of urban information systems, integrated municipal information systems, computer-based models for policy making and geographic information systems demonstrate that historically governments have also

undertaken structural reforms, performance and program budgets, financial reforms, and many other reforms with IT viewed as a central part of these reforms. Laudon's (1974) *Computers and Bureaucratic Reform* was the first major piece of empirical IS research on the political functions and payoffs of automated information systems. Similar to the overarching research question in this dissertation, Laudon asked how the values and relative influence of different organizational interests could affect not only how the technology was implemented, but also which goals the technology served. Laudon's four case studies in the 1970s illustrate that the early promotional claims that automated data systems would provide new solutions and approaches to urban problems were not supported. As noted by Laudon in 1974, IT has the *potential* to bring about administrative reform, but it does not produce reform in itself.

One of the issues that have been reported to impede IT planning in the contemporary e-government literature is reforms that have decentralized IT planning responsibilities (see e.g., Bellamy and Taylor, 1998; Homburg and Bekkers, 2002 or Jansssen and Cresswell, 2005). Since the 1980s, rational choice inspired management reforms – often associated with the New Public Management philosophy (See Hood, 1991; Ferlie et al., 1996) – have been used by many governments to split large bureaucracies into smaller, more fragmented ones, and also to create competition between different public agencies, and between public agencies and private firms (Dunleavy et. al, 2006). As a result, there is often a lack of central management, and individual programs are funded without regard to the overall enterprise planning perspective (Homburg and Bekkers, 2002). Many policy processes are fragmented over several administrative agencies in 'silos' that impede the government's ability to offer new, integrated products and services, or to consolidate operations (Tranumüller and Wimmer, 2003). IT systems in government have typically been developed to support a single agency, while little attempt has been made to create technical and organizational interoperability (Klischewski, 2003; Scholl, 2005). Interoperability concerns the exchange of data and the sharing of information and knowledge across IT systems and business processes (Dawes, 1996; Park and Ram, 2004), and many countries are implementing interoperability frameworks (Guijarro, 2004). However, the reality in most governments today is that there is very little reuse of data and functionality, and each organization therefore develops its own specific work routines and IT systems with no consideration for the larger governmental 'enterprise' (Janssen and Cresswell, 2005).

A second challenge facing IT planning initiatives in the public sector is the complex goal structure and the strict legal norms that public agencies must work under when delivering services to business and citizens in a secure and transparency way (Traunmülller and Wimmer, 2003). Debates over where (e.g., at state, regional or local level) public agencies should reside, what they should do, and how they should do it are continuous; the maintenance of political support appears to be a never-ending, time-consuming process (Wilson, 1989). A primary argument put forward in both the classical and contemporary e-government literature is that managing IT in government with different levels of government creates management and interoperability challenges that are unique to the public sector (Bozeman and Bretschneider, 1986; Allen et al., 2001; Traunmülller and

Wimmer, 2003; Hazlett and Hill, 2003). For instance, West (2004) has illustrated that there is rarely a transparent overview of the different e-government initiatives at the Federal (or national) level, and at the regional and local level there is virtually none. Similarly, different areas of government often lack an overall coordination of their specific area, and it is therefore up to the different agencies in the sector to coordinate and communication on a bilateral basis (Bellamy and Taylor, 1994).

The reason why most governments have not introduced – or are just starting to introduce – IT planning initiatives, such as EA that spans different levels and functions of government, seems to be that e-government programs have only just now reached a maturity level where these matters are considered to be important (Stamoulis et. al, 2001; Moon, 2002; Andersen and Henriksen, 2006). The oft quoted e-government maturity model by Layne and Lee (2001) argues that progress on e-government integration is a matter of technological and organizational complexity. Layne and Lee conceptualize the development of e-government as falling into four stages: i) cataloguing ii) transaction iii) vertical integration and iv) horizontal integration. In the *cataloguing stage*, government establishes online presence and makes available downloadable forms. Citizens in the *transaction stage* are able to fill in forms, interact and perform financial transactions with government online. Governmental organization is automated in the last two stages. *Vertical integration* involves automation of a function such as tax processing across multiple governmental levels: local, region and nation. Finally, in the *horizontally integrated stage* the public sector is able to share data across levels and functions of government seamlessly.

The first two stages of Layne and Lee's four-stage adoption model are oriented towards citizens (citizen centric), while the vertical and horizontal integration stages are focused on reforming the structural characteristics of government organization and the civil service (organization centric). National EA programs for IT planning are established by governmental agencies inside and across functions at all levels. Thus, EA implementation requires government to think both vertically and horizontally (Bekkers and Homburg, 2005; Jansssen and Cresswell, 2005). EA is implemented mainly to enhance efficiency in operations and create interoperability, and is therefore identified as an organization centric activity.

One of the issues that have perhaps been investigated the least in the contemporary e-government literature is the vertical and horizontal integration of IT and business processes (Andersen and Henriksen, 2006). Cross-organizational processes can only be created by integrated information systems delivering timely and accurate information, and supporting cross-departmental processes. In practice, systems are often developed within departments without keeping the big picture in mind: capturing the architecture of the whole organization (Janssen and cresswell, 2005). Focusing on the integration of different levels (vertically) and functions (horizontally) of government, the contemporary e-government research views modern IT, and especially Internet and web technologies in the later stages of Layne and Lee's model, as enhancing the access, transparency, efficiency, and quality of public administration (Fountain, 2001; Heeks, 2001; Gasco, 2003; Bekkers and Homburg,

2007). Contrary to the findings by Kraemer and other IS researchers in the 1970s and 1980s, the contemporary rhetoric is optimistic about the potential of IT to drive administrative reform. According to Fountain (2001), IT could help pave the way to new and better government since they may be used to restructure existing institutional arrangements and to ensure that these innovations flourish. This new and better government is seen to be (1) more responsive to the needs of citizens and enterprises, (2) more democratic, and (3) more efficient (Bekkers and Homburg, 2005).

Traunmüller and Wimmer (2003) have noted that the 'huge potential' of e-government is not exploited to its fullest because of a lack of focus on business and IT integration. Current process developments reflect local needs and do not pay equal attention to the two sides of government activity, namely, the customers' views and the administration's views. Few attempts have been made to reorganize the organizational elements in making information systems work. In line with this observation, Andersen and Henriksen (2006) argue that, rather than focusing on the front-end, the core processes and activities involved are a more prosperous road to follow. Inter-organisational workflows, cross-border process standardisation of public services and process models integrating the external (service oriented) view of customers with the internal (competence oriented) view of public administration are among the requirements to implement integration on the process level (Bekker, 1998; Traunmüller and Wimmer, 2003).

This research has sought to understand how these special characteristics of the public sector affect the adoption of EA in government agencies. The theory outlined above alerts us to the fact that IT has the *potential* to bring about administrative reform. The question is whether the challenges described can be overcome by adopting EA programs as an IT planning innovation.

2.1.2 Adoption of Innovations

The new EA planning phenomenon in government can be considered innovative because it requires a new line of thinking with the definition and organizational tailoring of new IT planning processes (Damanpour and Gopalakrishnan, 2001). The diffusion of innovation tradition (Rogers, 1995) defines an innovation as "an idea, practice, or object that is perceived as new by an individual or other unit of adoption." Rogers (1995) is concerned with examining the adoption[4] of innovations within and among organizations. Hence, since this current research is interested in understanding the adoption of EA as a new IT planning approach in government, it is natural for an IS researcher to investigate the diffusion of innovation theory by Rogers (1995).

---

[4] Adoption is used in this research to mean the 'uptake and continuous use of EA'. Rogers (1995) states that "adoption of an innovation is the process of using an existing idea" (p. 174). Thus, this understanding of the term 'adoption' seems compatible with his understanding.

The adoption of innovations is often slow and unexpectedly painful, and the traditional diffusion of innovation theory (Rogers, 1995) has therefore drawn upon rational theories of organizational life adopted from economics, sociology, and communication theory to predict and explain the rates and patterns of IT innovation adoptions. Rogers' theory on the *innovation decision process* states that diffusion is a process through which an individual (or other decision-making unit) passes, that it occurs over time, and can be seen as having five distinct stages, namely, knowledge, persuasion, decision, implementation, and confirmation. Further, Rogers (1995) prescribes five particular factors that impact the adoption of innovations: relative advantage, compatibility, trialability, observability, and complexity. *Relative advantage* is the degree to which potential adopters see an advantage for adopting the innovation; *compatibility* is the degree to which the innovation fits in with potential adopters' current practices and values; complexity is the degree of ease of use of the innovation; *trialability* is the degree to which potential adopters have the availability of 'testing' before adopting; and *observability* is the degree to which potential adopters are able to see observable results of an innovation.

In the IS discipline the diffusion of innovation theory has been used extensively to produce exhaustive lists of factors influencing IT adoption, and has then been tested in case studies to determine which of these factors are generally influential (Nolan, 1973; Tornatzky and Klein, 1982; Hai, 1998; Gurbaxani and Mendelson, 1990; Premkumar et al., 1994; Cox and Ghoneim, 1996). Typically, these factors are researched through variance research, whereby hypotheses about influential factors in adoption-diffusion are statistically tested through (multiple) case research. Variance models explain the variability of a dependent variable based on its correlation with one or more independent variables (Shaw and Jarvenpaa, 1997).

At the same time, many IS researchers have also criticized this positivistic focus on 'objective' factors in determining the adoption process for missing important facets (Wolfe, 1994; King et al., 1994; Lyytinen and Damsgaard, 2001). The primary criticism is that the factor focus in the diffusion of innovation theory loses out on richness in its simplification of the phenomenon under study. The point made is that 'social reality' cannot be reduced to a small set of discrete variables (such as values, beliefs, stories, norms and rituals) that can be documented and manipulated in an instrumental way (Morgan, 1986). Lyytinen and Damsgaard (2001) argue that innovations like EA do not have to have distinct and measurable features; rather, complex systems have 'interpretive flexibility' with the different significance depending on context and time. Often there is inadequate knowledge or expertise available when a methodology or software tool is adopted to make informed decisions (Pettersen, 1995). And the traditional diffusion research has therefore been critiqued to produce endless lists of factors which are "inconclusive, inconsistent and characterized by low levels of explanation" (Wolfe, 1994).

Newell et al. (2000) purport that the weakness of the diffusion theory by Rogers can be explained if it is recognized that the characteristics of innovations are not, as assumed by traditional models, given and permanent, but rather that they are perceived and therefore

influenced by cognitive, social and political processes. When, for example, Rogers (1995) defines an organization as "a stable system of individuals who work together to achieve goals through a hierarchy of ranks and a division of labor," the relevance of power in its different dimensions and various embodiments (Bjørn-Andersen and Pedersen, 1980; Markus, 1983), the institutional arrangements, context and technologic and economic constraints reshape the diffusion space in which the innovation is diffused (Lyytinen and Damsgaard 2001), as well as the attributes of the innovation in themselves (Newell et al., 2000) being undervalued.

Finally, Clark and Newell (1993) highlight that meso- and macro-level factors need to be taken into account in understanding the diffusion and adoption process, as well as the micro intra-organizational level factors. Damsgaard and Lyytinen (1997) state that the micro-level of analysis "cannot account for differences in diffusion patterns due to variances in environmental and institutional factors" (p. 43). Research on the innovation diffusion process needs, therefore, to emphasize the context-dependent nature of the innovation process. This context dependency is related to the highly social nature of the innovation process.

To address and overcome the shortcomings in the diffusion of innovation tradition, this research has applied a neoinstitutional perspective to understand why and how EA is adopted as an IT planning innovation in the public sector.

2.1.3 Adoption in an Institutional Context

A neoinstitutional perspective offers an alternative view when we want to understand why and how, in a certain context, specific characteristics seem to influence the uptake and continuous use of EA in a particular way. Moreover, the neoinstitutional theory acknowledges to a larger extent that cause-and-effect paths can deviate from the expected route. As many researchers have shown (including this research), organizational changes due to newly introduced concepts in organizations often are emergent and unanticipated. The adoption of these concepts is neither intended nor deliberate (e.g., Orlikowski 1996), stages overlap and they are iterated, surpassed and frequently change in order (Newell et al., 2000).

Using Baskerville and Pries-Heje's (2001) categorization of three innovation diffusion models, the neoinstitutional lens applied in this research can be characterized as 'emergent' since the EA planning innovation is seen to be influenced by unpredictable and inevitable setbacks and surprises, arising out of the organizational and social context. Taking this view, innovation diffusion is an unstructured and emergent phenomenon that is too multivariate and convoluted for modeling in steps and stages which, for example, Layne and Lee (2001) and Rogers (1995) indicate in the e-government literature. Outcomes evaluation and histories of events are 'reframed,' contemporaneously joined together or partitioned in

order to rationalize 'the messy and complex progression of ideas observed in the innovation cases' (Schroeder et al., 1989).

In the IS literature there are few researchers who have recognized the contribution of the 'new' institutional theory (Kling and Iacono, 1989; King et al. 1994; Barrett and Walsham, 1999; Fountain, 2001; Crowston and Myers, 2004; Henriksen and Damsgaard, 2007). However, the organizational institutional theory (or neoinstitutional theory) answers the call for a new understanding of IT innovation adoption by emphasizing the critical question of meaning as a vital force in the evolving tradition of action explanation (DiMaggio and Powell, 1983), and through the research process this perspective has thus inspired and shaped this current research. As Alvarez and Urla (2002) has noted, the adoption decision is often influenced by other IS users, and introspective research in the field of management has suggested that management research and practice is characterized by fads and fashions (Abrahamson 1991; Abrahamson 1996; Abrahamson and Fairchild 1999; Miller and Hartwichk, 2002).

Contemporary neoinstitutionalism in organizational studies (see e.g., Dobbin, 1994) argues that social action is powerfully shaped by the social context, and that adoption is not always intentional or rational. The social 'reality' in which individuals, groups, and organizations function is viewed as a highly plastic construct that simultaneously enforces behavior on many dimensions while being altered to accept previously disallowed behaviors on many others. For instance, Zucker (1983) postulates that stability and resistance in organizations rest on beliefs which are developed and maintained across generations of organizational actors resisting change. Similarly, DiMaggio and Powell (1983) account for the homogeneity of organizational structures and practices by pointing to coercive, normative, and mimetic processes that drive organizations to adopt culturally legitimate norms and routines – resisting changes that are not aligned with these.

Institutional influences both enable and constrain reform and transformation. Neoinstitutionalists view organizations not as passive pawns that can be changed by new management paradigms, but as active players capable of responding strategically and innovatively to new changes in their environment (Oliver, 1991). As Selznick (1996) points out, interrelated norms and social relations form a context within which choice and problem-solving take place. Thus, unlike the positivistic focus on 'objective' factors, neoinstitutionalism sees the evolution of organizational form as haphazard, rather than as a linear progression toward increasingly efficient practices (Dobbin, 1994).

A central neoinstitutional concept used in this research is the 'organizational field.' DiMaggio and Powell (1983) define an organizational field as "those organizations that, in the aggregate, constitute a recognized area of institutional life; key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services and products" (p. 143). Others have similar definitions of the field and the forces that can transform the social 'reality' in a field where innovations are adopted (Powell, 1991; Scott et al., 2000; Dacin et al., 2002). Among these, three factors are dominant in the literature (Mazza and Pedersen, 2004): The first factor is boundary rearrangements, through

which new regulatory and legal frameworks are introduced that can reduce the relevance of existing norms, put at stake the existing power-dependence relations (Pfeffeer and Salancik, 1978), and question the legitimacy of institutions (Meyer and Rowan, 1977). Instructions will thus change to keep an active role in the environment. The second change factor is Fligstein's (1991) conceptualization of external shocks provided by macrocosmic conditions in which the state or other organizations powerfully shape dynamics among actors and the direction of the change. The third factor emphasized in the neoinstitutional theory is the concept of ineffective isomorphism, where pressures from existing institutions do not seem to be relevant and changes are more likely to occur at the organizational level (Scott et al., 2000).

Finally, the understanding of organizational isomorphism in neoinstitutional theory has played a central role in this research. DiMaggio and Powell (1991) show that organizations in the same organizational field adopt the same structures and ways of working in order to survive as a constraining process that forces one unit in a population to resemble other units facing the same set of organizational conditions. Imitation occurs through three mechanisms (DiMaggio and Powell, 1991): Coercive isomorphism implies that other powerful organizations demand adoption of an innovation either through regulation or by means of financial support. Mimetic isomorphism is a way to deal with uncertainty, i.e., a loss of legitimacy, by imitating what other organizations that are perceived as being successful have done. Normative isomorphism is the result of professionalizing. Normative isomorphism results from the training, or socialization of managers, the interactions between members of professions and the hiring of external consultants. Consequently, as more and more organizations adopt an IT planning innovation – either through coercion or imitation – they become a legitimate mode of operation for single organizations.

These insights from the neoinstitutional theory have been used as a theoretical point of departure in the research process of this study to understand why and how EA was adopted in the Netherlands, Denmark, and the United States Federal government. Some of the unanswered questions are related to the influence of national government policies on the uptake and continuous use of EA in individual agencies, the influence of private sector experiences, and EAs potential to be a catalyst for administrative reform in government. Before these questions are answered in this summary, the following sections outline the EA innovation in itself – and the IS foundation that it is based upon.

2.2 Enterprise Architecture in Information Systems

In seeking to understand EA as an IT planning innovation in the public sector, it is important to be aware of the theoretical IS roots of this emerging phenomenon, as well as the problems that it is trying to solve. The challenges of planning and managing IT in organizations are not new, and it is not only in government that we deal with these challenges. The best way to organize IT within an organization has been cited as being critical for IT executives since the 1980s (see e.g., Brancheau and Wetherbe 1987, Niederman et al., 1991). The real challenge

seems to be why and how to adopt and implement a stable approach that is aligned with the institutional forces in organizations as described above.

With new technologies, new interoperability and integration challenges, and new ways to use IT in organizational activities, the area of IT planning and management has undergone a minor revolution during the last few years (McNurlin and Sprague, 2002). The new approaches are often associated with IT Governance (Sambamurthy and Zmud, 1999; Weill and Ross, 2004), Information Management (Robson, 1997; McNurlin and Sprague, 2002), or EA planning, development and management (Bernard, 2004; Doucet et al., 2008). The EA phenomenon studied here claims to offer a broad and 'unifying approach' to the management and planning of IT in organizations by balancing out the corporate IT investments, services and maintenance expenditure (Ross et al., 2006). While IT Governance and Information Management take the viewpoint of the IT department and CIO in an organization, the EA approach aims to embrace the planning and management of all IT assets and their architecture together with organizational structures and processes (Richardson et al., 1990; Spewak, 1992; Ross, 2003; Bernard, 2004; Ross et al., 2006; Doucet et al., 2008).

Enterprise architecture is a broad discipline that includes a large number of sub-architectural disciplines, such as data architecture, security architecture, network architecture and process architecture, as well as independent disciplines like portfolio analysis methods and methods for systems and technology architecture modelling (Armour et al., 1999). As such, EA has been described as a 'meta-discipline' that embraces ideas from many other disciplines (Bernard, 2004). The first book that used the term 'enterprise architecture' was published in 1992 by Spewak (1992) and since then the book market has been flooded with new books about the phenomena (see e.g., Schekkerman, 2008; Blokdijk, 2008; Minoli, 2008).

According to Raphael Malveau (2004), the term 'enterprise architecture' (EA) was first used in government by the US Federal government in 1999 when the Federal Enterprise Architecture Framework was published in 1999. This EA framework for government – as well as most current frameworks – is derived from the Framework for Information Systems Architecture first developed in 1987 by John Zachman (1987) and later extended by in Sowa and Zachman (1992). Contemporary EA frameworks and methods are adopted to provide a high-level, top-down view of an organization that is understood by everyone in an organization, from the business-level down to the IT level (Ross, 2003; Bernard, 2004; Ross et al., 2006; Boh and Yellin, 2006; Doucet et al., 2008). Often framed as a transformational organization tool, EA frameworks and methods seek to document (or blueprint) the current state of an organization's business and IT mission and capabilities to develop a transitional plan for implementing new technologies in response to the changing mission needs (Kaisler et al, 2005; Rohleff, 2005).

While the new EA approach claims to strengthen our IT planning capabilities, the contemporary EA literature also tends to ignore what we know about IT planning and management in the IS literature (see for example Ross et al, 2006 and Doucet et al.. 2008).

Studying the ever increasing writings about EA usage, modelling and design principles since 1999, Ross (2003) and others have interestingly recorded that a universally accepted definition of EA does not exist, neither in the research community, nor the industry. In a recently published textbook, Scott Bernard[5] (2004: p. 31) broadly defines EA as "the analysis and documentation of an enterprise in its current and future state from an integrated strategy, business and technology perspective." Across a range of contemporary EA frameworks and methods, the following objectives can be identified (Armour et al., 1999; Boar, 1999; Carbone, 2004; Open Group, 2003; Lankhorst, 2005; Rohleff, 2005; Ross et al., 2006; Boh and Yellin, 2006; Doucet et al., 2008):

- *Strategy and business orientation:* enabling, leverage of IT, new business models.

- *Planning:* target oriented, steering of IT programs with strong impact and securing compliance to corporate standards.

- *Synergies:* the IT landscape developed and implemented in a systematic manner and utilizing synergies.

- *Adaptability:* dynamic development of market, business, and technology, provide for scalability and growth.

- *Transparency:* complexity and dependencies of architecture building blocks.

- *Communication between business and IT community:* heterogeneous composition of people involved (from management to IT experts).

As the broad scope of the most used EA frameworks and methods illustrate, the EA field is dominated by consultants that see EA as the 'silver bullet' for the integration, aligning, planning, and management of business and IT in organizations. Commercial practitioners have largely developed the EA frameworks and methods that are used in the public and private sector (Pulkkinen and Hirvonen, 2005), and companies such as Cutter Consortium, Meta Group, CBDI Forum, and Gartner Group publish reports with titles such as *"Enterprise Architecture: A Blueprint for Success"* (Gartner, 2003).

As indicated in the introduction, studies show that the actual implementation of EA initiatives in government has been disappointing, and it seems that few public organizations have been able to reap the benefits of adopting EA (Pardo et al. 2004; Jansssen and Cresswell, 2005; Weerakkody et al., 2007; Peristeras et al., 2008). Although a large number of commercial EA frameworks and methods exist, e-government research has just started documenting how public managers find it difficult to translate these 'generic' EA approaches to specific situations and then to use these architectures to guide their decision-making and

---

[5] Scott Bernard claims that his book is the first textbook on the subject of EA for graduate and undergraduate levels of study (Bernard, 2004, p. 13).

system integration. In general, there are few academic publications in the emerging EA field in electronic government. The contributions available (see e.g., Peristeras and Tarabanis, 2000; Pulkkinen and Hirvonen, 2005) tend to focus on building extensions to existing frameworks such as the Zachman Framework (Zachman, 1989; Zowa and Zachman, 1992), leading to what has been described as a 'method jungle' in other research areas, as "an unorganized collection of methods more or less similar to each other" (Jayaratna, 1994).

The following subsection investigates the history and current status of the EA research field with emphasis on the IS foundation. Hereafter, section 2.2.2 revisits the basic concepts in the EA frameworks and methods with relevance to this study of EA adoption as an IT planning innovation in the public sector.

2.2.1 The IS Planning Heritage

Enterprise architecture originates from a tradition based on engineering and scientific management principles (Fayol, 1919[6]) that emphasized preplanned and well-defined procedures. Looking back at the history of information systems development and management of information systems, three general approaches were typically adapted based on the engineering of complex production systems for the construction and aircraft industry (Hirschheim et al. 1995[7]). In short, the first approach is to ignore the complexities of organizational-wide planning, and to treat each system request separately (also called project-oriented systems development). The second approach also has a systems focus, but it is more sophisticated. This approach involves evolutionary systems development and prototyping (see e.g., Hawgood, 1982). The third approach is the planning of information systems understood to mean the global planning of the complete IT application portfolio of an organization (Evernden and Evernden, 2003). According to Hirschheim et al. (1995), the essence of the third approach– similar to definitions of EA outlined above – is not a working system, but an IT architecture that gives priorities and guidelines for planning the current and future IT applications of the organization as a whole.

The idea of the orderly development of individual information systems application by matching them against a global IT architecture has in the past been called information engineering. With roots in IBM's business systems planning approach developed by Dewey Walker in the late 1960s (IBM, 1984), the basic concepts in information engineering were primarily developed in the 1980s by Martin (1983), Finkelstein (1989) and Brancheau et al. (1989). The fundamental idea is to link the information needs of an organization to the principal business functions and components of the organizational structure (Grant et al.

---

[6] Generally, the notion of principles for organizational design is no novelty. With different perspectives on this, we might refer to Fayol's fourteen principles of management (1919), Weber's administrative principles of the bureaucratic organization (1924), or the principles of human resources management advocated by the human relations movement (McGregor 1960, Likert 1965).

[7] Hirschheim et al. (1995) furthermore distinguishes between IS paradigms that are process oriented and data oriented. Bearing in mind the overarching research question, the research focus here is on the processes of establishing EA programs in public agencies. Thus, different approaches to data modelling will not be further discussed.

1992). Information engineering first provided data analysis and database design techniques that could be used by database administrators and systems analysts for developing better database designs and applications (e.g., by applying CASE, Computer-Aided Software Engineering, tools). Later it became a philosophy, including methods, tools and techniques, for describing and analyzing relevant aspects of the organization, and deriving a conceptual architecture upon which the development and implementation of IT could be based (Ibid).

In the context of this research, it has also been important to note that the problem of lack of integration, islands of automation, sub-optimization of resources and the inability to migrate to future technologies is not new in the IS literature. The increasing complexity and size of individual information systems prompted the development of architecture programs considered broader "in scope, in organizational impact, and in process" in the 1980s (Nolan and Mulryan, 1987). The application of information engineering approaches to conceptual architecture development has in the past varied widely, and various approaches have been proposed for describing a map that can serve as an IS architecture where the key components are a model of business functions and their data needs. The most cited person in the IS architecture field - and one of the 'fathers' of modern EA – is John Zachman.

According to Zachman (1987), information systems architecture is a mechanism "for defining and controlling the interfaces and integration of all of the components of the system" (Zachman, 1987). There are different architecture disciplines, such as software architectures, hardware architectures, network architectures and system architectures, that confuse the meaning of 'architecture.' While, for example, software architecture describes the layout of the software modules and the connections and relationships among them, hardware architecture can describe how the hardware components are organized (Armour et al., 1999). The term 'architecture' can therefore have a range of meanings, goals, and abstraction levels, depending on the discipline speaking about it. For Zachman, IS architecture reflected a fundamental need to impose better management structures on system development. He was inspired by the millennial disciplines of classical architecture and the more recent development of the disciplines and methods in information engineering successfully adopted for the creation, design, and production of complex machine systems such as airplanes. In his first publication (Zachman, 1987) he observed that a great deal can be learned by observing how the expert practitioners of large edifices or machines go about their work. The framework that Zachman developed explicitly recognizes the stylized roles played by key actors (e.g., owners and users) in the creation of buildings and aircraft, how they are involved in the related processes, and what their unique informational needs and contributions were (Iyer and Gottlieb, 2004).

With time, it has become more and more evident in the IS literature that creating integration and interoperability in an organization has more facets than just technology (i.e., the large body of literature about adoption and diffusion in the IS discipline). Obviously, having an integrated telephone network is not a sufficient condition for intelligible communication between remote sources, while the introduction of technology for local employee decision making seems pointless in an organizational context where decision making is seen as a

management prerogative. Making technology work thus requires a wider perspective than technology alone, whereby contextual aspects are included in the design perspective, such that the organizational context and technology are optimally matched and integrated. Many failed introductions of IT have proved the importance of this notion (Morton, 1991; Galliers and Baets, 1998).

Strategic IS planning is one of the areas in the IS discipline that has most extensively studied the importance of developing and maintaining an IS architecture in an organizational context (McFarlan, 1984; Earl, 1989; Lederer and Salmela, 1996; Robson 1997; Broadbent and Weill 1997; Segars and Grover, 1998; McKeen and Smith 2002; Ward and Peppard, 2002; Weill et al., 2002). Strategic IS planning focuses on IT business needs and has argued that the information engineering approach is too static. In 1988, Lederer and Sethi published an article in MIS Quarterly where they defined strategic IS planning as "the process of identifying a portfolio of computer-based applications that will assist an organization in executing its business plans and realizing its business goals" (Lederer and Sethi, 1988). Very similar to the definition of EA by Bernard et al. cited above, strategic IS planning involves the selection of applications, from an existing list of possibilities that would best fill the organization's current and future needs. As Lederer and Salmela posit (1996), strategic IS planning might also entail the discovery of new applications with the potential to create an advantage over competitors (Ives and Learmonth, 1984; McFarlan, 1984; Porter, 1985; Porter and Millar, 1985; Boynton and Zmud, 1987).

The strategic IS planning literature emphasizes how numerous companies fail, not for technical reasons related to IS implementation, but rather because they neglect the effects of organizational context on strategic planning (see e.g., Bai and Lee, 2003). A large amount of empirical work has studied the relationship between strategic IS planning and the organizational context. These studies evaluate the effect of strategic IS planning (Premkumar and King, 1994), identify strategic IS planning prescriptions (Lederer and Salmela, 1996) and profiles (Segars and Grover, 1999), identify the implementation predictors of IS plans (Gottshalk, 1999), examine relationships between planning sophistication and IS success, assess the effect of IS maturity, and assess the usefulness of strategic IS planning (Teo and Ang, 2000).

The strategic IS planning theory proposed by Lederer and Salmela (1996) is especially interesting in this context. As the emerging EA literature also strives to incorporate non-technical aspects, the theory proposed predicts how planning resources, internal environments and external environments, as well as the planning process and information plan, influence alignment and implementation. Lederer and Salmela's theory consists of an input-process-output model, seven constructs, six causal relationships and six hypotheses. The model provides the initial base for the theory. The seven constructs are: (i) the external environment, (ii) the internal environment, (iii) planning resources, (iv) the planning process, (v) the strategic information systems plan, (vi) the implementation of the strategic information systems plan, and (vii) the alignment of the strategic information systems plan with the organization's business plan. The seven constructs exhibit causal relationships

among each other demonstrated by hypotheses. One could note that this theory is very closely related to the ideas and methods that new EA literature, presented by Janssen and Cresswell (2005), Rohleff (2005), Bernard (2004), and many others, proposes for the planning, building, implementation and management of information systems – inspired by the positivistic paradigm in engineering and scientific management principles (Fayol, 1919).

Throughout this dissertation research the IS planning heritage has greatly improved the understanding of the uptake and continuous use of EA from an organizational perspective. The uptake and continuous use of EA in government is not only a technical and rational exercise – it must be understood in its organizational context.

2.2.2   Enterprise Architecture in an Information Systems Context

Contrary to what most practitioners – and some academics – seem to presume, the definitions of EA that we see in the emerging literature on the topic should not be seen to be in contrast to current IS development methods and IS traditions such as Information engineering, IS architecture or strategic IS planning. The EA approaches that we see today claim to take the entire 'enterprise' into account (Armour, 1999; Schekkerman, 2004; Bernard, 2004; Ross et al., 2006; Doucet et al., 2008). Authors like Pulkkinen and Hirvonen (2005) emphasize that the early efforts to create EA frameworks and methods stem from times before the current networking technologies were known or widely used, and call attention to the 'fact' that traditional IT planning has been a specific system's plan. However, as the outline above sheds light on, the contemporary EA frameworks and methods are based on a number of methods and techniques developed in the IS field, for example: business process reengineering methods, portfolio analysis methods, architecture evaluation methods, methods for systems and technology architecture modelling as well as various description techniques (Bernard, 2004). Many of these are already acknowledged in the IT planning or strategic planning literature (Earl, 1989; Lederer and Salmela, 1996; Ward and Peppard, 2002; Robson 1997; Segars and Grover, 1998).

The argument made here is that it is wrong to disclaim the entire theoretical IS heritage and to believe that we have found a new 'silver bullet' that will fix our integration and interoperability problems in government tomorrow. The EA literature that we see today is important because it takes a more holistic perspective on the planning of IT than we have previously seen. But, many of the concepts used are based on ideas and concepts developed in the IS discipline – and we need to learn from this solid body of research. Traditional IS development methods and much of the IS literature about information engineering and IS architecture has a technical focus, where the basic idea is about producing a project plan, not choosing the project or, even better, providing the framework in order to choose. This type of planning is practical at the systems level but leads to lost business opportunities and incompatible systems, data stores and architectures. Here, a typical EA encompasses an overview of the entire information systems – including software and hardware. According to Schekkerman (2004), modern EA is a master plan which "acts as a collaboration force"

between aspects of business planning such as goals, visions, strategies and governance principles; aspects of business operations such as business terms, organizational structure, processes and data; aspects of automation such as information systems and databases; and the enabling technological infrastructures of the business such as computers, operating systems and networks.

Therefore, EA should be seen as a meta-discipline with an extensive scope that needs to cover a wide variety of viewpoints, deliverables, and processes across the organization (Bernard, 2004). According to most contemporary EA writings, a fully articulated architecture constitutes enterprise architecture: the integration of business, data, information, and technology into a coherent whole (Spewak, 1992; Bernard; 2004; Ross et al., 2006; Doucet et al., 2008). In Figure 2 below, a conceptual distinction between how a business focus and a technical focus is sought is illustrated by placing the different IS traditions and the new EA phenomenon into a simple two-by-two matrix.
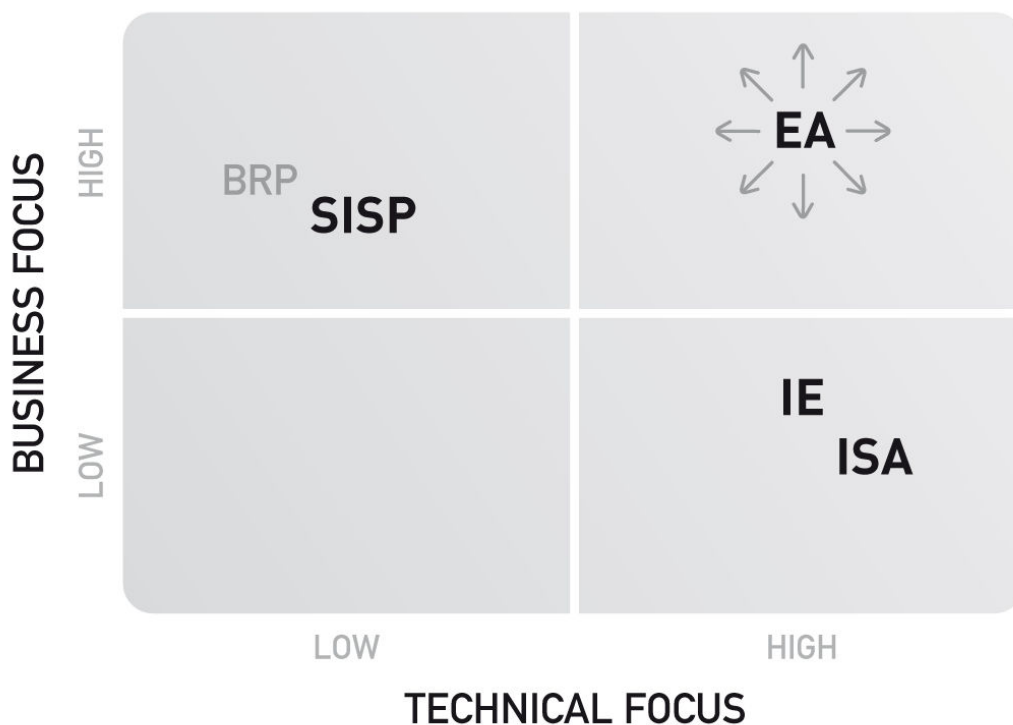
Figure 2: Enterprise Architecture in an IS Context

The Y-axis in Figure 2 represents the business and process focus that is evident in the strategic IS planning (SISP) literature and disciplines such as business process reengineering (BPR). Along this axis IS business needs and the possibility to gain a competitive advantage from implementing IT is considered to be most important, while technical implementation

'details' are less important. The other axis in the matrix, the X-axis, has a technical focus where data standardization and technical IT architectures are considered to be most important in the development and planning of IT. Here we find the data focus in information engineering (IE) and the technically focused IS architectures (ISA) from the IS discipline.

The EA meta-discipline that is perused by many governments around the world today is placed in the upper right corner of Figure 2 because these programs typically claim to have both a high technical focus and a high business focus at the same time – leading to less bureaucracy and a service oriented public sector (OMB, 2002; Pechtold, 2006; Digital Taskforce, 2007). Early EA sponsors, such as Spewak (1992) and Bernard (2004), tend to be more technically focused in their approaches, while contemporary advocates, such as Ross et al. (2006) and Doucet et al. (2008), place most of their focus on business processes and the actual business design through the application of EA.

Regardless of the EA focus favored, this section illustrates that the public sector EA programs that are studied in this research all stand on the shoulders of a solid IS discipline. Whether EA will evolve into a discipline in its own right like the IS discipline, or whether it will be embedded in IS, remains to be seen. As this research has documented, the meta-theoretical scope of current EA approaches leave a lot of room for interpretations when the concept is adopted in government.

2.3 Summary

This overview of the research field illustrates the importance of understanding the uptake and continuous use of EA for IT planning in the public sector from an IS perspective. The e-government field emphasizes the distinct characteristics of managing IT in the public sector and stages of maturity. The theories about adoption illustrate the challenges facing the uptake and continuous use of EA, and the IT planning literature emphasizes how IS researchers in the past have theorized about planning of IT in organizations. EA is not an entirely new approach to IT planning. EA is an emerging phenomenon that needs to establish itself as a discipline in its own right. Many governments and public organizations around the world are adopting EA programs to deal with interoperability issues and the break down of 'traditional bureaucracy' in order to create a service oriented public sector. The IS literature greatly improves our understanding of the research field, and shields us from being blinded by flashy, one-dimensional consultancy reports when we manage and implement EA in government.

The theoretical point of departure presented in this chapter still leaves several questions unanswered. As we will see in the following chapter 3, this research inscribes in an interpretive stream of IS research by seeking to understand the 'real' story about EA adoption in the public sector. Some of these unanswered questions that this research has sought to answer are: How do the special characteristics of the public sector affect the uptake and continuous use of EA in government agencies? Can the private sector

experiences with EA (Ross et al., 2006) really be translated into a less bureaucratic and more service oriented public sector? How do national governments influence the adoption of EA in public agencies, and what role do other organizations and key suppliers in the environment play in the adoption process? What influences the way that EA is adopted (focus, approach, artifacts)? And what does the new EA planning agenda in government mean for the actors, norms, and values in public organizations?

As this research will illustrate, overly rigorous EA frameworks, vague governance structures, inadequate management support, and a complex organizational adoption process in public agencies are some of the largest challenges for EA adoption in the public sector.

3. Research Approach

"I have still to see any problem, however complicated, which, when you look at it the right way did not become still more complicated."

(Paul Anderson)

The research goal and methodology outlined in this chapter illustrate the development of the overarching research question and the interplay between this question, its philosophical underpinnings, and the research process. Within the academic field of information systems (IS) a number of research approaches are legitimate (Lee and Bakserville, 2003). This chapter therefore makes the ontological and epistemological assumptions in this particular research contribution explicit. The aim is to illuminate the research process and demonstrate how the dissertation research was carefully designed and thoroughly planned following an interpretive philosophical research tradition.

The chapter is structured as follows. Section 3.1 describes how the research production developed the overarching research question in three conceptual research phases. Section 3.2 outlines the philosophy and assumptions underlying this research. Finally, section 3.3 details the research process and section 3.4 summarizes the chapter.

3.1 Developing the Overarching Research Question

The overarching research question spanning this research was developed in a reflective and inductive learning process where practical experiences, research findings, and theoretical insight have shaped the understanding of EA in government. A central mission in the work was to conduct research that both advances the scientific IS and e-government disciplines and enlightens practitioners adopting the new EA planning phenomenon in government.

This research followed an objectivist hermeneutic understanding of human understanding (see the philosophical underpinnings in section 3.2), and is therefore concerned with the meaning of the organizations that adopt EA in the public sector – as a text-analogue (Radnitzky, 1970). Following the idea of a hermeneutic circle, the understanding of a complex 'whole' is achieved by iterating between its 'parts' and the 'whole' (Klein and Myers, 1999). Figure 3 illustrates this research approach where the 'whole' is the understanding of EA adoption in government, and the 'parts' are the visual parts in the figure – the data from the case studies outlined in this chapter and the theoretical background outlined in chapter 2. The results of the research process are documented in the five publications that will be outlined in the following chapters.

RESEARCH
PUBLICATIONS

RESEARCH APPROACH

CASE   CASE   CASE   CASE   THEORY THEORY THEORY THEORY THEORY

I

II

III

IV

V
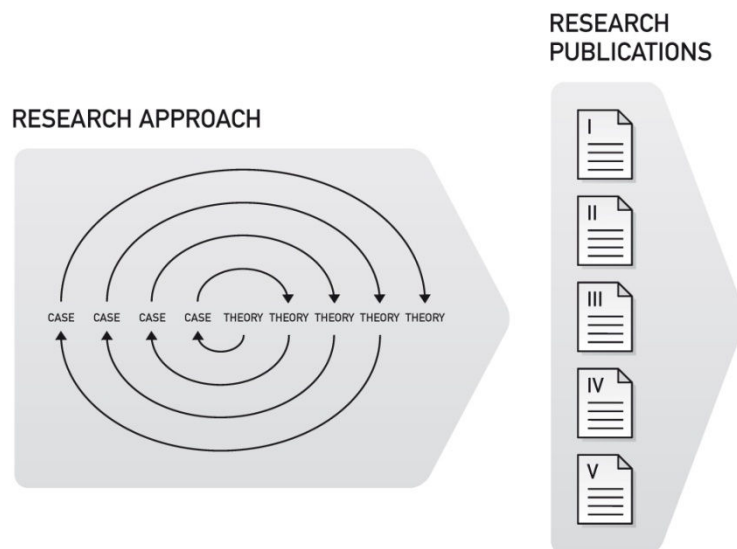
Figure 3: Research approach

As the figure illustrates, the understanding of EA adoption for IT planning in the public sector changed over time, and new perspectives appeared as more data and literature were consumed. The 'whole' changed over time for two reasons: 1) new 'parts' were explained and interpreted, and 2) the perceptions of the 'parts' were changing as the analysis progressed and the interrelationships between the parts became clearer.

Similar to, for instance, Simon's (1960) Intelligence-Design-Choice (IDC) model, the research started with an initial scanning phase where the feasibility of studying EA adoption in government was investigated. This phase identified interesting opportunities for research and called for further investigation. Hereafter, two case studies were conducted at the national macro-level and organizational micro-level to understand the interplay between the national IT planning context in government and the adoption at the organizational level in public agencies. This phase enlightened the understanding of the organizations' adoption process and focused on two case studies in the final phase of the research period.

Case studies	Research focus (time period)	Research approach	Research Objective	Colleagues involved	Resulting publications
1.	Implementation of EA at Denmark's largest university hospital (summer, 2004).	Qualitative case study, interpretive	Explore why the hospital implemented EA, and the challenges faced governing the program at different levels (vertically) and different functions (horizontally) in the Danish health sector	Burkard, J.	Publication II
2.	National EA adoption and use in The Netherlands and Denmark (spring and summer, 2005)	Qualitative case study, interpretive	Develop a framework to analyze national EA programs, and use this framework to explore the EA initiatives in Denmark and the Netherlands	Janssen, M.	Publication III
3.	Implementation of EA in Federal agencies in the United States (fall/winter, 2005 and winter, 2006)	Qualitative case study, interpretive	Analyze why – and under which circumstances – EA adoption improves IT planning and supports administrative transformation in the United States Federal government		Publication IV
4.	Implementation of EA in central government agencies in Denmark (spring and summer, 2008).	Qualitative case study, interpretive	Analyze the formation and adoption of EA in the central government of Denmark	Pries-Heje, J.	Publication V

Table 1: Case studies in the PhD research period

Table 1 provides an overview of the four case studies included in the dissertation. The table outlines the focus area, research approach, research objective, the colleagues involved, and the resulting dissertation publications for each of the case studies. The following three subsections outline the research processes in which these case studies were performed and the overarching research question was coined.

3.1.1 The Initial Feasibility Research Phase

With the given research topic on EA in government, the initial phase in the research was spent scanning the contemporary literature on e-government and EA. The problem investigated at this stage in the research process was how IT systems were to be managed in and across autonomous government agencies – using EA.

At first, a focus on technical interoperability in and across government organizations was inherited from the work in the Danish National IT and Telecom Agency. The bold objective of the young and inexperienced researcher was to "develop an integrated information systems architecture method based on EA that could improve the strategic and practical use of IT in the public sector"[8].

No empirical data was collected in the first research phase. Instead, two conceptual articles were published (Hjort-Madsen, 2004; Hjort-Madsen and Gøtze, 2004). The publications outline the systemic challenges that national governments and public organizations are faced with, and call for a (re)focus on architecture and planning in e-government research – using EA. The primary contribution in this research phase was thus a conceptual framework developed in Hjort-Madsen and Gøtze (2004) for understanding EA in government across different interoperability domains and for making a distinction between three levels of government. The contemporary literature overview suggested that the organizational challenges facing government were much greater than technical interoperability issues of data and technology integration. As a result, this feasibility scanning of the literature led to a change in research focus from technical interoperability issues to a new interest in organizational issues of EA adoption.

In line with much of the 'hype' in the contemporary e-government literature (cf. chapter 2), Hjort-Madsen and Gøtze (2004) promote EA planning and IT implementation as the key drivers for administrative transformation in government. Thus, the first research phase can be seen as a theoretical feasibility-study for the second phase of the research where empirical investigations in Denmark and the Netherlands challenged the 'silver bullet' perspective on EA as an instrument for administrative reform.

3.1.2 The Explorative Research Phase

The theoretical insight gained in the conceptual research phase opened up many avenues for further inquires. Thus, the explorative research phase can be described as a multifaceted learning, thinking, researching, interpreting, writing and explorative phase in the dissertation research that provided a deep understanding about adoption processes and EA as a process innovation shaped by norms, values, and organizational processes.

The aim in this research phase was to produce rich descriptions and explanations of the EA adoption process in their local context. Formally, this aim could pursued both quantitatively via surveys and qualitatively via observations and interviews, and it could be studied both theoretically and empirically through different theoretical perspectives with different research questions. However, when seeking to understand the complexity of human sense-making though the meaning that the people involved in the uptake and continuous use of this new EA phenomenon in government assign to it (Orlikowski and Baroudi, 1991), the research methods to be applied called for a paradigm that could preserve chronological

---

[8] This objective was articulated in the first PhD-study plan submitted to the PhD-board at the IT University of Copenhagen in 2004.

flows, and derive fruitful expiations of EA adoption in the public sector. An interpretive quantitative paradigm was thus selected and used in the entire dissertation research period despite the authors' educational background in the 'harder sciences' of software engineering and survey based political sciences (see section 3.2 and 3.3 for details about the philosophical reasoning and methodological implications hereof).

Based on the theoretical framework developed in Hjort-Madsen and Gøtze (2004), the explorative research phase resulted in two major interpretive case studies in Denmark and the Netherlands. The objective was to explore EA uptake and use in practice at different levels (vertically) and functions (horizontally) of government, and in this process to improve the understanding of the complex systemic challenges facing IT planning innovations such as EA in government.

The first case study concentrated on EA adoption in a public organization that adopted the EA planning innovation as one of the first organizations in Denmark – Copenhagen University Hospital. The results reported in Hjort-Madsen and Burkard (2006) suggested that EA uptake and continuous use was indeed driven by organizational isomorphism. The findings supported the idea that EA in government was adopted because of political and economic drivers at the field level just as much as by technical interoperability challenges at the organizational level. Furthermore, the finding led to a focus on the overall governance setup when introducing new planning approaches – and e-government governance at a national level in general.

The second case study, therefore, investigated EA uptake and use at the national level. Together with Marijn Janssen from the Netherlands, a first version[9] of a framework for comparing national EA programs was developed. The framework and a comparison of EA adoption in Denmark and the Netherlands were published in Janssen and Hjort-Madsen (2007). The analysis found that both countries struggled with implementation issues and that the EA governance setup was unclear. Both country studies confirmed the importance of institutional forces when understanding adoption, and called for a broader understanding of EA adoption in government.

The broad and explorative investigations in the second research phase improved the understanding of IT planning, technology, and adoption in valuable ways. Studying EA uptake and use both in a single public organization (micro-level) and across two national governments (macro-level) contributed to the understanding of EA as an emergent, evolving, embedded, fragmented, and provisional social innovation that is shaped as much by cultural and structural forces in the organizational context in which they are implemented as by rational technical and economic ones.

The insight gained in the explorative research phase helped narrow the research focus in the final research phase where the unifying research question was finally coined.

---

[9] An updated version of this framework and the country comparison is being submitted to a scientific journal.

3.1.3 The Focused Research Phase

The objective in the final research phase was to dive deeper into the understanding of EA as a process innovation – and 'trend' – shaped by norms, values, and organizational processes. The premise developed at the end of the explorative research phase was that the EA innovation and the social context within which they were adopted must be studied together in context if we want to understand why and how IT planning innovations such as EA are adopted in the public sector.

The first major case study in the grounded research phase was carried out in the United States Federal government. Here, 12 major agencies were studied and three adoption patterns were identified. The findings confirmed that the new IT planning approach does not in itself create administrative transformation. Contrary to the hyperbole about public transformation initiatives driven by e-government initiatives and IT planning innovations such as EA, the case study reported in Hjort-Madsen (2007) found the causal direction reversed from EA planning being transformative and prescriptive in its nature to EA planning being reshaped and adopted in step with the institutional forces in public organizations and their macro environment at the field level. Similar results of organizational isomorphism were found in the final focus group based case study in the central government of Denmark. The findings suggest that there are two major streams in public sector EA programs: a stable element of it-architecture and a fashion driven business architecture element – used in parallel, but with different focus, approach and artifacts (Hjort-Madsen and Pries-Heje, 2009).

The conventional, prescriptive EA frameworks and methods suggested by practitioners (cf. chapter 2) were thus further challenged in Hjort-Madsen (2007) and Hjort-Madsen and Pries-Heje (2009). The findings point out how EA is not a clear-cut method that can be adopted by any public organization with similar results. EA implementation must be understood in the organizational context in which it is implemented. Hjort-Madsen and Pries-Heje (2009) conclude that in order to be more than just another fashion fad, EA programs in government must provide a comprehensive and coherent view across business, information, and technology, that is, not just to guide the design of IT systems, but to deliver business change supported and enabled by IT.

Together the four qualitative case studies and the resulting five publications seek to answer the overarching research question introduced in chapter 1: **Why and how is enterprise architecture adopted for IT planning in the public sector?**

This short outline of the research process should illustrate how the conducting and writing up of qualitative research are part of an evolutionary and inductive process. The risk taking in the explorative research phase, as well as the early establishment of the theoretical framework in the initial feasibility research phase, proved valuable in a qualitative research process that is not a predictable or finite event (Meloy, 2002); rather, it is a process that needs time and space to grow and change.

In the following two sections the ontological and epistemological assumptions underlying the interpretive method and the research process are outlined.

3.2 Philosophical Underpinnings

The neoinstitutional understanding of adoption and the interpretive research method selected for this research are part of the interpretive philosophical tradition. The three basic research philosophies applied in IS research are positivist, interpretive, and critical research (Boland 1985; Lee 1991; Orlikowski and Baroudi 1991; Myers, 1997; Walsham 1993). Orlikowski and Baroudi (1991) use three "sets of beliefs" to describe positivistic, interpretive, and critical research. The three sets of beliefs are belief about physical and social reality (*ontology*), belief about knowledge (*epistemology*), and belief about the relationship between *theory and practice*. Although these distinctions are not always so clear cut in the practice of social research (e.g., see Lee, 1989), the philosophical assumptions are important because they frame the goal, the approach, and the assessment of the research. In other words, the basic philosophical assumptions guide what this research tries to achieve, how it tries to achieve it and how the results of this research are assessed.

While critical theory is a contemporary philosophical tradition (Blaiki, 1993), the major philosophical distinction in IS is traditionally made between the positivist and the interpretive traditions (Lee and Baskerville, 2003). The fundamental difference between these two streams is that the interpretive researchers emphasize the importance of subjective meanings, and they do not presume – as positivistic research would do – that organizational structure and social relations are objectively known or unproblematic (Orlikowski and Baroudi, 1991). Interpretive research is distinguished from positivistic and critical research ontologically by rejecting the possibility of describing an objective social world. Instead, the assumption is that the social world is relative and socially constructed. Klein and Myers (1999) propose that IS research can be "classified as interpretive if it is assumed that our knowledge of reality is gained only through social constructions such as language, consciousness, shared meanings, documents, tools, and other artifacts" (p. 69). Thus, the purpose of interpretive research is not to measure and establish relations between social structures independent of human beings, but to understand the meanings that an individual or organization applies to a phenomenon (Lee and Baskerville, 2003).

The contention in this research is that the current EA frameworks and methods proposed by practitioners and academics are too simplistic to explain the complex organizational EA adoption process in the public sector. Consequently, the underlying *ontological* understanding in this research is that the uptake and continuous use of the new EA phenomenon in the public sector cannot be seen as an isolated entity, but as part of a social reality shaped by external and internal institutional forces. Meanings are socially constructed rather than universal 'givens' and are thus contingent on the specific social context within which they are embedded.

In terms of the process of how explanations or knowledge is generated (*epistemology*), qualitative research is broadly characterized by the process of analytical induction, in which the researcher moves from empirical observation to generalization (Myers, 1997). Most qualitative research is naturalistic and holistic in that the focus is generally on studying both the organizational context and the information technology as emergent elements (Lee, 1999). It is also open-ended and flexible in that the research question may be modified as the research progresses, as new data are collected, and new avenues of inquiry are suggested (Lee and Baskerville, 2003). With the aim of producing an in-depth understanding of 'why' and 'how' EA is adopted for IT planning in the public sector, the *epistemological* belief in this research is thus that EA must be understood as a social phenomenon in a given setting that must be understood by producing rich descriptions of the adoption process.

The understanding of *theory* in this research is that prior theoretical knowledge is used to get a preliminary hold of the field of study – as tentative prior constructs (Eisenhardt, 1989) or seed categories (Miles and Huberman, 1994). As noted in chapter 2, the classical and contemporary e-government theory and the theoretical perspectives on adoption have informed this research. Unlike a deductive approach, theory has, however, not been a device used prescriptively for factor classifications in the research, and the case studies have not been approached with prior conceptions in mind. This research generalizes from rich empirical statements to theoretical statements by analyzing multiple sources of evidence. Inspired by the fundamental principle of the hermeneutic circle (Klein and Myers, 1999), the field studies have been shaped by the findings and the theory by iterating between the 'parts' and the 'whole'. In this way, the analysis of the data collected from the various sources indeed reflected and expanded the theoretical grounding of this dissertation by trying to identify important content, context, and process elements of the EA adoption process. This process has been described as a move from "generalizing from empirical statements to theoretical statements" (Lee and Baskerville, 2003).

3.3 Research Process

Grounded in the ontological and epistemological assumptions outlined above, this section outlines in detail the research process *across* the three research phases. The transversal case study research method used is first described, after which the methodology for data collection and analysis are outlined.

3.3.1 Research Method

It should be clear from the outline above that a qualitative research method is not a synonym for 'interpretive.' Qualitative research may or may not be interpretive, depending upon the underlying philosophical assumptions of the researcher (Myers, 1997). A specific qualitative research method (such as the case study method used here) can be positivist, interpretive, or critical, depending on the underlying philosophical position adopted. Thus,

the research method adopted depends on one's philosophical stand and the proposed research question.

Given the research question of aiming to understand 'why' and 'how' EA is adopted for IT planning in government, the research method selected for this research can be described as interpretive qualitative case studies using grounded theory techniques. As noted above, the research goal is to produce small but rich descriptions from a particular context and setting. The goal is not to test hypotheses and establish universal laws of cause and effect. The aim is not to fully discard the 'check lists' of factors that are produced by practitioners and contemporary EA researchers. The contribution to research and practice (as will be elaborated upon in chapter 4 and 5) is to improve our understanding of EA as an emergent, evolving, embedded, fragmented, and provisional social production in the public sector that is shaped as much by cultural and structural forces in the organizational context in which they are implemented as by rational technical and economic ones.

Case study research is the most common qualitative method used in information systems (Orlikowski and Baroudi, 1991; Alavi and Carlson, 1992). Although there are numerous definitions, Yin (1994) defines the scope of a case study as follows:

"A case study is an empirical inquiry that:

- investigates a contemporary phenomenon within its real-life context, especially when

- the boundaries between phenomenon and context are not clearly evident" (Yin 1994, p. 13).

As noted by Myers (1997), case studies are particularly well-suited to IS research since the object of our discipline is the study of information systems in organizations, and "interest has shifted to organizational rather than technical issues."

The primary argument for selecting the interpretive case study research method for this research has been that the adoption of EA in government is a complex process marked by no formal theory of model prediction connections between the variables. As chapter 2 illustrates, there are many possible relations determining the adoption of the broad EA phenomenon at the organizational and field level – a complex story that must be understood if we want to see more successful implementations in the public sector. Using a survey to understand the uptake and continuous use of EA would require a set of predefined factors to be tested - factors that are currently not well established and largely driven by commercial consulting companies (cf. chapter 2). Interpretive qualitative case studies of EA adoption permit analyses that include more variables than are typically possible in reductionist surveys, and analyses where the boundaries of the variables or their relationships are not clear cut and evident (Orlikowski and Barudi, 1991).

Using an interpretive case study method in this research to understand why and how EA is adopted for IT planning in the public sector allows for a deeper understanding of the unit of analysis (Walsham, 1993), enabling an explorative uncovering of nuances and shades in the EA adoption process in public organizations to be exposed in the research. In this way – having affiliation with grounded theory approaches (see how in the following subsections) – the research approach applied in this research allowed for the development of a theoretical account of the general features of the research topic, while simultaneously grounding the accounts in empirical observations and data (Martin and Turner, 1986; Lee and Baskerville, 2003).

Alternative research methods could have been action research or ethnography. While ethnography was dismissed early because of the significant time required in the field (Myers, 1997), action research was appealing in the explorative research phase because of its focus on contributions to practice and the author's unique positioning in the applied EA field. According to Galliers (1991) the line between case studies and action research is very thin, and he positions action research as a subset of case studies. However, Vreede (1995) argues that they are distinct methodologies, action research being participant, prescriptive and intervening with a focus on 'how to,' while case studies are observant, exploratory and explanatory focusing on 'why' and 'how,' Thus, action research seemed less relevant to this research since the overarching research question asked 'why' and 'how' – and not 'how to'[10].

The four case studies included in this dissertation research used different qualitative techniques for collecting empirical data. As noted by Yin (1994) case study research is an umbrella term for a family of research methods that can be used to collect and analyze empirical data having a common focus on a specific phenomenon. The following two subsections outline how the data was first collected and later analyzed inspired by the hermeneutic circle.

3.3.2 Data Selection and Collection

The selection of the four case studies followed *replication logic* to deal with contradictory experimental findings in the field study (Miles and Huberman, 1994; Yin, 1994). The focus on EA in public organizations was intrinsic in the research design. But, as section 3.1 illustrates the development of the overarching research question in the three research phases followed a hermeneutic circle where the next case study was selected based on an iteration between a complex 'whole' understanding of EA adoption in government and the case study 'parts'[11]. By using replication logic, it is possible to generalize beyond the

---

[10] As noted in the introduction, 'how to' prescriptions for IS managers and enterprise architects have, however, been published on a dissertation blog since January 2005 (see www.eagov.org). With over 200 blog entries over four years the dissertation research findings have been lively commented upon and valuable international input has enriched the research contribution.

[11] This data collection approach is also referred to as *theoretical sampling* (Glaser and Strauss, 1967). Here, the researcher's goal is not the representative capture of all possible variations, but to gain a deeper understanding of analyzed cases and facilitate the development of analytic frame and concepts used in the research.

individual cases, even when they do not have random samples (Miles and Huberman, 1994). Constantly seeking a deeper understanding of why and how EA is adopted in the public sector, the evolutionary use of case studies in this research helped improve the validity and reliability of the contributions to research and practice across the five individual scientific publications (cf. the contributions summarized in chapter 4).

The selection of Copenhagen University Hospital for the first case study can be characterized as *opportunistic sampling* (Miles and Huberman, 1994). As described above, the university hospital was one of the first public organizations in Denmark to follow the recommendations in the EA white paper published by the Danish Ministry of Science, Technology and Innovation, and the setting thus allowed a first-hand understanding of EA adoption processes. This understanding led to the need for a national inquiry, and the second case study therefore used *purposive sampling* (Ritchie et al, 2003). The criteria of having a serious national EA program and some implementation experiences were essential, and the Netherlands and Denmark were thus chosen for the second case study. Upon uncovering the interesting findings from the first two case studies, *reputational sampling* (Miles and Huberman, 1994) was used when EA adoption in the United States Federal government was selected as the unit of analysis. As noted above, the United States Federal government was the first national government to adopt EA, and this setting thus provided valuable insights into the adoption of EA in a mature and Anglo-Saxon context. Returning to Denmark in the fourth and final case study, *literal replication* (Yin, 1994) was used to predict similar results and/or contradictory findings in the countries and cases studied.

The individuals interviewed were selected on the basis of willingness to participate and on the basis of their prior involvement in and experience with the uptake and use of EA in public sector organizations. The recruitment was fairly uncomplicated in Denmark and the Netherlands because of the researcher's well established networks and unique positioning in these countries (cf. section 1.1). In contrast, gaining access to CIOs and chief architects in Washington DC was a challenge. Via the Federal government's official CIO Council and the network of the chef architect in the Office of Management and Budget, the CIOs and chief architects were eventually encouraged to participate, on the condition that the preliminary findings in the twelve organizations had to be presented in the Architecture and Infrastructure Committee under the CIO Council.

As noted by Miles and Huberman (1994), qualitative data collection can take many forms ranging from moving pictures to written data sources such as published and unpublished documents, reports, memos, email messages, newspaper articles, and so forth. Based on the interpretive case study research method, this research primarily uses individual interviews, focus group interviews and documentary materials. Table 2 provides an overview of the types of primary and secondary qualitative data used in the four dissertation case studies.

Case studies	Data sources	Explanation
1.	11 interviews	Formal semi-structured interviews with practitioners
	3 Meeting notes	Informal notes from discussions about EA
	1 EA documentation review	Examination of relevant documents and presentations produced by practitioners
	3 Participatory observation	Taking part in action where problems were discussed or results from EA initiatives were used
	1 Newspaper review	Examination of relevant news coverage
2.	18 Interviews	Formal semi-structured interviews with practitioners
	2 EA documentation review	Examination of relevant documents and presentations produced by practitioners
	2 Internet website review	Examination of relevant Internet websites
	2 Newspaper review	Examination of relevant news coverage
3.	21 Interviews	Formal semi-structured interviews with practitioners
	1 Meeting notes	Informal notes from discussions about EA
	12 EA documentation review	Examination of relevant documents and presentations produced by practitioners
	12 Internet website reviews	Examination of relevant Internet websites
	1 Newspaper review	Examination of relevant news coverage
4.	2 focus group interviews	Formal focus group interviews with practitioners
	2 Interviews	Formal semi-structured interviews with practitioners
	1 EA documentation review	Examination of relevant documents and presentations produced by practitioners
	1 Internet website review	Examination of relevant Internet websites
	1 Newspaper review	Examination of relevant news coverage

Table 2: Data sources in the four case studies included in the dissertation research

The 52 individual interviews and the two focus group interviews were all tape-recorded and completely transcribed. The length of the interviews varied from half an hour (executive interviews) to two hours (focus group interviews). This extensive interview documentation was supplemented with meeting notes and participatory observation in situations where it was not allowed to tape-record. Furthermore, all case studies included a review of relevant documents and presentations available, and examinations of relevant news coverage and Internet websites where such were available. In this way, it was possible to triangulate sources of evidence and methods for data collection (Yin, 1994).

In line with the selected case study research method, the collection of data for the four case studies was performed inductively. A theory-based analytical framework was used in all the publications as tentative prior constructs (Eisenhardt, 1989) or seed categories (Miles and Huberman, 1994). But, the data collection was inspired by grounded-theory techniques

(Strauss and Corbin, 1998; Dyer and Wilkins, 1991) where the analysis takes off from the empirical material (inductive) and not from pre-defined hypotheses (deductive). As such, the prior constructs from theory was used only initially to shape the design of the data collection and analysis in the individual case studies, while the theoretical understanding was developed and used in the hermeneutic process across and beyond the case studies.

In practice, the ideal that inductive theory building research should have no theory under consideration and no hypotheses to test (Eisenhardt, 1989) is impossible to achieve because researchers always have some pre-theoretical understanding of the phenomenon under study (Charmaz, 2000). As noted above, the researchers' presuppositions, as well as the prior constructs from theory (Cf. chapter 3), affect the gathering of the data, and the questions posed to respondents largely determine what is to be uncovered (Myers, 1997). The approach to the data collection followed here can thus be described as an attempt to reflect and expand the analytical framework applied as a prior construct inductively in trying to identify important content, context, and process elements grounded in the EA planning adoption process in the case studies.

Following this approach, the 52 interviews used a semi-structured interview guide (Kvale, 1996). The focus on EA uptake and use in government was predetermined, and the prior constructs influenced the questions. But, the use of semi-structure interviews also allows the respondents to explain the EA adoption process in rich detail, preserving chronological flows and fruitful expiations in their own words while still keeping some structure. The questions asked were open in order to allow the subjects to bring up issues important to them. The approach during the interviews was to ask initial questions and then try to pick up interesting remarks and examine these further to deepen the understanding for EA adoption in practice. Table 3 illustrates the interview themes in the semi-structured interview guide used in the second dissertation case study conducted in Denmark and the Netherlands. The individual interview questions are not included in this illustration.

No.	Interview themes
1.	Agency and Interviewee background
2.	Definition of EA and drivers for EA
3.	Organizational setup - Policies - Actors - Structures
4.	Governance setup
5.	EA frameworks, methods, principles, and standards used
6.	Traditional IS planning problems and EA Leadership issues Implementation issues Resource issues
7.	EA in government specifically
8.	The future of EA in government

Table 3: Illustration of semi-structured interview guide used for the second dissertation case study (specific questions are not included)

The interview themes in the interview guides were adjusted during the data collection as the theoretical understanding evolved – applying the principles of the hermeneutic circle (Klein and Myers, 1999). Conference publications, books, and journal articles were studied, and each case study provided new understanding. For instance, the understanding of national governments' influence on the adoption of EA in public agencies was greatly improved after the second case study in the Netherlands and Denmark. This understanding was built into the interview guide used in the case studies in the United States and Denmark. In grounded theory this kind of adaptation is called 'theoretical sensitivity,' and for theory-building research this is considered legitimate since "investigators are trying to understand each case individually and in as much depth as feasible" (Eisenhardt, 1989). Thus, following Eisenhardt, new data collection opportunities or new insight in the research process was used to improve the semi-structured interview guides and the data collection approach to better ground the theory or to provide new theoretical insight.

In the fourth and final case study two focus groups were used to collect data. This approach was selected to better understand the technical and organizational complexities in the EA adoption process which defy the reduction of the study problem to a few variables. Focus groups are a qualitative research method where the group of people in focus is asked about their attitude towards an idea, a concept or a product (Fern, 2001). This interaction between participants often leads to rich data and high data quality (Krueger and Casey, 2000); in the current research the approach proved to be enormously valuable to the understanding of EA uptake and continuous use in Denmark's central government.

In practice, applying the hermeneutic perspective – the distinction made here between data collection and the data analysis - is not always clear (Myers, 1997). In the following subsection the data analysis process is described with this interdependency in mind.

3.3.3 Data Analysis

All four case studies were analyzed using grounded theory techniques (Strauss and Corbin, 1998; Eisenhardt, 1989) to understand the contextual and processual elements associated with the adoption of EA for IT planning in the public sector. In line with the selected research method and the interpretive philosophical tradition, grounded theory is based on the constant comparison method (Glaser and Staruss, 1967), which promotes inductive theory creation from different types of data. The sequential steps prescribed by grounded theory were not followed rigorously in all four case studies[12]. The following three sections illustrate how the different techniques guided the data analysis *across* the four case studies. Examples and reflections from the case studies are included to illustrate the application of the techniques in practice.

Open coding

The first step in the data analysis process was open coding (Strauss and Corbin, 1990). Iterating between the seed categories (Miles and Huberman, 1994) and the text (interviews, documents, news coverage, Internet websites, etc.), the researcher's aim was first to identify, name, categorize and describe the phenomena found in the empirical material. Each interview was initially approached as a standalone entity representing the respondent's subjective perception of the EA adoption process. Later in this process write-ups and coded data were printed, and coloured highlighters and pens were used to deconstruct coded data reports again. The printing made it possible to identify gaps, investigate themes, and cross-check whole files where these gaps or exciting themes were found.

Figure 4 illustrates how ATLAS.ti was used as a workbench during the early coding stages in the third dissertation case study.

---

[12] Some generalization is made here to illustrate the analytical process across the four case studies. For instance a thematic network approach (Attride-Stirling, 2001) was used to capture basic themes – similar to the analytical level codes used by Strauss and Corbin (1998) – in the first dissertation case study manually, using only coloured highlighters, pens, and scissors.
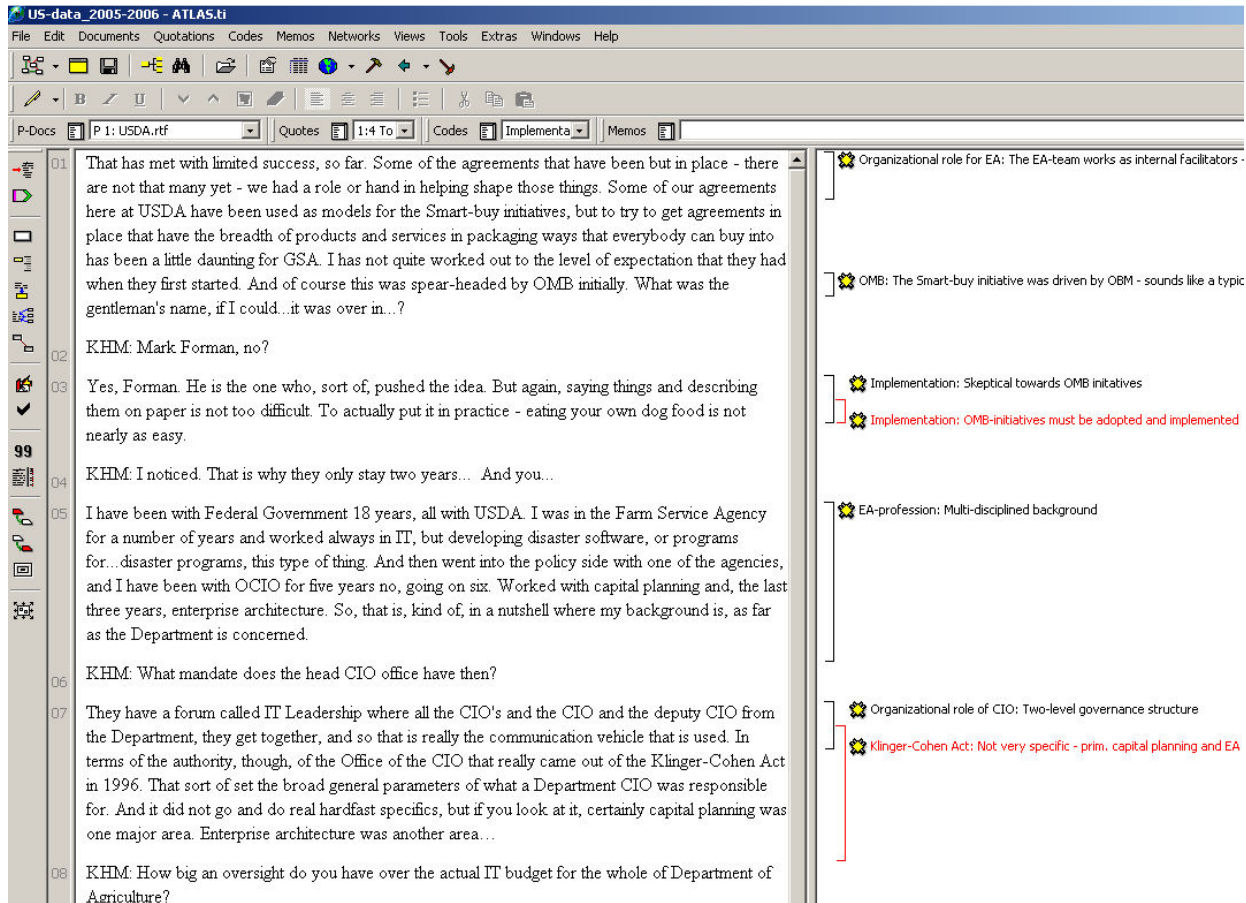
Figure 4: Illustration of open coding in ATLAS.ti for the third dissertation case study

The analytical process involved reading line-by-line, sentence-by-sentence, paragraph-by-paragraph, etc., in search of the repeated question, "What is this about?" "What is being referenced here?" Figure 4 illustrates how the text on the left side of the screen-dump is categorized on the right side. This piece of text originated from an interview with a chief architect in Washington DC, where overlapping codes were used to derive meaning from the text during the first open coding phase.

Using ATLAS.ti to perform the initial open coding provided flexibility and a range of different ways to apply and combine codes. However, the software does not specify whether or how to generate codes or apply themes to data. And there is a danger that the software coding may fracture the data too much (see for example Mason, 2002). This challenge also faced the analysis of the 21 interviews collected in Washington DC. With almost 200 pages of transcripts, the amount of data was overwhelming at first. But by using ATLAS.ti only as a tool in the analytical process, this danger was minimized by printing and rereading the text again and again in a time consuming process. Also, the text and initial open codes were shared with co-authors and the dissertation supervisors with extensive experience

performing interpretive case study research to quality the meaning and perspectives inscribed in the codes.

In three of the case studies ATLAS.ti was not used. Instead, colored highlighters, pens, and scissors were used manually to systematically examine similarities between the various social phenomena in order to develop concepts or ideas. Figure 5 shows an example of the coding of a transcribed interview in the fourth case study. In the middle of Figure 5 an excerpt of the transcribed text is inserted (in Danish). The 'bubbles' around the text indicate the open coding of the text. These codes were typically shared and compared between the co-authors, and the dissertation supervisors were often included in this process.

Figure 5: Illustration of manual open coding for the fourth dissertation case study

Axial coding

After the open coding the relationships between the categories were resolved using axial coding (Strauss and Corbin, 1990). The categories and concepts created in the open coding phase were related to each other via a combination of inductive and deductive thinking in order to better understand the causal conditions, context conditions, intervening conditions,

and consequences. The grouping was an iterative process where some codings were grouped in one group, then moved to another group, then back again, then copied to both groups, and so on. This process continued until clear findings from each of the group of codings could be induced.

The axial coding reduced the number of codes. Figure 6 illustrates how ATLAS.ti was used to build 'code families' to enable category retrieval and find relationships between categories. The example below stems from the third case study in the United States Federal government, where the initial open codes (on the left) were grouped (on the right) to understand the different statements in the interviews about the role of the Office of Management and Budget in the national 'field context' and the organizational context.
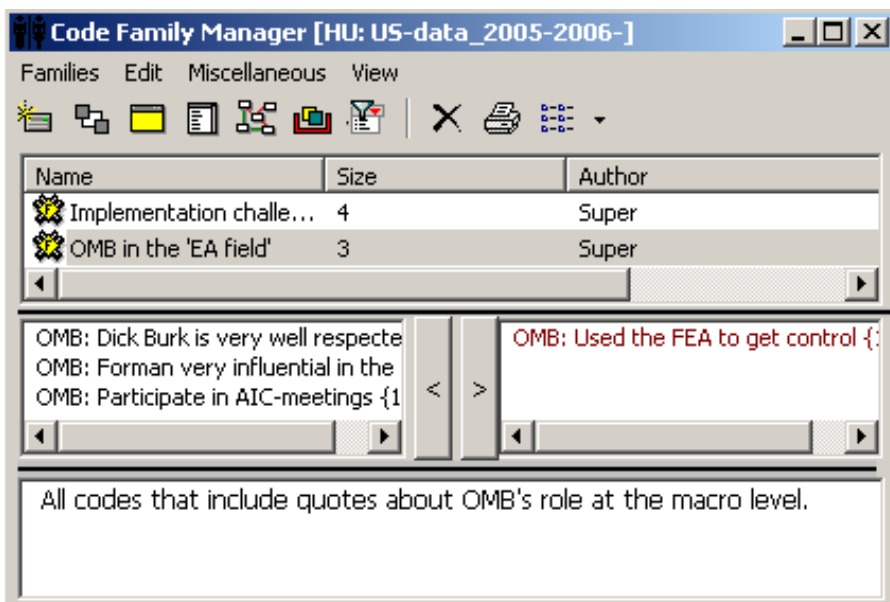
Figure 6: Illustration of axial coding using ATLAS.ti in the third dissertation case study

The axial coding made it possible to identify relationships between the initial categories, and thus to reduce complexity. For example, collapsing the codes in the first case study revealed a pattern of 'political agenda' (Hjort-Madsen and Burkard, 2006) where a consistent emphasis on political motives for implementing the EA program was revealed in the individual interview – and across the interviews with the chief architect and the CIO. Hence, the analysis was able to reveal that the EA program at Copenhagen University Hospital could be viewed as an attempt to keep up with the national recommendations, as much as 'rational' motives such as increasing interoperability, consolidation and value preservation.

Another illustration of the usefulness of this technique is shown in Figure 7 below. The figure illustrates how the understanding of a technical IT-architecture perspective on EA materialized in the fourth case study in Denmark.
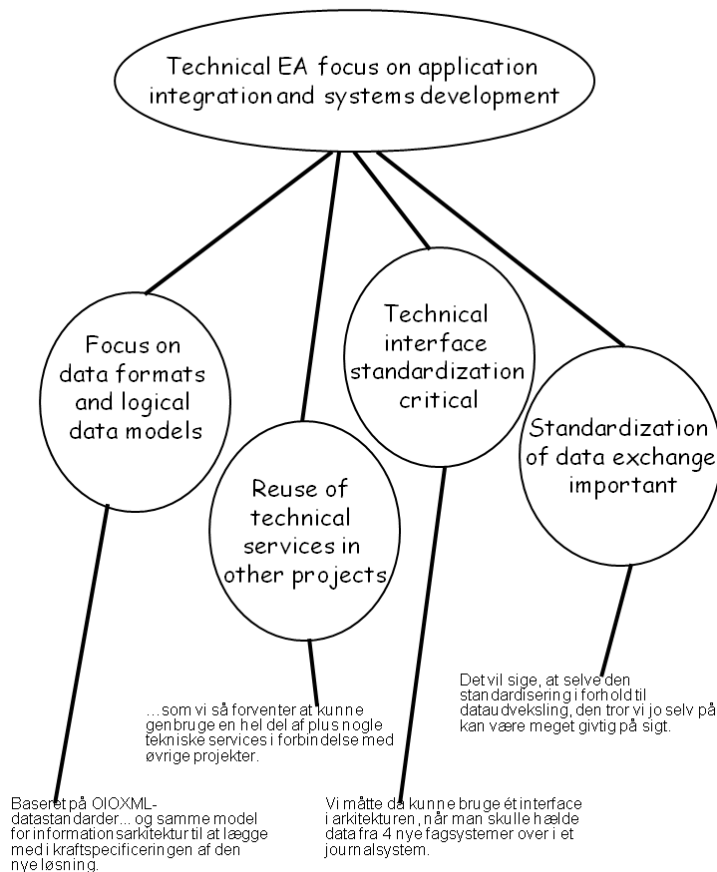
Figure 7: Illustration of axial coding technique used in the fourth dissertation case study

Figure 7 demonstrates how the axial coding technique was used to get an overview of the focus group respondents' understanding and use of EA across almost 100 pages of transcripts in the fourth case study. At the bottom of the figure the quotes from the original text are inserted (in Danish). The four 'bubbles' around the text show the open coding of the text, while the 'bubble' in the top of the figure displays the final group that the open codes were assigned to during the axial coding. When breaking up such a large text into codes and fragments it is easy to lose the overview. Thus, the grouping of codes using axial coding created clarity, while the connection to the actual empirical material was at the same time still maintained.

Eisenhardt (1989) distinguishes between within-case and across-case analysis. In within-case analysis, "the overall idea is to become intimately familiar with each case as a stand-alone entity" which allows the unique patterns of each case to emerge before investigators push to generalize patterns across cases. In this process, data from all sources – interviews, documents, presentations, and newspaper clippings – are synthesized in the case-study write-ups.

An example that followed these prescriptions was the second case study in the Netherlands and Denmark where the two countries were first independently analyzed by the researchers in rich detail. Hereafter, within and across-case analyses were performed to extract and reorganize information from the case study write-ups into a cross-case comparative format, following the design indications for comparative qualitative research by Miles and Huberman (1994). The cases were discussed amongst the researchers at several 'interpretative' telephone meetings. Each time a new round of iterations was initiated between theory (to enlighten and to substantiate conceptually an empirically observed pattern) and data sources (to provide missing information for further induction) following the idea of the hermeneutic circle.

Selective coding

The final step in the data analysis was the selective coding (Strauss and Corbin, 1990) that coined the final rich descriptions from a particular context and setting about EA adoption. In practice overlapping with the axial coding, the selective coding is the process of choosing one category to be the core category, and relating all other categories to that category (Strauss and Corbin, 1990).

The result of this step is a single storyline around which everything else is draped. The process of moving from open coding over the axial coding to the selective coding ensures that the understanding generated in the dissertation publications is firmly grounded in the empirical material. Figure 8 illustrates how the first open codes in the third case study was broken down into categories (code families) in the axial coding phase and later assigned again during the selective coding phase.

Excerpt from transcribed interviews and documentation	Codes assigned during the *open coding* stage	Codes assigned during the *axial coding* stage	Codes assigned during the *selective coding* stage

Donec eu metus sed lorem auctor vehicula. **That is also thanks to the good understanding of EA that Dick Burk has.** Fusce dolor. Nulla iaculis congue leo.

OMB: Dick Burk is well respected

Donec eu metus sed lorem auctor vehicula. **When Forman came in a lot was changed at the OMB. He really changed the EA-agenda.** Fusce dolor. Nulla iaculis congue leo.

OMB: Forman is very influencial in the EA group

Donec eu metus sed lorem auctor vehicula. **We listen when Mr. Burk is in the room – his oppion really matters when we want the money.** Fusce dolor. Nulla iaculis congue leo.

OMB: The chef architect at OMB seems very powerfull

Influence of the OMB chief architect

OMB influnce in the EA 'field'

Donec eu metus sed lorem auctor vehicula. **Yes, I always try to participate in the AIC-meetings.** Fusce dolor. Nulla iaculis congue leo.

OMB: Participate in AIC-meetings

Donec eu metus sed lorem auctor vehicula. **After this, we look at the EA documentation and the target archiecture for the agency.** Fusce dolor. Nulla iaculis congue leo.

OMB: Review target architecture from all agencies

OMBs official influence on the EA-agenda

Figure 8: Illustration of selective coding in the third dissertation case study

The selective coding example in Figure 8 exemplifies how the massive data collection in the third case study in the United States Federal government was organized and analyzed in detail. This extract from the data analysis shows the way that the influence of the Office of Management and Budget (OMB) was coded in the three stages prescribed in Grounded Theory. It demonstrates how an understanding of OMB's role in the 'organizational field' of EA in the Federal government in Hjort-Madsen (2007) did not just 'emerge' from the empirical materials. Rather, the data analysis was an exhaustive process of constructing empirical material from the many events observed. Reliability was ensured by employing these different independent perspectives on the data, and different sources of empirical materials (internal documents, news coverage, Internet websites, etc.) were further included in an iterative process of empirical material collection, analysis, reflection and synthesis.

In finishing and reporting the studies, Eisenhardt's (1989) notion about 'enfolding literature' was also applied. For instance, in the third case study, other studies dealing with the importance of an 'organizational field' (e.g., Mazza and Pedersen, 2004) and the special characteristics of the public sector (e.g., Evans et al., 1985; Pressman and Wildavsky, 1987),

etc., were used in order to understand the role of OMB in the context of the twelve organizations studied. The aim was to raise the theoretical level, sharpen the constructs, and build validity. Yin (1994) refers to this as 'analytical generalization' to distinguish it from the more typical statistical generalization that generalizes from a sample to a population.

Whether 'theoretical saturation' (Glaser and Strauss, 1967) is achieved in this dissertation research is difficult to assess in practice (Eisenhardt, 1989). As stated by Locke: "the practical reality is that as researchers we will have to decide on and articulate the story our data makes it possible to tell." Theory can always be developed further, and time and money normally poses some restrictions (Eisenhardt, 1989). The claim made here is that the marginal improvement to the understanding of the overarching research question became smaller in the focused dissertation research phase. Extending the studies to include other public organizations and different countries might produce new understandings of the EA adoption process in government (cf. section 6.2 about future research topics). However, as noted by Walsham (1995), beginning with the rich descriptions of a case study, IS researchers can generalize to concepts, to a theory, to specific implications, or to rich insight.

By embodying the idea from Grounded Theory (Glaser and Strauss, 1967) where theory is grounded in descriptive categories and relationships that emerge from properly collected and coded data, in this research, the emergence of theory from the four major case studies was not forced. When reporting the case study findings in the five dissertation publications a great deal of effort was put into cross checking with the empirical material in order to prevent stretching the conclusions more than was justified. The multiple sources of evidence were collected and analyzed in a systematic inductive manner, and theoretical abstractions and generalizations were carefully related to the case study details as they were collected by the researcher. As noted by Klein and Myers (1999): "theory plays a key role in interpretive research, and clearly distinguishes it from just anecdotes." In the following chapter 5, Lee and Baskerville's (2003) notion of "generalizing from empirical statements to theoretical statements" is thus applied when seeking to present a set of contributions to practice and research across the five scientific publications described in the following chapter 4.

3.4 Summary

This chapter describes the development of the overarching research problem in three conceptual phases, explicates the philosophical underpinnings, and outlines the research method and techniques used throughout the research process.

The appropriate research approach to answer the overarching research question in this dissertation was interpretive since it allowed the research to get closer to the complex social, political and cultural context within which EA is adopted. Consistent with this, a case study approach was chosen because it allowed us to get a deeper insight into a limited unit of analysis, thus enabling an explorative uncovering of nuances and shades that improved the understanding of EA adoption in government. The data was collected semi-structured,

and grounded theory techniques were used to analyze the data inductively, using existing theory only as prior constructs. The theoretical abstractions and generalizations generated in the rigorous research process were reported in the five publications presented in chapter 4.

4. Research Publications

"If you speak of nothing but what you have read, no one will read you."

(Schopenhauer, *The Intellectual Life*)

This chapter presents short summaries of the five scientific publications that form the main contribution to this research. The publications have been published separately throughout the dissertation period at peer-reviewed academic conferences (Publication I, III, and V) and in scientific journals (Publication II and IV). The publications are summarized in a uniform manner, where first the research objective is briefly presented, the results are then overviewed, and finally the relation to the whole dissertation is summarized. The complete publications can be found in the Appendix.

Table 4 provides an overview for each of the included publications and the case study foundation (cf. chapter 3). Sections 4.1 through 4.5 summarize each of the five publications. Section 4.6 outlines the praxis of the joint publications with other researchers and practitioners.

#	Title	Authors	Outlet	Case study foundation
I	Enterprise Architecture in Government - Towards a Multi-Level Framework for Managing IT in Government	Hjort-Madsen, K. and Gøtze, J.	European Conference on e-Government 2004, Dublin, Ireland.	
II	When Enterprise Architecture Meets Government - An Institutional Case Study Analysis	Hjort-Madsen, K. and Burkard, J.	Journal of Enterprise Architecture 2006, Volume 2, No. 2, pp. 11-25.	1. Implementation of EA at Denmark's largest university hospital.
III	Analyzing Enterprise Architecture in National Governments: The Cases of Denmark and the Netherlands	Janssen, M. and Hjort-Madsen, K.	40th Annual Hawaii International Conference on System Sciences 2007.	2. National EA adoption and use in the Netherlands and Denmark.
IV	Institutional Patterns of Enterprise Architecture Adoption in Government	Hjort-Madsen, K.	Transforming Government: People, Process and Policy, 2007, Volume 1, Issue 4, pp. 333-349.	3. Implementation of EA in Federal agencies in the United States.
V	Enterprise Architecture in Government: Fad or Future?	Hjort-Madsen, K. and Pries-Heje, J.	42th Annual Hawaii International Conference on System Sciences 2009.	4. Implementation of EA in central government agencies in Denmark.

Table 4: Peer-reviewed conference and journal publications included

4.1 I: Enterprise Architecture in Government - Towards a Multi-Level Framework for Managing IT in Government

Based on the contemporary e-government literature, the information systems management theory, and the emerging EA publications at the time of submission, the first publication outlines some of the organizational challenges that national governments and public organizations face when adopting EA. The publication introduces EA as a potential IT planning approach for solving various interoperability challenges at different levels of government.

4.1.1 Results

The publication presents a conceptual model for understanding EA in government that is based on the European Interoperability Framework and a distinction between three levels of government (national, sectors and organizations). The publication claims that information systems architecture has been a lost realm in e-government research, and that there is a need for a broad and integrated view that takes both organization, semantic and technology in government into account.

The framework emphasizes the need for research both at the organizational micro-level and at the national macro-level. The argument put forward is that we need to understand the interplay between different levels (vertically) and functions (horizontally) of government if we want to understand the adoption of EA as an information systems planning innovation in the public sector. The publication illuminates the need for strong IT governance using EA, and practitioners can use the framework to coordinate and govern different e-government initiatives across government levels (vertically) and functions (horizontally). Finally, the publication helps public organizations to see the dynamic complexity of the public sector from an EA perspective and to understand their particular extra-organizational horizontal and vertical linkages as part of a greater whole.

4.1.2 Relation to the whole

Publishing this publication in the initial feasibility research phase proved helpful for the overall understanding of the uptake and continuous use of EA in the public sector. The application of institutional theory is rather immature (e.g., there is no clear differentiation between organizations and institutions, and the applicability of institutional theory in private organizations can seem somewhat misinterpreted). But, overall, the publication served as a good basis for the explorative research phase where the actual adoption of EA at both the micro and macro level was studied.

4.2 II: When Enterprise Architecture Meets Government - An Institutional Case Study Analysis

Focusing on the organizational micro- and meso-level rather than on the national and international macro-level, the case study presented in this publication explored the adoption of an EA program at Denmark's largest hospital to answer two research questions: (1) Why do public organizations implement EA programs; and (2) How is interoperability governed across different levels (vertical) and different functions (horizontal) of government in EA programs?

4.2.1 Results

The case study highlights the interoperability and integration challenges that public organizations face when implementing e-government initiatives that span organizational boundaries. The analysis clearly illustrates that there is little coordination between the different levels and functions of the Danish health sector. The implementation and management of IT has been decentralized as part of New Public Management reforms. While Copenhagen University Hospital is a part of Copenhagen Hospital Cooperation and the national health sector at large, in reality the hospital worked very independently with its IT planning initiatives. The case study also reveals how the EA adoption process is neither straightforward nor rational, and that the established institutional norms and values in the organization powerfully shaped the technical approach to EA adopted. Economic pressure for cost reductions was largely driven from outside the CIO-office, and normative requirements of appropriateness and legitimacy heavily influenced the adoption process (with interoperability and integration requirements as the 'official' argument).

By providing an alternative understanding of adoption, the institutional perspective applied can help IS-researchers better understand the fragmented and socially constructed uptake and use of EA in government. The findings call for a contextual understanding of adoption - especially the adoption of innovations like EA. By shedding light on the special characteristics of the public sector, this publication can help practitioners understand why and how EA is adopted in government. This insight can be applied by national governments and public agencies to improve the implementation and adoption of EA programs.

4.2.2 Relation to the whole

As the first of two dissertation publications in the explorative phase, this publication contributed to the understanding or EA adoption in a single public organization (micro-level). The insight gained here was very important in the focused research phase and provides a solid foundation for the dissertation as a whole.

4.3 III: Analyzing Enterprise Architecture in National Governments: The Cases of Denmark and the Netherlands

This third publication applied a comparative macro approach to the understanding of EA in national governments. The objective was to expand our understanding of national EA programs – and their particular adoption. This was done by framing, analyzing and comparing the national EA efforts in the Netherlands and Denmark.

4.3.1 Results

Based on an analytical framework developed for this publication, we found that the two countries studied were both very ambitious in their national EA programs. However, both countries also struggled with implementation and the governance setup was weak and unclear. Comparing the two countries, Denmark focused more on technical interoperability, while the Netherlands used EA to reduce 'red tape' (excessive bureaucracy). Both case studies confirm the importance of institutional norms and values, and this publication therefore calls for a broader understanding of EA in government. The framework proposes that at least 5 elements should be considered when we try to understand nation EA-adoption 1) Policies, actors and structures, 2) Governance 3) Architecture model 4) Architecture principles and standards and 5) Implementations.

The publication provides two contributions to research: 1) a framework for analyzing national EA programs, and 2) insight into the national EA programs in the Netherlands and Denmark, comparing the different features of the proposed framework. EA efforts in the two countries have had an impact on the IT planning practice. But, by offering a contextual understanding of the adoption process, the empirical findings also alert us to the fact that public organizations adopt EA because of their need for legitimacy more often than do the potential for dramatic efficiency gains. Thus, the findings do not indicate that the new EA phenomenon should generate administrative reforms in government in itself.

4.3.2 Relation to the whole

As the second of the two publications in the explorative phase, this joint publication with Marijn Janssen from the Netherlands contributed to the understanding of EA uptake and use at the national 'field level.' The insight gained here was very important in the focused research phase and provided a solid foundation for the dissertation as a whole.

4.4 IV: Institutional Patterns of Enterprise Architecture Adoption in Government

The objective of the fourth publication was to understand why, and under which circumstances, EA adoption improved IT planning and supported administrative transformation in government. By studying EA and the organizational norms and values it is adopted within, the goal was to gain a deeper understanding of why and how EA was adopted comparative to different public organizations.

4.4.1 Results

Across 12 Federal agencies studied, three adoption patterns were identified. These patterns illustrate that the uptake and continuous use of EA is largely shaped by institutional norms and values, and that the IT planning innovation does not create administrative or political transformation in itself. Compliance and imitation primarily drives the adoption process, while fundamental transformation to the tasks performed in government is only achieved if the institutional force at the micro-and macro-level promotes transformation. For example, the adoption pattern of the 'Transformers' illustrates that EA planning was used to facilitate administrative and technical reform, but only because a 'window of opportunity' was established by other forces in the organizations. The 'Transformers' used the momentum that an organizational reform agenda had established to institutionalize EA planning programs that were focused on business level issues and the importance of change management. Even though the EA programs studied appeared to be very similar at the surface, the findings illustrated three different applications of the EA approach because the adoption processes were largely defined by the organizations within which they were used.

The neoinstitutional perspective proposed in this publication can be of value to other IS researchers as a basis for empirical work in other situations; the implications of the case study can be taken as a starting point for further research into the important topic of IT based administrative e-government transformation. The research illustrates that EA adoption is an emergent, evolving, embedded, fragmented, and provisional social production that is shaped as much by cultural and structural forces in the organizational context in which they are implemented as by rational technical and economic ones. The findings highlight the importance of strong governance. The three adoption patterns can help public organizations better understand and manage the uptake and continuous use of IT planning innovations. The 'Transformers' pattern of adoption could especially be studied to learn how EA can be a catalyst for change and transformation in government organizations.

4.4.2 Relation to the whole

Solidly grounded in theory and practice, this publication illustrates why and how the organizational field (macro-level), with formalized and non-formalized institutional forces,

created a mutual orientation among independent organizations (micro-level). Rather than a single organizational focus, this publication studied both the institutional context around and within which the 12 organizations were studied. The understanding derived from this case study was essential for the overall conclusions in this research.

4.5 V: Enterprise Architecture in Government: Fad or Future?

Based on Abrahamson's management fashion theory, this publication investigated the formation and adoption of EA in the central government of Denmark. Empirically grounded, the publication seeks to understand why and how EA is adopted as a management fashion in practice.

4.5.1 Results

Grounded in the empirical data and Abrahamson's theoretical framework, the analysis indicates that the EA concept is indeed characterized by fashion. EA was 'chosen' as the appropriate approach to strengthen the Ministry of Science, Technology and Innovation's influence on the e-government agenda – seen as efficient and at the forefront of 'best practices' in IT planning. The definition of EA provided Ministry of Science is largely inherited by the Danish organizations studied. However, our group interviews also reveal that the EA phenomenon is not very well understood in the central government of Denmark, and nothing indicates that it is generating administrative reforms in government that would replace traditional hierarchies with leaner structures. The CIO's and enterprise architects in our focus groups performed EA as a technical exercise by focusing very similarly on the interrelationships of different applications, modeling, and exchanging of data – and not so much the link between business and IT. The findings suggest that there are two elements to EA in government: a stable element of IT architecture and a fashion driven business architectural element.

Applying Abrahamson's management fashion theory to the understanding of EA adopted as an information system planning innovation in the public sector proved valuable when we wanted to understand the embedded and fragmented adoption of EA as an information system planning innovation in government. This insight could be of value to other IS researchers as a basis for empirical work in other situations.

For practitioners, the findings alert us to the fact that the uptake and use of IT planning innovations such as EA is most often associated with as much frustration and desperation as with accomplishment and joy because it challenges conventional institutional norms and values in government. Furthermore, the distinction between a stable element of IT architecture and a fashion driven business architecture element contributes to the general understanding of EA as a meta-discipline – and questions the value of the strategy and business focus in contemporary EA frameworks and methods developed by consulting companies and self proclaimed 'EA gurus.'

4.5.2 Relation to the whole

As the last publication in the dissertation, this publication offers a rich understanding of why and how EA is adopted for IT planning in the public sector. It contributes to the general

understanding of institutional forces at play both at the macro-level and at the micro-level in the adoption process.

4.6 The Praxis of the Joint Publications

Publication I, II, III, and V are joint publications written with two practitioners (Jakob Burkard and John Gøtze), a professor from the Netherlands (Marijn Janssen), and the academic supervisor of this research (Jan Pries-Heje). In all publications the author of this dissertation was the primary researcher and writer. Working with the practitioners, the author conducted most of the research and scope for the publications, and the articles were written by the author. The practitioner in publication II 'opened the doors' to the organizations studied, but all data was collected and analyzed by the dissertation author. Working with the practitioners greatly improved the conditions for producing a reflective understanding of the EA adoption process to practice. In publication III and V the workload was more evenly distributed between the dissertation author and the academic peers. This collaboration focused the studies and brought direction to the studies and methods in the writing process. Table 5 details the praxis of the four joint publications.

	Contribution	Dissertation author	Co-authors
Dissertation publication (I)	*Research*	*80%*	*20%*
	Scoping	*80%*	*20%*
	Writing	*100%*	*0%*
Dissertation publication (II)	*Research*	*80%*	*20%*
	Scoping	*70%*	*30%*
	Writing	*90%*	*10%*
Dissertation publication (III)	*Research*	*50%*	*50%*
	Scoping	*50%*	*50%*
	Writing	*50%*	*50%*
Dissertation publication (IV)	*Research*	*100%*	*0%*
	Scoping	*100%*	*0%*
	Writing	*100%*	*0%*
Dissertation publication (V)	*Research*	*50%*	*50%*
	Scoping	*75%*	*25%*
	Writing	*50%*	*50%*

Table 5: Contribution in the joint publications

5. Contribution to Research and Practice

"To write is to raise a claim to be read, but by whom?"

(C. Wright Mills, 1959)

Across the five individual scientific publications outlined in the previous chapter, this chapter summarizes a coherent set of contributions to practice and research. Although the original objective of the research project included the development of an integrated information systems architecture method that could improve the strategic and practical use of IT in the public sector, no such explicit 'how to' contributions are directly included in this research. As outlined in the previous two chapters, the research process and the findings provided results demonstrating that plain technical rationality of having stronger EA formalisms is not adequate. We need a better understanding of EA adoption in real-life public sector settings if EA is to be used by governments around the world in order to deliver efficient, responsive and integrated e-government solutions to citizens. EA's potential to not just guide the design of IT systems, but to deliver real organizational transformation in government organizations, relies on our ability to understand the complex adoption process in government organizations. Thus, the results of this research provide new insights for both research and practice on how to improve the EA adoption process.

The graphical presentation in Figure 9 illustrates how the contributions to research and practice are grounded in the multiple sources of evidence collected in the four case studies and analyzed in the five dissertation publications. In this way, the theoretical abstractions and generalizations summarized here across the five research publications are carefully related to the findings in the case studies.
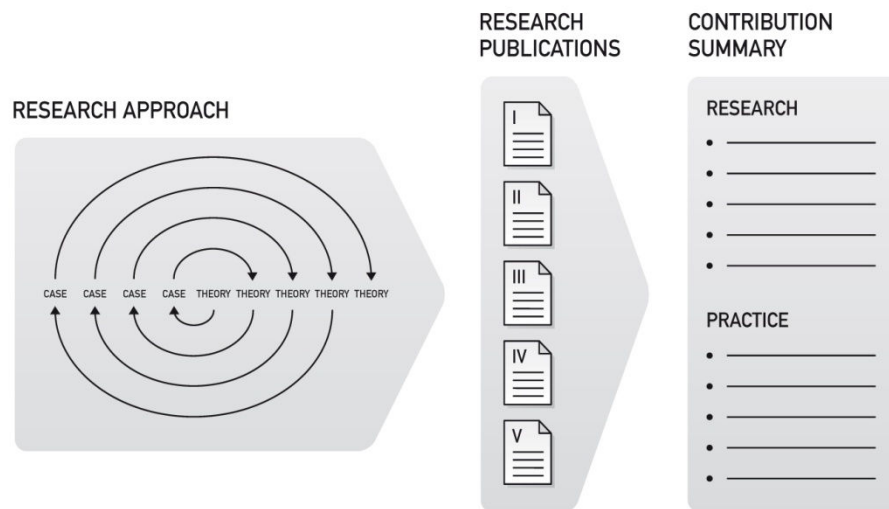
Figure 9: Contribution to Research and Practice.

The following section 5.1 summarizes five contributions to the contemporary e-government and EA fields, the IT planning disciplines, and the theory about adoption of innovations. Hereafter, section 5.2 outlines the contribution to practice with five recommendations and indicates the uptake and continuous use of EA as an IT planning innovation in the public sector. The recommendations for practice are based on the research contributions.

5.1 Contribution to Research

The research presented in this dissertation contributes to the scarce research on EA in government, as well as in the general understanding of IT adoption. Researchers have called for a better understanding of EA adoption for IT planning in public organizations (Bernard, 2004; Ross et al. 2006; Weerakkody et al., 2007; Peristeras et al., 2008). And in the e-government literature we have just started documenting how and why public managers find it difficult to translate the 'generic' EA approaches to specific situations and use these architectures to guide their decision-making and system integration (Pardo et al. 2004; Jansssen and Cresswell, 2005; Weerakkody et al., 2007; Peristeras et al., 2008). The next section presents five contributions to our knowledge about EA adoption in government to answer the overarching research question and ground our theoretical understanding of EA uptake and use in government. Details can be found in the publications in the Appendix.

5.1.1 Understanding Incentives in Government

Contribution 1: Public organizations will resist the potential for dramatic efficiency gains from introducing new IT planning initiatives such as EA if they fear the loss of resources (budget and personnel).

First of all, when theorizing about EA adoption in government, it is important to understand the special characteristics of government structures, norms, and rationalization (Fountain, 2001; Kraemer and King, 2006). Government IT managers work in an environment with complex goal structures, and strict legal norms often define how public agencies must work when delivering e-government services to business and citizens in a secure and transparent way (Traunmüller and Wimmer, 2003). The environment in which public agencies operate consists of interorganizational IT systems that include other agencies, other levels of government, and other interest groups. As we saw in the first case study in this research, there is often no clear distribution of powers across the public sector (e.g., at state, regional or local level), and responsibilities are not clearly mandated. Furthermore, the struggle for political support in the government agencies studied was reported to be tough and time-consuming (Hjort-Madsen, 2007).

The potential of EA to reform the business of government is often inferred from the transformation of business organizations using EA to drive process simplification, service quality enhancements, as well as cost and labor savings (Ross et al. 2006; Doucet et al., 2008). Following 'best practices' from the private industry, the three governments studied in this research pursue rationalization and modernization in different ways though the application of EA for better IT planning in their national governments (OMB, 2002; Pechtold, 2006; Digital Taskforce, 2007). But, there seems to be a cleavage between the EA rhetoric and the reality of the shop floor. The first conceptual contribution in this research (Hjort-Madsen and Gøtze, 2004) highlights some of the theoretical challenges of adopting EA programs horizontally and vertically across governments. And the four case studies in Hjort-Madsen and Burkard (2006), Janssen and Hjort-Madsen (2007), Hjort-Madsen (2007), and Hjort-Madsen and Pries-Heje (2009) describe the challenges which public managers are facing when they seek to introduce EA as a transformational tool in their individual organizations.

Paradoxically, these research findings do not support the idea of EA as an instrument of administrative reform. While public sector practitioners (e.g., Doucet et al., 2008), researchers (e.g., Peristeras and Tarabanis, 2000; Pardo et al. 2004), and standards organizations (e.g., Open Group, 2003) have advocated the adoption of EA to ensure that IT resources are planned, leveraged, and coordinated *better* in government, this research primarily finds that EA reinforces existing administrative and political arrangements. As the first case study illustrates, the often decontextual uptake and use of EA approaches in many public sector EA programs might initially be effective in spreading powerful messages about the benefits of using EA to leverage and manage the public IT systems (Hjort-Madsen and Burkard, 2006). However, in the long run, the promotional EA rhetoric might also entail a

high risk of misguiding and frustrating local efforts to make sense of the new IT planning phenomena.

The findings in the research indicate that it is unlikely that the development in the public sectors' IT planning efforts will resemble the development in the private sector. Public sector IT planning is simply qualitatively different from planning in private enterprises or industries; while dramatic higher profits, promotions, stock price increases, and market shares are drivers for planning reforms in the private sector, this can be a showstopper in the public sector where effective IT planning most often will be rewarded with budget cuts, staff reductions and loss of resources.

5.1.2 Understanding the Need for Legitimacy

Contribution 2: New IT planning initiatives like EA will tend to appear alike across public organizations when adopted in the same national context because of pressure from the 'organizational field' and the need for legitimacy.

The second contribution alerts us to the fact that public organizations in the same national context will tend to adopt the same structures and ways of working with EA. As illustrated by Pettersen (1995), there is often inadequate knowledge or expertise available when a methodology or software tool is adopted to make informed decisions. The adoption decision is often influenced by other users (Alvarez and Urla, 2002), and introspective research in the field of management has suggested that management research and practice is characterized by fads and fashions (Abrahamson, 1991; Abrahamson and Fairchild, 1999). When studying the uptake and continuous use of the new EA approach in Denmark, the Netherlands and the United States, this research illustrates how most organizations in a given national context adopted the same general structures and ways of working with EA (Janssen and Hjort-Madsen, 2007; Hjort-Madsen, 2007; Hjort-Madsen and Pries-Heje, 2009). DiMaggio and Powell has called this a 'constraining process' that forces one unit in a population to resemble other units that face the same set of environmental conditions (DiMaggio and Powell, 1991).

'Best Practices' and standards seem to provide an acceptable way of doing things with an ostensibly technical rationale (Abrahamson, 1991). In the 1980s many public and private organizations were working with office automation; in the 1990s Business Process Re-egineering was the important approach to adopt; in the 2000s it seems that concepts like IT Governance and EA are among the most popular IT management issues in government (McNurlin and Sprague, 2002). Public sector IT managers live in a seeming confusion of an e-government 'method jungle' that is thick with hyperbole about public IT based planning reform initiatives. This, combined with the unclear goals, strict legal norms, and complex organizational cooperation – and conflicts – in public agencies, makes the need for legitimacy in government great.

It was surprising to learn how much the need for legitimacy in government drives the adoption of an IT planning innovation like EA. On a national scale, the fourth dissertation case study illustrates how the Danish Ministry of Science, Technology and Innovation used the internationally perceived 'best practice' of EA in 2003 to legitimize and strengthen their role on the national e-government agenda (Hjort-Madsen and Pries-Heje, 2009). After publishing a white paper in 2003, the EA concept enjoyed almost instant fame and attracted tremendous managerial attention in the central government of Denmark positioning the Ministry of Science, Technology and Innovation as a key player in the national e-government efforts. Similarly, the case studies in Denmark and the United States (Hjort-Madsen and Burkard, 2006; Hjort-Madsen, 2007) showed that all the agencies were guided as much by legitimated elements at the field level – from standard operating procedures defined in the US Federal Enterprise Architecture to professional EA norms and values in the Danish context – as rational technical and economic elements in their respective organizations that improve the actual IT planning performance.

These findings are interesting because they help explain the high degree of homogeneity in the EA adoption process within the governments studied. One the one hand, one should assume that the adoption of the new EA phenomenon in a public agency aimed to improve the specific integration and IT planning challenges and to meet the needs of the specific organization would lead to context dependent and tailored adoptions of EA (cf. Bernard, 2004; Ross et al., 2006; Doucet et al., 2008). On the other hand, the EA phenomenon's broad meta-theoretical scope leaves a lot of room for interpretations (cf. section 2.2) – leading to very different adoptions of EA. However, the findings in this research illustrate that the high degree of uncertainty in government organizations (cf. the first contribution) and the socialization, training and interactions between IT managers in a country lead them to imitate each other and adopt EA in very similar ways across their individual agencies.

As best described in the fourth dissertation publication (Hjort-Madsen, 2007), this work illustrates that the homogenization emerges from the structuration of the 'organizational EA field' in a given governmental context. Organizational fields are defined as "those organizations that, in the aggregate, constitute a recognized area of institutional life: key suppliers, producers, regulatory agencies, and other organizations that produce similar services or products" (DiMaggio and Powell, 1983). The case studies in the United States documented a striking homogeneity in the way that the 12 EA planning programs were defined. This homogeneity was created because the agencies were all part of the same field with formalized and non-formalized institutional forces that create a mutual orientation towards EA. A similar homogeneity in the uptake and continuous use of EA was documented in Denmark and the Netherlands – with a focus on reduction of administrative burdens (red tape) in the Netherlands (Janssen and Hjort-Madsen, 2007) and technical application integration and data integration in Denmark (Hjort-Madsen and Pries-Heje, 2009).

In sum, these findings suggest that the rhetoric of innovation generally associated with IT planning innovations like EA ignores the social and technical commitments and historical patterns that continue to shape the future. We might have expected that the EA frameworks

and methods would be adopted by public agencies to improve the specific integration and planning challenges and needs that face the organization. However, what we found was that the EA programs were only loosely tailored to solve agency needs. More so, the EA programs in the three countries studied look very similar due to a strong EA 'field' where agencies follow the national EA development very closely. Many of the respondents even noted that parts of their own EA planning programs were 'borrowed' from other agencies – and not so much driven by the needs in their own organizations.

5.1.3 Understanding the Shaping of EA Programs

Contribution 3: The adopted focus in EA programs will be shaped by culture, history, and standard practices in individual public agencies and national governments.

While the second contribution informed us about EA adoption similarities across government agencies, the third contribution concerns the shaping of the EA focus in the specific organizational context. As noted by Selznick (1996), interrelated norms and social relations form a context within which choice and problem-solving take place. While pressure from other organizations and legitimacy seem to drive much of the EA uptake and use in government, the organizational context also influences choice, as well as every step preceding choice: the recognition and formation of problems, the development of preferences and interests, which problems are put on the agenda for attention, the criteria for analysis, the participants in the problem-solving process, and the roles that they will play (Fountain, 2001).

The introduction of a new approach to things in a specific organization creates the potential for conflicts between the incumbent institutional regime and the institutional logics embedded in the new system. Old work habits, values, and dilemmas faced by users working with legacy systems are likely to carry over and confront the new system (Alvarez, 2005). Pre-existing structures may orient organizations to be pre-disposed to oppose the logics of new EA planning phenomenon. In other cases, the new approach may be selectively appropriated to be consistent with existing institutional conditions. As noted by Zucker (1983), stability and resistance in organizations rest on beliefs, which are often developed and maintained across generations of organizational actors resisting change. The actual adoption of the new EA approach to IT planning in government thus often faces a serious organizational resistance.

This research illustrates how the EA phenomenon is being reshaped and adopted in step with the institutional forces in public organizations and their environments. Most often the new 'scientific' EA frameworks and methods studied here are not used as intended toward directed ends, potentially creating unintended side effects not envisaged by the IT managers or national governments that designed the new approaches to IT planning. For instance, the first dissertation case study illustrated how the loose governance structure in the Danish health sector and the battle for political legitimacy shaped the EA adoption to focus very

narrowly on technical interoperability issues even though a business focus was pursued in the EA program (Hjort-Madsen and Burkard, 2006).

The three national governments studied in this dissertation have all produced white papers, statements, and booklets that provide 'best practice' EA advice. However, these promotional documents do rarely give us a full and balanced picture of what is happening 'on the ground.' On the contrary – as noted in the publications Hjort-Madsen and Burkard (2006), Hjort-Madsen (2007), and Hjort-Madsen and Pries-Heje (2009) – agencies adopting the EA 'best practices' find it difficult to translate the prescriptions and recommendations into their everyday work practice. Introducing new IT planning routines, structures and values is difficult. IT organizations find it difficult to communicate with the business people in their agencies, and it is thus more common that EA is made to conform to existing behavior and practice than to change the practice of IT planning.

Understanding why and how EA is adopted for IT planning in the public sector, one must therefore look beyond the 'official' proclamations by national governments and individual public agencies. EA stands on the shoulders of many years of IS research and it is important to acknowledge this heritage. In the IS literature, Kling and Iacono (1989) have pointed to the need to conceptualize computer-based information systems in terms of both their institutional characteristics and their information processing characteristics. They claim that institutional characteristics may effectively support routine activities but hinder substantial innovation. As noted by Kramer and King (2006), the Internet and related technologies have improved our ability to communicate and organize our work within and across organizations. But, this does not mean that those tasks or the nature of the work itself will be altered in fundamental ways. The uptake and continuous use of EA does not seem to have a noticeable effect on administrative reform. On the contrary, the new IT planning approach seems to reinforce existing administrative and political arrangements in many of the agencies studied.

A misalignment between the incumbent institutional logics and the new EA planning paradigm was resolved by adopting a particular 'flavor' of EA. Best described in the fourth case study in Denmark (Hjort-Madsen and Pries-Heje, 2009), agencies simply picked the artifacts and approaches from the broad EA meta-discipline that they needed to support their everyday work and strategic objectives. As we saw, the CIO's and chief architects in our Danish focus groups performed EA as a technical exercise that focused on the interrelationships of different applications, modeling and exchanging data – and not so much on the linking of business and IT described in the 'best practice' publications issued by the Ministry of Science, Technology and Innovation and the Digital Taskforce. As illustrated in the second case study, local IT managers find it hard to keep up with the many national initiatives and recommendations, and the local EA adoption patterns are thus very much shaped by the context in which EA is adopted (Janssen and Hjort-Madsen, 2007).

The hyperbole surrounding government modernization and transformation via EA adoption thus seem to be epochal. With an epochal schema of old style bureaucratic IT planning on one side, and the new EA planning agenda that has considerable intuitive appeal on the

other side. However, as this research illustrates, organizational context, imitation and compliance explain adoption patterns better than a universal and invariable recipe of management procedures and techniques such as EA. EA cannot transform government by itself. Fundamental transformation to the tasks performed in organizations is only achieved if political will and institutional norms and values promote transformation.

5.1.4 Understanding the Power of EA

Contribution 4: New IT planning initiatives such as EA will constrain the routines of organizational actors, social structures, norms, and values in public organizations.

The fourth contribution alerts us to the fact that EA is also a carrier of institutional logics in itself and that this constrains the way in which IT planning is performed in government. Like Orlikowski (1992) note that the designers of IT systems "build into the technology certain interpretive schemes (rules reflecting knowledge of the work being automated), certain facilities (resources to accomplish that work), and certain norms (rules that define the organizationally sanctioned way of executing that work)," the new EA approach to IT planning in the public sector also constrain the routines of organizational actors. Even though we have learned that stability and resistance in organizations rests on beliefs, which are often developed and maintained across generations, this research also documents how the EA innovation have changed structures, routines and values in the organizations and national governments studied. By emphasizing a 'scientific management' approach to business driven, top-down IT planning, EA represents a particular approach to the conduct of government's IT planning activities. The directive power of EA as an institution comes from both cognitive and normative elements embedded in the approach. The new phenomenon influences and shapes social action just as other institutions that depend on subtle, shared beliefs do: by creating classification systems, specifying what is focused upon, determining the role of different actors, and setting standards for the design and use of IT in government.

Contrary to the hyperbole surrounding EA in government, the new institutional practices for IT planning are not created from scratch. As we have seen, they are built on, and their adoption is constrained by, older institutional practices. As highlighted in the first three contributions, organizational change is informed by historically guided values and norms that have stabilized and persisted. Similarly, historical choices made with reference to EA implementations will constrain the future decisions that can be made. Not only is this persistence due to interdependencies among the generation of technologies that exist in an organization, but also due to institutional constraints that limit conceptualizations of technology. As noted by Orlikowski (1992), prolonged use of an information system may even lead to 'legitimized' elements that outlive the demise of the system. Similarly, over time, the EA frameworks and methods – and the IT systems and business processes that are guided by them - serve to accumulate the impact of decisions made by the organization and progressively constrain the range of actions that employees can perform. As suggested in the

last dissertation publication (Hjort-Madsen and Pries-Heje, 2009), we must question the effects of new management fads and fancies in government. But, we must not underestimate the influence of new phenomena like EA.

What is interesting about the EA adoption in government is its persistence. All the countries studied in this research still peruse administrative reform and transformation by the use of EA, and the practitioners studied do not seem to see an alternative to EA. As we have learned in this research, the adoption process is not as smooth as the general rhetoric would like us to believe. The adoption seems to favor the technical IT-architectural elements, and it is difficult to show that EA really creates *better* IT planning. But, EA addresses the 'real' problems of managing a complex, interrelated landscape of applications, interfaces and infrastructure that support the cross-cutting organizational processes of government and the service delivery to citizens. EA offers solutions to the planning and coordination of IT resources in government, and problems such as high maintenance costs, lack of critical IT skills, incompatible systems (Perkins, 2000), and inability to share data across systems (Hamilton, 1999; Niederman, 1991; Segars and Grover, 1996). EA is not just fashion. EA in government seems to follow a powerful 'incubated' path in a world where management trends normally come and go very fast (Abrahamson, 1991; 1996).

Most prominent in the United States Federal government, the introduction of the Federal Enterprise Architecture created an external shock to the public organizations studied by changing the boundaries for the Federal IT planning field (Hjort-Madsen, 2007). Before 2002 when the FEA was introduced, formal IT planning in the Federal government was modest and confined to a technical application focus. Now the FEA details how IT planning should be performed in Federal agencies, and focuses on a business driven need for: improved cross-agency analysis and the identification of duplicative investments, gaps, and opportunities for collaboration, interoperability, and integration within and across government agencies. Similarly, EA sparked a new IT planning rhetoric in Denmark and the Netherlands as well (Hjort-Madsen and Burkard, 2006; Janssen and Hjort-Madsen, 2007). At the Danish hospital studied, EA changed the IT planning focus, and in the Netherlands a new agenda focused on 'red tape' was introduced with the adoption of EA at a national scale.

5.1.5 Understanding the Processes of Adoption in Government

Contribution 5: The EA adoption process in government must be understood as a social production because cultural and structural institutional forces shape new IT planning initiatives just as much as do rational technical and economic forces.

Finally, a general contribution across the five dissertation publications concerns the understanding of adoption of innovations in Information Systems. As reported by Orlikowski (1996) and others, the adoption of newly introduced concepts in organizations is often emergent and unanticipated, and Rogers' (1995) stages often overlap, are iterated, surpassed, and frequently change order (Newell et al., 2000). The IT adoption process is

often not linear, but 'emergent' (Baskerville and Pries-Heje, 2001). In the specific cases of EA adoption we must thus understand EA as an important incarnation of institutional commitments (e.g., standards determination, financial IT control and other governance instruments). At the same time, EA is shaped by the institutional forces and processes already enacted in the adopting agencies or national governments. From this research we have learned that not only economic pressure, interoperability challenges, or the potential for efficiency gains drive the EA adoption process. Normative requirements of appropriateness and legitimacy often also influences the adoption process in the public organizations (Hjort-Madsen and Burkard, 2006; Hjort-Madsen, 2007; Hjort-Madsen and Pries-Heje, 2009) and national governments (Janssen and Hjort-Madsen, 2007).

The three adoption patterns, for example as presented in Hjort-Madsen (2007), supplement the exhaustive lists of factors influencing IT adoption that have been produced in the traditional diffusion of innovation theory (Nolan, 1973; Tornatzky and Klein, 1982; Hai, 1998; Gurbaxani and Mendelson, 1990; Premkumar et al., 1994; Cox and Ghoneim, 1996). The adoption process is not linear, and local norms and values often determine the adoption pattern. By emphasizing how compliance and imitation primarily drive the uptake and continuous use of EA, this research points out how the 'social reality' cannot be reduced to a small set of discrete variables. Instead, cultural and structural institutional forces must be considered when we try to understand stability and resistance towards an innovation like EA in government organizations.

As also found by Lyytinen and Damsgaard (2001), the traditional diffusion of innovation researchers has traded simplicity and generalizability against accuracy by using simple, positivistic models of adoption. Thus, as this research illustrates, the critical role of institutional norms and structures in government must be understood if we want to fully understand why and how innovations like EA are adopted in government.

5.2 Summary of Research Contribution

As the five contributions should illustrate, the answer to the overarching research question is not straight forward. Table 6 summarizes the five different contributions to research and relates them to the five dissertation publications in the Appendix.

#	Contribution for Research	Dissertation Publication
1.	**Understanding Incentives in Government.** Public organizations will resist the potential for dramatic efficiency gains from introducing new IT planning initiatives such as EA if they fear the loss of resources (budget and personnel).	I, II, III, IV, and V
2.	**Understanding the Need for Legitimacy.** New IT planning initiatives like EA will tend to appear alike across public organizations when adopted in the same national context because of pressure from the 'organizational field' and the need for legitimacy.	II, III, IV, and V
3.	**Understanding the Shaping of EA Programs.** The adopted focus in EA programs will be shaped by culture, history, and standard practices in individual public agencies and national governments.	II, III, IV, and V
4.	**Understanding the Power of EA.** New IT planning initiatives such as EA will constrain the routines of organizational actors, social structures, norms, and values in public organizations.	II, IV, and V
5.	**Understanding the Processes of Adoption in Government.** The EA adoption process in government must be understood as a social production because cultural and structural institutional forces shape new IT planning initiatives just as much as do rational technical and economic forces.	II, III, IV, and V

Table 6: Contribution to research

5.3 Recommendations for Practice

The introduction of EA by the Danish Ministry of Science, Technology and Innovation in 2003 marked a new era for e-government and IT planning in the Danish public sector. Similar to the introduction of the FEA in the United States in 2002 and the introduction of the Dutch EA program in 2004, the new and innovative EA approach was intended to break down the 'traditional bureaucracy' and create a 'service oriented' public sector with citizens and businesses at the centre (OMB, 2002; Pechtold, 2006; Digital Taskforce, 2007).

However, as this research illustrates, the introduction and adoption of the EA innovation in government is not a straight forward process. EA planning implementation is context dependent and typically comes with as much frustration and desperation as accomplishments and joy for the practitioners working with this new IT planning approach. Many of the findings demonstrate that the work with many different stakeholders in government, both leadership and subject matter experts that aims to build a holistic view of the organization's strategy, processes, information, and information technology assets by using EA, is not just a walk in the park. However, EA in government seems to follow a powerful 'incubated' path in a world where management trends normally come and go very fast – and we must therefore become better at incorporating the politics of government, and focus less on complicated technical frameworks in our EA implementation efforts.

This research does not provide clear-cut prescriptions for better EA planning in the public sector. Throughout the research process, the research findings have been presented to practitioners in the sponsoring organizations, at practitioners' conferences like Gartner's yearly EA Summit (Gartner, 2006) and on the Internet via the discussions on the dissertation blog (www.EAGov.org). Furthermore, the research findings have been applied directly in the establishment of an EA program in Denmark's national Digital Taskforce, and the Finish government has used the framework presented in Janssen and Hjort-Maden (2007) to establish their national EA program. By giving back and 'testing' the findings with the practitioners actually performing EA in government, the aim has been to produce a reflective understanding of the EA adoption process to practice. In so doing, the rational EA frameworks and methods normally applied by practitioners are, hopefully, supplemented by the organizational understanding of EA uptake and use for IT planning in practice provided by this research.

Formulated as short 'how to' recommendations, the contributions to practice presented in this section somewhat contradicts the research approach followed in this dissertation (cf. chapter 3) and the theoretical grounding in institutional theory (cf. chapter 2) where a descriptive approach is outlined. However, the aim of this section is to bridge the traditional gap between theory and practice (see e.g., Benbasat and Zmud, 1999) by daring to cross the chasm between the academic and practitioner communities. As recently noted by Van De Ven (2007), academics are traditionally concerned with the construction of scientific knowledge which tends to be decontextualized and based on technical rationality, while practitioners are more concerned with practical knowledge that focuses on making moral choices about how to act in contingent situations. The experience in this research is that scientific and practical knowledge does not have to be viewed as mutually exclusive with scientific knowledge occupying a privileged position. In the following, the contributions to research are thus reframed as five recommendations to practice in a 'how to' fashion. Based on the research contributions outlined in section 5.1, the argument is first presented and then followed by a paragraph illuminating the essence of the recommendation.

5.3.1 Don't be Blinded

Recommendation 1: Public organizations are conservative creatures and administrative reform and transformation is not driven by IT or the planning of IT use with EA alone. Fundamental transformation of the tasks performed in public organizations depends on political and institutional determination.

The first recommendation alerts public sector IT managers to the fact that they work in an environment with complex goal structures and strict legal norms that will be likely to impede their chances for successful EA implantations. The EA rhetoric of transformation and modernization will seem appealing to many public sector managers and their politicians. However, the practitioners should not let themselves be blinded by the flashy, one-dimensional consultancy reports when managing and implementing EA programs in

government. It is only when environmental shifts occur, including economic, political, or technical 'shocks' or crisis that the institutional settings will allow EA to become a transformational modernization tool in government.

5.3.2 Understand the Politics of Government

Recommendation 2: The business of government is complex, mandates are often unclear, and the struggle for political support can be tough. Understand the environment, agency programs, and potential 'obstacles' before launching EA programs.

The second important recommendation for practice is that they must understand their political context. This is easier said than done, but the benefits of understanding the politics and business of government seem to be great. The EA programs studied here that were adopted with most success understood the business of government and the politics in their own organizations, and they used this knowledge to produce great EA programs. External consultants often do not understand the business of government, and it is therefore up to the public servants leading EA program implementations to 'design' these programs in alignment with the business context within which they are adopted.

5.3.3 Focus on Business and Leadership, Not Technical Frameworks

Recommendation 3: EA has a tendency to get very complicated and technically focused. New EA programs must ensure management backing and focus on business process management and change management in their own specific context.

Third, EA programs should not be driven by complicated EA frameworks and methods. This research indicates that many public EA programs spend far too much time and energy selecting and populating technical EA frameworks. By focusing on their own unique context, IT mangers in the public sector must secure management support for their EA programs and focus on the business of government. It is time to stop slavishly populating standard frameworks and methods. Public IT managers must start defining their own 'light weight' frameworks based on the objectives for their unique EA programs by including a strong business focus. Perceived 'best practices' are not always the right medicine in a specific context. EA programs must proactively be customized to a specific context if success is to be achieved.

5.3.4 Use EA as a Toolbox and Focus on Governance

Recommendation 4: EA is a meta-discipline that embraces, supplements, and extends other disciplines, as for example Business Process Management. EA programs must change over time

and become part of a continuous business improvement agenda with clear governance structures across levels and functions of government.

To be more than just another fashion fad, future EA programs in government must provide a comprehensive and coherent view across business, information, and technology, that is, not just to guide the design of IT systems – but to deliver business change supported and enabled by IT. EA must be understood as a meta-discipline that embraces, supplements, and extends other disciplines such as Portfolio Management, Business Process Management, and Information Management. EA programs should be adopted in alignment with these other disciplines, and address shifting business needs in partnerships and use EA content and demanding timetables to drive changes in the way IT performs. Communication is often neglected in the public EA programs studied. For the EA program to be effective, many things must be communicated, including the scope and objectives of the architecture, the decisions that are made (with justifications) and the benefits that are derived from the EA process. Furthermore, the often unclear distributions of power, unclear mandates, and a constant struggle for political support in government requires a clear and strong EA governance structure across levels and functions of for successful EA adoption to be achieved.

5.3.5 Think Big and Start Small

Recommendation 5: The need to interact with external partners is especially far-reaching in government. Develop EA programs that can embrace the need for extra-organizational horizontal and vertical linkages.

Finally, the last recommendation for practice emphasizes that EA must be adopted and implemented incrementally. This research documents how difficult it is to implement successful EA programs in government, and it is therefore important not to try to implement all the EA tools at once. Because EA is not a project with a defined beginning and end, EA programs often neglect project discipline, resulting in an unfocused effort that does not deliver a coherent stream of results. As we have seen, the business of government often provides complex goal structures and strict legal norms. Thus, we must balance the need to win in the present with activities that will lead to successful transitions in the future by executing one project at a time. In an unstable environment with many stakeholders and unclear goals, it is crucial to build incremental IT plans that incorporate this uncertainty; thus, we need to start small and think big.

5.4 Summary of Recommendations for Practice

Table 7 below summarizes the five recommendations for practice in relation to the five dissertation publications in the Appendix.

#	Recommendations for Practice	Dissertation Publication
1.	**Don't be blinded.** Public organizations are conservative creatures and administrative reform and transformation is not driven by IT or the planning of IT use with EA alone. Fundamental transformation of the tasks performed in public organizations depends on political and institutional determination.	I, II, III, IV, and V
2.	**Understand the politics of government.** The business of government is complex, mandates are often unclear, and the struggle for political support can be tough. Understand the environment, agency programs, and potential 'obstacles' before launching EA programs.	II, III, IV, and V
3.	**Focus on business and leadership, not technical frameworks.** EA has a tendency to get very complicated and technically focused. New EA programs must ensure management backing and focus on business process management and change management in their own specific context.	II, III, IV, and V
4.	**Use EA as a toolbox and focus on governance.** EA is a meta-discipline that embraces, supplements, and extends other disciplines, as for example Business Process Management. EA programs must change over time and become part of a continuous business improvement agenda with clear governance structures across levels and functions of government.	II, IV, and V
5.	**Think big and start small.** The need to interact with external partners is especially far-reaching in government. Develop EA programs that can embrace the need for extra-organizational horizontal and vertical linkages.	II, III, IV, and V

Table 7: Recommendations for practice

6. Conclusion

"One does not set out in search of new land without being willing to be alone on an empty sea."

(André Gide)

This dissertation summary has outlined five years of research into the adoption of EA in the public sector. By asking why and how EA is adopted for IT planning in the public sector, the research project has sought to go beyond the traditional rhetoric of public sector reform driven by extensive EA programs in national governments and individual public agencies. Four rich case studies were conducted in the Netherlands, Denmark, and the United States in three research phases. Fifty-two interviews and two focus group interviews were carried out and a large amount of secondary data was analyzed to understand the complex EA adoption process. An interpretive case study approach was found appropriate to answer the overarching research question, and grounded theory techniques were used to analyze the data inductively, using existing theory about e-government, adoption of innovations, institutions, EA, and IS planning only as prior constructs.

Throughout the research process, the theoretical abstractions and generalizations generated to theory were published at three peer-reviewed academic conferences (Publication I, III, and V) and in two scientific journals (Publication II and IV). These primary contributions are reported in the Appendix.

Across the five publications, five contributions to research and practice have been summarized. The 'why' in the overarching research question is primarily answered in contribution two and four. The second contribution illustrates that EA is often adopted in government because of legitimacy concerns and pressure from formalized and non-formalized forces in the environment. The fourth contribution alerts us to the fact that EA addresses the 'real' problems of managing a complex, interrelated landscape of applications, interfaces and infrastructure that support the cross-cutting organizational processes of government and the service delivery to citizens. However, when we look at 'how' EA is adopted for IT planning at the shop floor, contribution four also reveal that the adoption of EA tends to have a technical focus on IT-architectural elements, and that it is difficult to demonstrate that EA really creates better IT planning in the public sector.

The 'how' is further detailed in the first, second, third, and fifth contribution. The first contribution emphasizes the importance of understanding the incentives in government when we seek to develop knowledge about the uptake and continuous use of an innovation like EA. National governments and individual public agencies cannot be expected to adopt private sector EA 'best practices' with results mirroring the results in the private sector. The second contribution illustrates that EA programs will be adopted similarly across agencies in

the same national context because of formalized and non-formalized forces in the environment that create a mutual orientation. The potential misalignment between the new EA phenomenon and the standard practices and politics in government is illustrated in contribution three – helping us understand how EA adoption is shaped by institutional forces in public organizations and their environments.

Contrary to the rhetoric about EA as a catalyst or instrument of administrative reform, this research found that EA adoption seems to reinforce existing administrative and political arrangements. The norms and values already existing in government powerfully shaped the EA focus and approach adopted. Finally, the fifth contribution summarizes the findings in the research by emphasizing how the adoption process is not linear, but subject to local institutional forces. The uptake and continuous use of EA use is a complicated matter, and we must understand the realities of the shop floor if we want to see better IT planning in government.

This dissertation research has sought to explore and understand the important questions that practitioners face in their work with EA in government. Putting theory and practice in relationship with each other is not an intellectual cognitive activity that can be constructed in one's head; rather, it is an embodied relational activity that necessitates bringing members of scholarly and practitioner communities into conversation with one another (Van De Ven, 2007). Many of the recommendations and statements in this research have already been embraced in Denmark by the National IT and Telecom Agency, the Digital Taskforce, and the Ministry of Finance, as well as the Ministry of Finance in Finland. Hopefully, the application of the dissertation research's contributions can improve the adoption and use of EA in the public sector. All too often scientific and practical knowledge tend to be viewed as mutually exclusive with scientific knowledge occupying a privileged position. This research illustrates the value of a dialogue with practitioners that enriched the research process and produced relevant contributions to practitioners in government as well as the academic community.

6.1 Limitations of the research

As most applied research in the social sciences, this research also has its limitations. Perhaps, the most immediate one concerns the ability to generalize the findings across public organizations and national borders. The specific time, place, and environment for the conduct of the research makes it context sensitive, and the generalizations that can be made from case study research like this are therefore limited (Patton, 1990). This critique stems from positivistic science, which considers scientific knowledge to be obtainable from sense data that can be directly experienced and verified between independent observers to develop generalizable results (Susman and Evered, 1978). However, as described in chapter 3, this research followed an interpretive case study tradition where the research findings can be generalized to theory rather than a population (Lee and Baskerville, 2003). Other

methods and research paradigms could be useful to confirm the understanding of EA adoption in government under other epistemological assumptions.

The findings presented in the five publications mostly represent 'snapshots' of the EA adoption process in practice. Little could be reported about the longitudinal impacts of EA in the governments and agencies studied, and it is therefore possible that some idiosyncratic aspects in the particular organizations studied are not included in the analysis. The emergent understanding of EA adoption developed in the three research phases could perhaps have been organized more explicitly at the beginning of this research. And the sequential analysis of the cases in Denmark, the Netherlands, and the United States may have affected the reported findings. However, this research represents a reflective and inductive learning process where practical experiences, research findings, and theoretical generalizations have shaped the understanding of EA adoption in government presented. As argued in chapter 3, conducting and writing up qualitative research is an evolutionary and inductive hermeneutic process. The organizational focus on the uptake and continuous use of EA forms one of the *research results* instead of a research premises. This research has not aimed at the creation of generalizable facts in a form of homothetic natural laws. Based on the rich case studies in three different countries the aim has been to produce theoretical abstractions and generalizations that can be related back to the case studies.

The tentative prior constructs (Eisenhardt, 1989) or seed categories (Miles and Huberman, 1994) used to get a preliminary hold of the research field might have influenced the understanding developed here. There are more models of innovation, diffusion of innovation and technology transfer that might overlap with the theoretical point of departure presented in chapter 2. Applying different theoretical perspectives to the understanding of EA adoption in government might even develop new domains of learning about the uptake and use of EA in public agencies that this research has been blind to see.

Finally, the selection of cases can furthermore be criticized for not meeting the criteria of 'theoretical saturation' (Glaser and Strauss, 1967). As pointed out by Eisenhardt (1989), theory can always be developed further. But time and money normally poses some restrictions, and in practice only a limited amount of cases can be studied. The selection of cases at the national macro-level, the organizational micro-level, and in three different countries that all have EA high on their e-government agendas' ensured that the marginal improvement to the understanding of the overarching research question became smaller in the focused dissertation research phase. Naturally, the four case studies in three different countries included in this research could be extended by including more cases and countries – leaving room for further research topics.

6.2 Future research topics

The opportunities for future research topics are extensive. For instance, it would be very interesting to perform a dedicated cross-country study based on the data collected in

Denmark, the Netherlands, and the United States. Additional data might have to be collected, other countries could be included, and other (quantitative) data collection methods might be considered. A comparative study might be based on the revised version of the framework presented in dissertation publication III (to be published soon).

Based on the deep understanding of EA adoption in government acquired in this research, the original objective of developing 'how to' methods, tools and processes for public IT planning could also be pursued. As the contributions to research and practice presented here illustrate, there is room for improvement in the EA frameworks and methods that are currently used in government. Future EA programs in the public sector must develop frameworks and methods that can embrace the politics of government and provide a comprehensive and coherent view across business, information, and technology without being overly technical. The findings in this research could be used to design such frameworks and methods that help public IT managers understand public sector dynamics better, create clear(er) governance structures, and incorporate business process management and change management elements in a continued improvement effort.

The design of future EA frameworks and methods for IT planning must also address the language gap identified between IT organizations and the business people in government. This need for alignment is not new. But, the growing need for horizontal and vertical integration in government means that the establishment of a shared understanding of strategies, business capabilities, it-services, and technology is becoming a crucial foundation for the delivery of effective e-government services. Different approaches to modeling ontologies in the e-government domain are emerging (See e.g., Crichton et al., 2007), but more standardized reference models and taxonomies must also be developed to deal with organizational and semantic interoperability issues.

Finally, the study of fads and fancies in public sector IT planning could also be extended beyond a narrow focus on EA in government. The application of Abrahamson's fashion theory and the neoinstitutional lens could be used to study current management topics such as IT Governance, Lean Management, and Rightshoring, or technical 'silver bullets' like Software as a Service, Mashups, and Cloud Computing. The need for legitimacy and the rhetoric of IT driven administrative reforms is not likely to change in government. Critical 'best practice' studies might, however, shed important new light on recent fads and fancies – helping governments and public agencies to navigate in the 'jungle' of methods more or less similar to each other.

List of References

Abrahamson, E. (1991). Managerial fads and fashions: The diffusion and rejection of innovations. Academy of Management Review, 16(3), 586-612.

Abrahamson, E. (1996). Management fashion. The Academy of Management Review, 21(1), 254-285.

Abrahamson, E. and Fairchild, G. (1999). Management Fashion: Lifecycles, Triggers, and Collective Learning Processes. Administrative Science Quarterly, 44(4), 708-740.

Accenture (2009). Leadership in Customer Service: Creating Shared Responsibility for Better Outcomes. Available at http://nstore.accenture.com/acn_com/PDF/LCS08Report_010809.pdf. Last accessed February 2009.

Alavi, M. and Carlson, P. (1992). A review of MIS research and disciplinary development. Journal of Management Information Systems, 8(4), 45-62.

Aldrich, D., Bertot, J. C. and McClure, C. R. (2002). E-Government - Initiatives, Developments and Issues. Government Information Quarterly, 19(4), 349-355.

Allen, BA. Juillet, L., Paquet, G. and Roy J. (2001). E-Government and government on-line in Canada: Partnerships, people and prospects. Government Information Quarterly, 18(2), 93-104.

Alvarez, R. and Urla J. (2002). Tell me a good story: using narrative analysis to examine information requirements interviews during an ERP implementation. Database for Advances in Information Systems, 33(1), 28-52.

Andersen, K. V. and Henriksen, H. Z. (2006). E-Government Maturity Models: Extension of the Layne and Lee Model. Government Information Quarterly, 23(2), 236-248.

Armour, F. J., Kaisler, S. H. and Liu, S. Y. (1999). Building an enterprise architecture step by step. IT Professional IEEE, 1(4), 31 –39.

Attride-Stirling, J. (2001). Thematic networks: Ananalytic tool for qualitative research. Qualitative Research, 1(3), 385-405.

Bai, R. J. and Lee, G. G. (2003). Organizational factors influencing the quality of the IS/IT strategic planning process. Industrial Management and Data Systems, 103(8), 622-632.

Barrett, M. and Walsham, G. (1999). Electronic trading and work transformation in the London insurance market. Information Systems Research, 10(1), 1-22.

Baskerville, R. and Myers, M. D. (2002). IS as a Reference Discipline. MIS Quarterly, 26(1), 1-14.

Baskerville, R. Pries-Heje, J. (2001). A multiple-theory analysis of a diffusion of information technology case. Information Systems Journal, 11, 181-212.

Bekkers, V. J. J. M. and Homburg, V. M. F. (2005). The information ecology of e-government: Background & concepts. In The information ecology of e-government: E-government as institutional and technological innovation in the public sector, ed. Bekkers, V. J. J. M. and Homburg, V. M. F., 1–20. Amsterdam: IOS Press.

Bekkers, V. J. J. M. and Homburg, V. M. F. (2007). The Myths of E-Government: Looking Beyond the Assumptions of a New and Better Government. The Information Society, 23(5), 373-382.

Bellamy, C. and Taylor, J. A. (1994). Introduction: Exploiting IT in public administration. Towards the information polity. Special Issue of Public Administration, 72(1), 1-13.

Bellamy, C. and Taylor, J. A. (1998). Governing in the Information Age. Open University Press, Buckingham.

Benbasat, I., Goldstein, D. K. and M. Mead (1987). The Case Research Strategy in Studies of Information Systems. MIS Quarterty, 11(3), 369-386.

Bernard, S. A. (2004). An Introduction to Enterprise Architecture. Author House, Indiana.

Bjørn-Andersen, N. and Pedersen, P. H. (1980). Computer Facilitated Changes in the Management Power Structure. Accounting, Organizations and Society, 5(2), 203-216.

Blaikie, N. (1993). Approaches to social inquiry. Polity Press, Cambridge.

Blokdijk, G. (2008). Enterprise Architecture 100 Success Secrets - 100 Most Asked Questions on Enterprise Architecture Definition, Design, Framework, Governance and Integ. Emereo Pty Ltd.

Boar, B. H. (1999). Constructing Blueprints for Enterprise IT Architectures. John Wiley & Sons.

Boh, W. F. and Yelling, D. (2006). Using Enterprise Architecture Standards in Managing Information Technology. Journal of Management Information Systems, 23(3), 163–207.

Boland, R. (1985). Phenomenology: A Preferred Approach to Research in Information Systems. In Research Methods in Information Systems, E. Mumford, R.A. Hirschheim, G. Fitzgerald, and T. WoodHarper (eds.), NorthHolland, Amsterdam, pp. 193-201.

Boynton, A. C. and Zmud, R. W. (1987). Information technology planning in the 1990's: directions for planning and research. MIS Quarterly, 11(1), 59-7 1.

Bozeman, B. and Bretschneider, S. (1986). Public Management Information Systems: Theory and Prescription. Public Administration Review, 46, Special Issue: Public Management Information Systems, 475-487.

Brancheau, J., Schuster, L. and March, S. (1989). Building and Implementing an Information Architecture. Data Base, 20(2), 9-17.

Brancheau, J. and Wetherbe, J. (1987). Issues In Information Systems Management. MIS Quarterly, 11(1), 23-45.

Bretschneider, S. (1990). Management Information Systems in Public and Private Organizations: An Empirical Test. Public Administration Review, 50(5), 536-545.

Broadbent, M. and Weill, P. (1997). Management by Maxim: How Business and IT Managers Can Create IT Infrastructures. Sloan Management Review, 38(3), 77-92.

Brynjolfsson, E. and Hitt, L. M. (2003). The Catalytic Computer: Information Technology, Enterprise Transformation, and Business Performance. First International Conference on the Economic and Social Implications of Information Technology, Washington DC.

Carbone, J. A. (2004). IT Architecture Toolkit. Prentice Hall, Upper Saddle River, NJ.

Charmaz, K. (2000). Grounded Theory: Objectivist and Constructivist Methods. In Handbook of Qualitative Research, second edition, Denzin and Lincoln (Eds.). Sage Publications Ldt., London.

Chorafas, D. N. (2002). Enterprise Architecture and New Generation Information Systems St. Lucie Press, Boca Raton.

Clark, P. and Newell, S. (1993). Societal embedding of production and inventory control systems: American and japanese influences on adaptive implementation in Britain. International Journal of Human Factors in Manufacturing, 3(1), 69-81.

Crichton, C., Davies, J., Gibbons, J., Harris, S. and Shukla, A. (2007). Semantic frameworks for e-government. Proceedings of the 1st international conference on Theory and practice of electronic governance.

Cox, B. and Ghoneim, S. (1996). Drivers and barriers to adopting EDI: A sector analysis of UK industry. European Journal of Information Systems, 5, 24-33.

Crowston, K. and Myers, M. (2004). Information technology and the transformation of industries: three research perspectives. Journal of Strategic Information Systems, 13(1), 5-28.

Dacin, M.T., Goodstein, J. and Scott, W.R. (2002). Institutional theory and institutional change: introduction to the special research forum. The Academy of Management Journal, 45(1), 45-57.

Damanpour, F. and Gopalakrishnan, S. (2001). The dynamics of the adoption of product and process innovation in organizations. Journal of Management Studies, 38(1), 45-65.

Damsgaard, J. and Lyytinen, K. (1997). Hong Kong's EDI Bandwagon. Derailed or on the right track? In Facilitating Technology Transfer through Partnership: Learning from Practice and Research. Edited by T. McMaster, E. Mumford, B. Swanson, B. Warboys and D. Wastell. Pp. 39-63. London: Chapman and Hall.

Danziger, J. N. and Andersen, K. V. (2002). The impacts of information technology on public administration: an analysis of empirical research from the "Golden Age" of transformation. International Journal of Public Administration, 25(5), 591-627.

Davis, G. (2000). Information Systems Conceptual Foundations: Looking Backward and Forward. In: Organizational and Social Perspectives on Information Technology, R. Baskerville, J. Stage, and J. DeGross (eds.), Kluwer.

Dawes, S. (1996). Interagency information sharing: expected benefits, manageable risks. Journal of Policy Analysis and Management, 15(3), 377-394.

Dedrick, J. and Kraemer, K. L. (2005). The Impacts of IT on Firm and Industry Structure: the Personal Computer Industry. California Management Review, 47(3), 122-142.

Digital Taskforce (2007). The Danish E-government strategy, 2007-2010 – Towards better digital service, increased efficiency and stronger collaboration. Available at www.modernisering.dk/da/english/e_governement_strategy/. Last accessed December 2007.

DiMaggio, P. J. and Powell, W. W. (1983). The iron cage revisited: Institutional isomorphism and collective rationality in organizational fields. American Sociological Review, 48(2), 147-160.

DiMaggio, P. J. and Powell, W.W. (1991). The New Institutionalism in Organizational Analysis. University of Chicago Press, IL.

Dobbin, F. (1994). Cultural models of organization: the social construction of rational organizing principles. In Crane, D. (Ed.), The Sociology of Culture: Emerging Theoretical Perspectives, Basil Blackwell, Oxford, pp. 117-41.

Doucet, G., Gøtze, J., Saha, P. and Bernard, S. (2008). Coherency management: using enterprise architecture for alignment, agility, and assurance. Journal of Enterprise Architecture, 4(2), 9-20.

Dunleavy, P., Margetts, H., Bastow, S. and Tinkler, J. (2006). Digital Era Governance, Oxford: Oxford University Press.

Dunleavy, P. and Hood, C. (1993). From old public administration to new public management. Public Money and Management, 14(3), 9-16.

Dyer, Jr, W. G. and Wilkins, A. L. (1991). Better Stories, Not Better Constructs, to Generate Better Theory: A Rejoinder to Eisenhardt. Academy of Management Review 16(3), 613–19.

Earl, M.J. (1989). Management Strategies for Information Technology. New York: Prentice Hall.

Edwards, J. (1999). Three-Tire Client-Server at Work, Wiley.

Eisenhardt, K. M. (1989). Building Theories from Case Study Research. Academy of Management Review 14(4), 532–50.

Evans, P.B., Rueschemeyer, D. and Skocpol, T. (1985). Bringing the State Back In. Cambridge University Press, Cambridge.

Evernden, R. and Evernden, E. (2003). Third-generation information architecture. Communications of the ACM, 46(3), 95-98.

Fayol, H. (1919). General and Industrial Management. London Pitman.

Ferlie, E., Pettigrew, A., Ashburner, L. and Fitzgerald, L. (1996). The new public management in action. New York, NY: Oxford University Press.

Fern, E. (2001). Advanced Focus Group Research. Sage Publications, London.

Finkelstein, C. (1989). An Introduction to Information Engineering. Addison-Wesley, Sydney: Australia.

Fligstein, N. (1991). The structural transformation on American industry: an institutionalaccount of the causes of diversification in the largest firms 1919-1979. In Powell, W.W. and DiMaggio, P.J. (Eds),

The New Institutionalism in Organizational Analysis, The University of Chicago Press, Chicago, IL, pp. 311-36.

Fountain, J. E. (2001). Building the Virtual State: Information Technology and Institutional Change. Washington, DC: Brookings Institution Press.

Galliers, R. D. (1991). Choosing Appropriate Information Systems Research Approaches: A Revised Taxonomy. In Information Systems Research: Contemporary Approaches and Emergent Traditions, 327-345.

Galliers, R. D. and Baets W. R. J. (1998). Information Technology and Organizational Transformation: Innovation for the 21st Century Organization. John Wiley & Sons.

Gartner (2003). Enterprise Architecture: A Blueprint for Success. Available at: www.gartner.com. Last accessed June 2004.

Garson, G. D. (2004). The Promise of Digital Government. In A. Pavlichev and G.D. Garson (Eds.), Digital Government Principles and Best Practices, 2-15.

Gasco, M. (2003). New Technologies and Institutional Change in Public Administration. Social Science Computer Review, 21(1), 6-14.

Glaser, B. G. and Strauss A. L. (1967). The Discovery of Grounded Theory: Strategies for Qualitative Research. Chicago: Aldine.

Gottschalk, P. (1999). Implementation predictors of strategic information systems plans. Information and Management, 36(2), 77-91.

Grant, D. A., Ngwenyama, O. K. and Klein, H. K. (1992). Modeling for CIM information systems architecture definition: An information engineering case study. Computers in Industry, 18, 199-212.

Grönlund, Å. (2005). State of the art in e-gov research: surveying conference publications. International Journal of Electronic Government Research, 1(4), 1-25.

Grönlund, Å. and Horan, T. (2005). Introducing E-Gov: history, definitions, and issues. Communications of AIS, 15, Article 39, 713-29.

Guijarro, L. (2004). Analysis of the Interoperability Frameworks in e-Government Initiatives. Lecture Notes in Computer Science, Springer, 3183, 36–39.

Hai, T.H. (1998). Organizational Predisposition toward and Information Technology Innovation: The Roles of Three Theoretical Perspectives in the Case of Financial Electronic Data Interchange, Department of Computer Science and Information Systems, National University of Singapore, Singapore.

Hall, P. A. and Taylor, C. R. (1996). Political Science and the Three New Institutions. Political Studies, 44(5), 936-957.

Hamburg, V. and Bekkers, V. (2002). The Back-Office of E-Government (Managing Information Domains as Political Economies). Proceedings of the 35th Hawaii International Conference on System Sciences.

Hamilton, D. (1999). Linking strategic information systems concepts to practice: systems integration at the portfolio level. Journal of Information Technology, 14(1), 69-82.

Hazlett, SA. and Hill, F. (2003). E-government: the realities of using IT to transform the public sector. Managing Service Quality, 13(6), 445-452.

Hawgood, J. (1982). Evolutionary Systems Development. North-Holland, Amsterdam.

Heeks, R. (2006). Implementing and Managing eGovernment: an International Text. Sage, London.

Henriksen, H. Z. and Damsgaard, J. (2007). Dawn of e-government - An institutional analysis of seven initiatives and their impact. Journal of Information Technology, 22(1), 13-23.

Hirschheim, R., Klein, H.K. and Lyytinen, K. (1995). Information Systems Development and Data Modeling: Conceptual and Philosophical Foundations. Cambridge University Press.

Hood, C.C. (1991). A public management for all seasons. Public Administration, 69(1), 3-19

Hood, C. (1998). The Art of the State. Clarendon Press, Oxford.

IBM (1984). Business Systems Planning: Information Systems Planning Guide. IBM, GE20-0527-4.

Ives, B. and Learmonth, G. (1984). The information system as a competitive weapon. Communications of the ACM, 27, No. 12, 1193-1201.

Iyer, B. and Gottlieb, R. (2004). The four-domain architecture: An approach to support enterprise architecture design. IBM Systems Journal, 43(3), 587-597.

Janssen, M. and Cresswell, A. (2005). An Enterprise Application Integration Methodology for E-Government. Journal of Enterprise Information Management, 18(5), 531-547.

Jayaratna, N. (1994). Understanding and Evaluating Methodologies. NIMSAD – A Systemic Framework. New York: McGraw-Hill.

Jorgensen, D. W., Ho, M. S. and Stiroh, K. J. (2003). Lessons from the US Growth Resurgence. First International Conference on the Economic and Social Implications of Information Technology, Washington DC.

Kaisler, S.H., Armour, F. and Valivullah, M. (2005). Enterprise Architecting: Critical problems. Proceedings of the 38th Hawaii International Conference on System sciences.

Kettinger, W. J., Grover, V., Guha, S. and Segars, A. H. (1994). Strategic Information Systems Revisited: A Study in Sustainability and Performance. MIS Quarterly, 18(1), 31-58.

King, J. L., Gurbaxani, V., Kraemer, K.L., McFarlan, F.W., Raman, K.S. and Yap, C. S. (1994). Institutional Factors in Information Technology Innovation. Information Systems Research, 5(2), 139-169.

King, J. L. and Kraemer, K. L. (1985). The Dynamics of Computing. New York: Columbia University Press.

Klein H. K. and Michael D. M. (1999). A Set of Principles for Conducting and Evaluating Interpretive Field Studies in Information Systems. MIS Quarterly, 23(1), 67-93.

Kling R. and Iacono, S. (1984). The control of information systems developments after implementation. Communications of the ACM, 27, 1218-1226.

Kling, R. and Iacono, S. (1989). The institutional character of computerized information systems. Information Technology & People, 5(1), 7–28.

Klischewski, R. (2003). Top down or bottom up. In R. Traunmüller and M. Palmirani (Eds.) Proceedings of 1st International Workshop on E-Government at ICAIL, 17-26.

Kraemer, K. L. and King, J. L. (1987). Computer and the Constitution: A helpful, harmful, or harmless relationship? Public Admin Review, 47(1), 93-105.

Kraemer, K. L. and King, J. L. (2006). Information technology and administrative reform: will e-government be different? International Journal of Electronic Government Research, 2(1), 1-20.

Krueger, R. A. and Casey, M. A. (2000). Focus Groups: A Practical Guide for Applied Research. Sage Publications, London.

Kvale, S. (1996). Interviews: An Introduction to Qualitative Research Interviewing. Sage Publications, Thousand Oaks California.

Lankhorst, M. (2005). Enterprise Architecture at Work - Modelling, Communication, and Analysis. Heidelberg: Springer Verlag.

Laudon, K. (1974). Computers and Bureaucratic Reform. New York: John Wiley and Sons.

Layne, K. and Lee, J. (2001) Developing fully functional e-government: A four stage model. Government Information Quarterly, 18(2), 122-136.

Lederer, A. L. and Salmela, H. (1996). Toward a theory of strategic information systems planning. Journal of Strategic Information Systems, 5(3), 237-253.

Lederer, A. L. and Sethi, V. (1988). The implementation of strategic information systems planning methodologies. MIS Quarterly 12(3), 445-461.

Lee, A. S. (1989). A Scientific Methodology for MIS Case Studies. MIS Quarterly 13(1), 33-52.

Lee, A. S. (1991). Integrating Positivist and Interpretive Approaches to Organizational Research. Organization Science, 2(4), 342-365.

Lee, A. S. (1999). Researching MIS. In Rethinking Management of Information Systems. An interdisciplinary perspective. Currie and Galliers (eds.) Oxford University Press, 7-27.

Lee, A. S. and Baskerville, R. (2003). Generalizing Generalizability in Information Systems Research. Information Systems Research, 14(3), 221–243.

Lyytinen, K. and Damsgaard, J. (2001). What's wrong with the diffusion of innovation theory? Proceedings of the IFIP TC8 WG8.1 Fourth Working Conference on Diffusing Software Products and Process Innovations, 173-90.

Malveau, R. (2004). Bridging the gap: business and software architecture. Cutter Consortium.

Markus, L. (1983). Power, politics, and MIS implementation. Communications of the ACM, 26(6), 430-444.

Martin, J. (1983). Managing the Data Base Environment. Englewood Cliffs, NJ: Prentice-Hall, Inc.

Martin, P. Y. and Turner, B. A. (1986). Grounded Theory and Organizational Research. The Journal of Applied Behavioral Science, 22(2), 141-157.

Mason, J. (2002). Qualitative Researching, 2nd edition. Sage, London.

Mazza, C. and Pedersen, J.S. (2004). From press to e-media? The transformation of an organizational field. Organization Studies, 25(6), 875-96.

McFarlan, F.W. (1984). Information Technology Changes the Way You Compete. Harvard Business Review, May-June, 98-105.

McKeen, J. and Smith, H. (2002). New Developments in Practice: Managing the Technology Portfolio. Communications of the AIS, 9(5), 1-25.

McNurlin, B. and Sprague R. (2002). Information systems management, (5th Edition). Prentice Hall, Pearson Education, Englewood Cliffs, NJ.

Meloy, J. M. (2002). Writing the Qualitative Dissertation. Lawrence Erlbaum Associates Inc. Mahwah, NJ.

Meyer, J. and Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. American Journal of Sociology, 83(2), 340-363.

Miles, M. B. and Huberman, A. M. (1994). Qualitative Data Analysis: An Expanded Sourcebook. Sage, Thousand Oaks, CA.

Miller, D. and Hartwick, J. (2002). Spotting Management Fads. Harvard Business Review 80(10).

Ministry of Science, Technology and Innovation (2003). Whitepaper on Enterprise Architecture. Available at: www.oio.dk/arkitektur/english. Last accessed June 2006.

Minoli, D. (2008). Enterprise Architecture A to Z: Frameworks, Business Process Modeling, SOA, and Infrastructure Technology. Auerbach Publications.

Moon, M. J. (2002). The Evolution of E-Government among Municipalities - Rhetoric or Reality? Public Administration Review, 62(4), 424 - 433.

Morgan, G. (1986). Images of organization. Beverly Hills ; London, Sage

Morton, M. S. S. (1991). The Corporation of the 1990s: Information Technology and Organizational Transformation. Oxford University Press.

Moulder, E. (2001). E-government: if you build it will they come. Public Management, 83(8), 10-14.

Myers, M. D. (1997). Qualitative Research in Information Systems. MIS Quarterly, 21(2), 241-242.

Newell, S., Swan, J. and Galliers, R. D. (2000). A knowledge-focused perspective on the diffusion and adoption of complex information technologies: the BPR example. Information Systems Journal, 10, 239-259.

Newell, S., Swan, J. and Robertson, M. (1998). A cross-national comparison of the adoption of business process reengineering: fashion-setting networks? The Journal of Strategic Information Systems, 7(4), 299-317.

Niederman, F., Brancheau, J. C. and Wetherbe, J. C. (1991). Information systems management issues in the 1990s. MIS Quarterly, 15(4), 475-499.

Nolan, R. L. (1973). Managing the computer resources: A stage hypothesis, Communications of the ACM, 16(7), 399-405.

Nolan R. L. and Mulryan, D. W. (1987). Undertaking an Architecture Program. Stage by Stage 7(2).

Norris, D. F. and Moon, M. J. (2005). Advancing e-government at the grass roots: tortoise or hare? Public Administration Review, 65(1), 64-75.

OECD (2007). Towards Better Measurement of Government. OECD Working Papers on Public Governance, 1, OECD Publishing.

OECD (2005). OECD Peer Review of E-government in Denmark. OECD Publishing.

OMB (2002). The federal enterprise architecture reference models. Available at: www.whitehouse.gov/omb/egov/a-2-EAModelsNEW2.html. Last accessed March 2005.

Oliver, C. (1991). Strategic responses to institutional pressures. Academy of Management Review, 16(1), 145-179.

Open Group (2003). TOGAF (The Open Group architecture framework) version 8.1. White Paper, San Francisco. Available at www.opengroup.org/architecture/togaf8/downloads.htm. Last accessed April 2006.

Orlikowski, W. J. (1992). The Duality of Technology: Rethinking the Concept of Technology in Organizations. Organizational Science, 3(3), 398-427.

Orlikowski, W. J. (1996). Improvising organizational transformation over time: A situated change perspective. Information Systems Research, 7(1), 63-92.

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

Pardo, T. A., Cresswell, A. M., Dawes, S. S. and Burke, G. B. (2004). Modeling the social & technical processes of interorganizational information integration. Proceedings of the 37th Hawaii International Conference on System Sciences.

Park, J. and Ram, S. (2004). Information systems interoperability: What lies beneath? ACM Transactions on Information Systems, 22(4), 595-632.

Patton, M. Q. (1990). Qualitative Evaluation and Research Methods. Newbury Park, CA, Sage Publications.

Pechtold, A. (2006). Resultaten van de onderzoeken naar administratieve lasten. Letter to the parliament of the Minister of Innovation. Available at: www.lastvandeoverheid.nl/LVDO/Web/Resultaten/Pechtold+brengt+bureaucratie+voor+burgers+in+kaart/. Last accessed January 2006 (in Dutch).

Perkins, A. (2000). Critical success factors for enterprise architecture engineering. Alexandria, VA: Visible Systems Corporation.

Peristeras, V. and Tarabanis K. (2000). Towards an enterprise architecture for public administration using a top-down approach. European Journal of Information Systems, 9(4), 252-260.

Peristeras, V., Loutas, N., Goudos, S. K. and Tarabanis, K. (2008). A conceptual analysis of semantic conflicts in pan-European e-government services. Journal of Information Science, 34(6), 877-891

Pettersen, I. J. (1995). Budgetary control of hospitals - Ritual rhetorics and rationalized myths? Financial Accountability & Management, 11(3), 207-222.

Pfeffeer, J. and Salancik, G. (1978). The External Control of Organizations: A Resource Dependence Perspective. Harper & Row, New York, NY.

Pollitt, C. and Bouckaert, G. (2004). Public Management Reform. Oxford University Press.

Porter, M. E. (1985). Competitive Advantage: creating and sustaining superior performance. Free Press, New York.

Porter, M. E. and Millar, V.E. (1985). How information gives you competitive advantage. Harvard Business Review, July-August, 149-160.

Powell, W. W. (1991). Expanding the scope of institutional analysis. In Powell, W.W. and DiMaggio, P.J. (Eds), The New Institutionalism in Organizational Analysis, The University of Chicago Press, Chicago, IL, pp. 183-203.

Prahalad, C. K. and Hamel, G. (1990). The core competence of the corporation. Harvard Business Review, 68(3), 79-92.

Premkumar, G. and King, W. R. (1994). Organizational characteristics and information systems planning: an empirical study. Information Systems Research 5(2), 75-109.

Premkumar, G., Ramamurthy, K. and Nilakanta, S. (1994). Implementation of electronic data interchange: an innovation diffusion perspective. Journal of Management Information Systems, 11(2), 157-86.

Pressman, J. L. and Wildavsky, A. (1984). Implementation – How Great Expectations in Washington Are Dashed in Oakland. University of California Press.

Pulkkinen, M. and Hirvonen, A. (2005). EA planning, development and management process for agile enterprise development. Proceedings of the 38th Annual Hawaii International Conference on System Sciences.

Radnitzky, G. (1970). Contemporary Schools of Metascience, Goteborg: Scandinavian University Books.

Reddick, C. G. (2004). A Two-Stage Model of E-Government Growth: Theories and Empirical Evidence for U.S. Cities. Government Information Quarterly, 21(1), 51-64.

Reinermann, H. (1988). Vor einer "Verwaltungsreform?" Informationstechnisch motivieerte Ziele und "Systemkonzepte" der Verwaltungspolitik. In H. Reinermann, H. Fiedler, K. Grimmer, K. Lenk and R. Traunmuller, Neue Informationstechniken Neue Verwaltungsstruckturen? Heidelberg, Germany: R.v. Decker and C.F. Muller, pp.38-50.

Richardson, G. L., Jackson, B. M. and Dickson, G. W. (1990). A principles-based enterprise architecture: lessons from Texaco and Star enterprise. MIS Quarterly, 14(4), 385-403.

Ritchie, J. and Lewis, J. (2003). Qualitative Research Practice: A Guide for Social Science Students and Researchers. SAGE Publications Ltd.

Robson, W. (1997). Strategic management and information systems. (2nd Ed.). UK: Financial Times, Pitman Publishing.

Rogers, E. M. (1995). Diffusion of Innovations. The Free Press, New York, NY.

Rohleff, M. (2005). Enterprise Architecture - Framework and Methodology for the Design of Architectures in the Large. Proceedings of the Thirteenth European Conference on Information Systems, ECIS, Regensburg, Germany.

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

Ross, J. W., Weill, P. and Robertson, D. C. (2006). Enterprise Architecture as Strategy: Creating a Foundation for Business Execution. Harvard Business School Press, Boston.

Sambamurthy, V. and Zmud R. W. (1999). Arrangements for Information Technology Governance: A Theory of Multiple Contingencies. MIS Quarterly, 23(2), 261-290.

Schekkerman, J. (2004). How to Survive in the Jungle of Enterprise Architecture Frameworks: Creating or Choosing an Enterprise Architecture Framework. 2nd edition, Trafford Publishing, Victoria, British Columbia.

Schekkerman, J. (2008). Enterprise Architecture Good Practices Guide: How to Manage the Enterprise Architecture Practice. Trafford Publishing, Victoria, British Columbia.

Schoeniger, E. (2000). Retooling government for the Internet economy. Unisys Exec, September-October, 15-23.

Scholl, H. J. (2005). E-government-induced business process change (BPC): an empirical study of current practices. International Journal of Electronic Government Research, 1(2), 27-49.

Schroeder, R. G., Van de Ven, A. H., Scudder, G. D. and Polley, D. (1989). The development of innovation ideas. In: Research on the Management of Innovation: the Minnesota Studies Van de Ven, A.H., Angle, H.L. & Poole, M.S. (eds), pp. 107–134. Harper & Row, New York.

Scott, W. R. (2001). Institutions and Organizations. Sage, Thousand Oaks, CA.

Scott, W. R. and Meyer, J. W. (1994). Institutional Environments and Organizations: Structural Complexity and Individualism. Sage, Thousand Oaks, CA.

Scott, W. R., Ruef, M., Mendel, P. J. and Caronna, C. A. (2000). Institutional Change and Health Care Organizations: From Professional Dominance to Management Care. University of Chicago Press, Chicago, IL.

Schultz, U. and Boland R. Jr. (2000). Knowledge management technology and the reproduction of knowledge work practice. Journal of Strategic Information Systems, 9(2-3), 193-212.

Segars, A. H. and Grover, V. (1996). Designing company-wide information systems: Risk factors and coping strategies. Long Range Planning, 29(3), 381-392.

Segars, A. H. and Grover, V. (1998). Strategic information systems planning success: an investigation of the construct and its measurement. MIS Quarterly, 22(2), 139-63.

Segars, A. H. and Grover, V. (1999). Profiles of Strategic Information Systems Planning. Information Systems Research, 10(3), 199-232.

Selznick, P. (1996). Institutionalism "Old" and "New". Administrative Science Quarterly, 41(2), 270-277.

Sertillanges, A. D. (1978). The Intellectual Life: Its Spirits, Conditions and Methods. Dublin: Mercier Press.

Shaw, T. and Jarvenpaa, S. (1997). Process models in information systems. Information systems and qualitative research. In: A. S. Lee, J. Liebenau and J. I.DeGross. London, Chapman and Hall: 70–100

Simon, H. (1960). The New Science of Management Decision. Harper and Row, New York.

Sowa, J. F. and Zachman, J. A. (1992). Extending and formalizing the framework for information systems architecture. IBM Systems Journal, 31(3), 590-616.

Spewak, S. H. (1992). Enterprise Architecture Planning – Developing a Blueprint for Data, Applications and Technology. John Wiley & Sons, Inc, New York.

Stamoulis, D., Gouscos, D., Georgiadis, P. and Martakos, D. (2001). Revisiting public information management for effective e-government services. Information Management & Computer Security 9(4), 146-153.

Strauss, A. and Corbin, J. (1990). Basics of Qualitative Research: Grounded Theory Procedures and Techniques. Newbury Park, CA: Sage Publications.

Strauss, A. and Corbin, J. (1998). Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory. Sage, Thousand Oaks, CA.

Sullivan, C. H. (1985). Systems Planning in the Information Age. Sloan Management Review, 26(2), 3-12.

Susman, G. I. and Evered, R. D. (1978). An Assessment of the Scientific Merits of Action Research. Administrative Science Quarterly, 23(4), 582-603.

Teo, T. S. H. and Ang, J. S. K. (2001). An examination of major IS problems. International Journal of Information Management, 21(6), 457–470.

Tornatzky, L. G. and Klein, K. J. (1982). Innovation characteristics and adoption-implementation. IEEE Transactions on Engineering Management, EM-29(1), 28-45.

Traunmüller, R. and Wimmer, M. (2003). E-Government at a Decisive Moment: Sketching a Roadmap to Excellence. R. Traunmüller (Ed.). Proceedings of the 2nd International Conference, EGOV, Springer Verlag.

Van de Ven, A. H. (2007). Engaged Scholarship: A Guide for Organizational and Social Research. Oxford University Press, USA.

Vreede, G. J. (1995). Facilitating Organizational Change: The Participative Application of Dynamic Modelling. Published PhD Dissertation, Delft University of Technology.

Walsham, G. (1993). Interpreting Information Systems in Organizations. Wiley, Chichester.

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

Ward, J. and Peppard, J. (2002). Strategic planning for information systems, (3rd Edition). Chichester, UK. John Wiley & Sons.

Webster, J. and Watson, R. T. (2002). Analyzing the Past to Prepare for the Future: Writing a Literature Reveiw. MIS Quarterly 26(2).

Weerakkody, V., Janssen, M. and Hjort-Madsen, K. (2007). Integration and Enterprise Architecture Challenges in E-Government: A European Perspective. International Journal of Cases on Electronic Commerce, 3(2), 14-38.

Weill P. (2004). Don't Just Lead, Govern: How Best Performing Organizations Govern IT. MIS Quarterly Executive, 3(1), 1-17.

Weill, P. and Ross, J. W. (2004). IT governance - How top performers manage IT decision rights for superior results. Boston, MA: Harvard Business School Pres.

Weill, P. and Ross, J. W. (2005). A matrixed approach to designing IT governance. MIT Sloan Management Review, 46(2), 26–34.

Weill, P., Subramani, M. and Broadbent, M. (2002). Building IT Infrastructure for Strategic Agility. Sloan Management Review, Fall, 57-65.

Weiner, M. E. (1969). Service: The Objective of Municipal Information Systems. Storrs, CN: Institute of Public Service, University of Connecticut.

West, D. M. (2004). E-Government and the Transofrmation of Service Delivery and Citizen Attitudes. Public Adminstration Review, 64(1).

Westrup, C. (2003). Discourse, management fashions, and ERP systems. In Global and Organizational Discourse about Information Technology. Kluwer Academic Publishers, Norwell, Mass.

Wildavsky, A. (1987). Choosing preferences by constructing institutions: a cultural theory of preference formation. The American Political Science Review, 81(1), 3-22.

Wilson, J. Q. (1989). Bureaucracy – What Government Agencies Do And Why They Do It. Basic Books.

Wimmer, M., Codagnone, C. and Janssen, M. (2008). Future e-Government Research: 13 Research Themes Identified in the eGovRTD2020 Project. Proceedings of the 41st Hawaii International Conference on System Sciences.

Wolfe, R. A. (1994). Organisational Innovation: review, critique and suggested research directions. Journal of Management Studies, 31(3), 405–431

World Economic Forum (2009). The Global Information Technology Report 2008-2009. Available at: http://www.weforum.org/en/initiatives/gcp/Global%20Information%20Technology%20Report/index.htm. Last accessed February 2009.

Wright Mills, C. (1959). The Sociological Imagination. New York: Oxford University Press.

Yin, R. (1994). Case study research - design and methods. Thousand Oaks, CA: Sage.

Zachman, J. A. (1987). A Framework for Information Systems Architecture. IBM Systems Journal, 26(3), 454-470.

Zucker, L. G. (1983). Organizations as Institutions. Research in the Sociology of Organizations, JAI Press, Greenwich, CT, S.B. Bacharach.

Publication I

Hjort-Madsen, K. and Gotze, J. (2004). "Enterprise Architecture in Government -
Towards a Multi-Level Framework for Managing IT in Government," Proceedings
of 4th European Conference on e-Government, Dublin, Ireland, pp. 365-374

Enterprise Architecture in Government - Towards a Multi-Level Framework for Managing IT in Government

Kristian Hjort-Madsen and John Gøtze
National IT and Telecom Agency, Denmark
khm@itst.dk
jgz@itst.dk

Abstract: This paper outlines a theoretical framework for a research project in progress focusing on the management of information systems at different levels in government through the use of enterprise architecture in conjunction with the European Interoperability Framework. In response to the growing business and civilian demands for improved service and efficiency, public sectors in Europe are restructuring with e-government initiatives. Many of these e-initiatives have, however, failed to illustrate success in practice, and even though the e-government field has matured over the last few years, there is fairly little research in the ability of public institutions to evolve, develop and manage new information systems that helps realize the potential of e-government. This paper introduces enterprise architecture as an information systems architecture approach for solving various interoperability challenges at different levels of government. The paper argues that information systems architecture has been a lost realm in e-government research, and that there is a need for a broad and integrated view that takes both organization, semantic and technology in government into account.

Keywords: Enterprise Architecture, e-Government, European Interoperability Framework, Information system architecture, IS planning, IS management

1. Introduction

In response to the growing business and civilian demands and expectations for improved service and efficiency, governments and government institutions in Europe are transforming their traditional service-delivery channels and internal operations by an intensive use of IT and communication technology. Since the 1990's, the introduction of information technology has promised to optimise government service delivery, constituency participation and internal government operations through the use of new IS-based management paradigms for the public sector (see e.g. Bellamy and Taylor, 1998). The successful private sector experiences with e-commerce have raised expectations for government service delivery, and citizens and businesses now want services "anytime, anywhere" through multiple channels like they know it from the private sector (Schoeniger, 2000). However, despite a few significant success stories, many governments and individual institutions are failing to deliver the kind of benefits that were expected from the incurring huge cost and scheduling overruns[1].

In practice, the challenge in government institutions is that many e-government initiatives require information exchange in networks of various governmental organizations. Most public institutions today manage technology in what is popularly described as "stove pipes" or "islands", with individual institutions implementing their own channels, web page applications and supporting infrastructure (Hamburg and Bekkers, 2002). While much of recent public sector management reform e.g. the introduction of New Public Management (NPM) has been about giving more autonomy to organizational units (se the outline of NPM below), digital government requires a tremendous amount of central co-ordination to yield system-wide adaptation and horizontal action (Allen et al., 2001). The pressure to coordinate has always been present in government, but the Internet has escheated this need, and in the future, barriers to efficient service provision arising from the way government institutions are organized will not be accepted by neither politicians nor public institutional leaders (Hazlett and Hill, 2003). e-Government is not just 'old government' plus the Internet; it is the use of new technologies to transform public institutions and to provide new ways of working – organizing government front and back offices in a way that places citizens and business at the centre of attention.

---

[1] Meta Group reports that only 25% of projects deliver on their narrowly-defined "project only" goals and only 12% deliver any strategic business advantage (see metagroup.com).

When working with the management of IT in the public sector, political scientists and other researchers in this field need to draw on the research perspectives developed in the IS discipline. As Baskerville and Myers (2002) have pointed out, IS has much to offer researchers in other disciplines and IS scholars should consider where there might be opportunities for cross-field collaboration with e.g. political scientists. However, most IS e-Government research has focused little on the interoperability challenges that governments in most countries are facing in the struggle to support the exchange of data and the sharing of information and knowledge across IT-systems and business processes. In the literature on e-government, the focus is often on the interaction between governmental institutions and citizens – the front-office (see e.g. the excellent study by West, 2004). This paper argues that there is a need to address the interdependence across institutions in government – the back-office. e-Government practice and research is very much about cooperation between government institutions in order for them to provide quality and reliable services for business and civilians. As stated by Stamoulis et al. (2001) the value of offering governmental services through a plethora of user-friendly electronic channels is not the biggest issue in e-government. The big issue in e-Government research lies in the area of strategy and planning, and more emphasis must therefore be put on business strategy and information systems architecture.

With a private sector focus, a number of IS researchers have been paying attention to the management of *IT infrastructure* and related capabilities and artefacts in information systems architecture (Broadbent and Weill 1997; McKeen and Smith 2002a; Weill, Subramani and Broadbent 2002). However, this line of research remains unfamiliar to the majority of the e-government literature. Many practitioners and scholars have tried to build frameworks for connecting the citizen interface (front-end) of the transaction services with the organization's back-office to complete the processing cycle and offer the rich spectrum of services that customers want and governments have promised. Some of these have been successful, but the majority has failed because there has not been enough emphasis on optimising existing business processes in the back-office through the use of technology (Hamburg and Bekkers, 2002). In order for e-government initiatives to be successful we need to develop a framework for managing IT at different levels of governments where back-office operations are also to be taken into account (Bekkers, 1998). There is a need for an integrated approach to the management of information systems in government institutions that incorporates organizational as well as semantic and technological issues.

In this paper, enterprise architecture (EA) is introduced as an information systems architecture approach a government can employ to manage e-Government initiatives at state, regional and local levels though a systemic alignment of the IT function within the business vision of the institution. Theory about institutions in the public sector and different IS architecture disciplines is outlined to address the need for an integrated approach to managing IT through the use of EA in government institutions. A tentative framework is proposed on the basis of the theoretical presentation, literature on the management of information systems in government settings and the hitherto limited findings in the research project.

2. Information systems architectures and institutional theory in e-Government research

In this section, the theoretical assumptions underpinning the research project on the dynamics of institutional behaviour in the public sector and different information systems architectures is briefly presented. The paper mainly draws on theory from information systems management processes in the IS discipline (cf. Davis, 2000) while institutional theory from political science is brought in to understand the difference between managing IT in industry and government respectively.

2.1 Institutional theory in e-Government

The organization of the public sector is about the distribution of responsibilities and competences between politicians and government institutions; how the public institutions are financed, and how this is brought to work in practice (Christiansen, 1998: p. 195). Coming from

different traditions, institutional theory in the political science discipline is concerned with the organizational structure and behaviour in public institutions (Hall and Taylor, 1996). On the one hand public institutions must be responsive to business and civilian requirements through democratic access to the public sector, and on the other hand institutions must secure efficiency and effectiveness in their everyday operations. So far however, e-Government research has mainly focused upon the first aspect, the transactions between identifiable customers (citizens, businesses and public institutions), while the latter aspect, the efficiency in the multitude of government institutions in charge of registering objects, issuing passports, collecting taxes or paying benefits, has been less investigated (Bekkers, 1998).

In practice however, one of the largest challenges in managing e-government is coordinating IT-initiatives in public institutions at the local, regional and national level. A recent U.S. government study found that the greatest concerns for e-government managers were not democratic or technical issues, but instead policy issues, including coordination and collaboration between institutional leaders and agency-centric thinking, rather than focusing on the overall goals and functions of e-government, and improving communication to better understand and foster inter-relationships between e-government projects (see whitehouse.gov). Like other areas in the public sector, the lack of coordination between and across, the national, regional and local level can have a significant impact on the success of government efforts in general (Bogason, 2003).

The New Public Management (NPM) philosophy (see Hood, 1991) has in many western countries resulted in an arrangement of back offices of organizations whose goals do not necessarily overlap (Hamburg and Bekkers, 2002). NPM has, among other things, resulted in the breaking-down of large organizations into networks of relatively autonomous organizations, and many policy processes are therefore fragmented over several administrative organizations in "stove pipes" and "islands" because organizations in networks are often unwilling to comply with arrangements that may not be designed to suit them (Pfeffer and Salancik, 1978). The introduction of managerial processes and behavior from the private sector has had several positive effects (see e.g. Box 1999). But, as described by Allan et al. (2001), digital government requires more coordination than "traditional" policy areas in public institutions. The fact that governments are divided into competing institutions within and between the three different levels outlined above limits the policy makers' ability to get bureaucrats to work together to promote e-government innovations (West, 2004), just as the individual institutions must work via a complex tissue of cooperation involving many different acting entities (Traunmüller and Wimmer, 2003). The results have so far been that complex bureaucratic maze has been duplicated on the web, where institutional web sites serve to perpetuate their own mission and do little to enhance responsiveness or citizens' participation (Davis, 1999).

These interoperability challenges are further deteriorated by the complex goal structure and the strict legal norms that public institutions must work under delivering services to business and citizens, securing transparency, etc. (Traunmüller and Wimmer, 2003). Unlike most private enterprises, government institutions often spend much of their time fending off challenges from rival institutions (wanting to take some of their turf), coping with the criticism from the media and interest groups, and trying to win or maintain political support (Wilson, 1989). Debates over where (at state, regional or local level) and what public institutions should do and how they should do it are continuous, and the maintenance of support is a never-ending, time-consuming process. In contrast to a private head of a business, who refer to the board of directors and is judged and rewarded on the basis of the firm's bottom line, the head of a public institution is often judged and rewarded on the basis of appearance of success because their goals are often vague, multidimensional or simply difficult to achieve, and the progress toward their realization is hard to assess (Ibid).

2.2 Different architecture disciplines and enterprise architecture

Enterprise architecture is not an entirely new discipline in IS. As pointed out by Päivärinta and Opdahl (2003) the often broad definitions of information systems architecture have close relations to traditional concepts in the IS literature, like Information Resource Management (Nolan 1973; Nolan 1977; Nolan 1979), Information Architecture or Enterprise Information

Architecture (Cook 1996) and Strategic Information Systems Planning (Ward and Peppard 2002) because EA addresses the current and planned totality of information systems (Hirschheim et al., 1995). Furthermore, there exist different architecture disciplines like software architectures, hardware architectures, network architectures and system architectures that confuse the meaning of "architecture". While e.g. software architecture describes the layout of the software modules and the connections and relationships among them, hardware architecture can describe how the hardware components are organized (Armour et al., 1999). The term "architecture" can therefore have a range of meanings, goals, and abstraction levels, depending on the discipline speaking about it. A typical EA, however, encompasses an overview of the entire information systems – including software and hardware. In this sense, EA is a multidimensional discipline with an extensive scope that needs to cover a wide variety of viewpoints, deliverables, and processes across the whole enterprise. A fully articulated architecture constitutes enterprise architecture: the integration of business, data, information, and technology into a coherent whole (Boar, 1999).

The idea of having an information systems architecture to manage and coordinate information systems in an enterprise has been around since 1987 when John Zachman first proposed the idea and conceived a series of frameworks that would help model them. Inspired by Boar (1999) *this paper defines EA as an information systems architecture approach with a series of architectural concepts, principles, guidelines, drawings, standards, and rules which guide an institution through acquiring, outsourcing, integrating, building, modifying, operating and retiring IT resources throughout an enterprise.* In e-government terms, EA is about creating the support over time, which governments and government institutions need to foster the ability to align the institution's business strategy, IT strategy, and individual programs and projects. In this way, information systems architecture is a manifestation of IT strategy. The goal is to improve efficiency and services through shared infrastructure and services and improved application and data interoperability.

Several approaches exist for documenting an EA, ranging from the Zachman Framework mentioned above; the Federal Enterprise Architecture Framework (FEAF) in the USA; and a number of major consulting organizations with proprietary frameworks. These frameworks differ in their nomenclatures and modelling approach, but they consistently provide for defining an enterprise's operations in both (1) logical terms, such as interrelated business processes and business rules, information needs and flows, and work locations and users, and (2) technical terms, such as hardware, software, data, communications, and security attributes and performance standards. Although frameworks may differ in some of their descriptive techniques, they all focus on the necessity of integrating a business model with technology, information, and data models that support it. Architecture is a disciplined approach to understanding how components of an enterprise communicate, change, and function together as a whole. The frameworks also provide for defining these perspectives both for the enterprise's current or "as-is" environment and for its target or "to-be" environment, as well as a transition plan for moving from the "as-is" to the "to-be" environment. Enterprise Architecture does not assume "centrality of control", but does talk about strong governance and managerial ways of dealing with drifting (Chorafas, 2002).

In Europe little effort has been made by public institutions in implementing such frameworks and very few departments are exploiting their business processes to the minimum extend required to institute the change necessary to realize the benefits of EA. Today, almost every department has its own architecture (conceptualised or not) with a countless number of overlapping systems, bundles of duplicate data and inconsistent presentation to the customer. As Zachman has stated "this is an accident of how technology has matured rather than particularly the fault of a department, individual or supplier" (zifa.com).

In the next section some of the interoperability challenges that governments are facing at different levels are briefly sketched out from an EA perspective and EA is used as an information systems architecture to outline an initial framework for managing IT in government. The main argument is that EA, and information systems architectures in general, are poorly understood and managed in public institutions and e-Government research, at a time where

governments and government institutions in Europe are transforming their traditional service-delivery channels and internal operations by an intensive use of IT and communication technology. EA has been a lost realm in e-government practice and research, lost between organization-level approaches to strategic IS planning and IT management and technology-level approaches to enterprise computing. The goal of the proposed EA initiatives is the articulation of all levels of a public institution, integrating the strategic and business processes with the technology and data systems that enable them.

3. The interoperability challenges in government – Laying the foundation for a framework for managing IT in government at different levels

According to a recent international report published by the consultancy company, Accenture (2003) on e-government leadership, one of the largest challenges in developing an efficient and service-oriented e-government is creating interoperability between IT-systems and business processes across institutional borders in government. As it was pointed out above, public sectors in Europe are today organized in "stove pipes" and "islands" where both business processes and IT-systems have been developed to support a single public institution and little attempt has been made to support the exchange of data and the sharing of information and knowledge across IT-systems and business processes. There is very little reuse of data and functionality and each institution therefore develops their own specific work routines and IT-systems. The challenge of creating interoperability between systems arise because there is no overall coordination of the different e-government initiatives in the "stove pipes" and because different institutions, in sectors or on their own, often have no dimidiate incentives or opportunities of sharing data and functionality with other institutions.

The challenge here is to 're-write the rules' for how government institutions use EA as an information systems architecture to work internally, interact with their customers (citizens and businesses) and use IT to increase productivity by making business transactions easier to carry out. In this section, the challenges of managing IT in government institutions are briefly examined from an EA perspective and an initial framework for dealing with these issues in the research project is outlined.

3.1 The different enterprise architecture levels of government

As we saw in section 2.1, institutions within and across the different levels of government - local, regional and national - have different agendas and there is a complex mixture of cooperation and conflict between public institutions with multifaceted goal structures. In EA terms it is therefore challenging to define what the "enterprise" is in a governmental context.

The EA literature typically defines the enterprise as the planning and management of IT in a single organization – small companies as well as large enterprises (see e.g. Chorafas, 2002, Boar, 1999 or Spewak, 1992). In this sense, the management of all kinds of technologies in public institutions at all levels constitutes enterprises on their own as defined in the "traditional" EA literature. However, individual public institution at state, regional and local level might at the same time be part of other enterprises at a higher level in government, just as all government enterprises are also part of the overall national enterprise.

The argument put forward here is that managing IT in government with different levels of enterprises creates some interoperability challenges that are unique to the public sector. At the national level there is rarely a transparent overview over the different e-government initiatives at the federal level, and at the regional and local level there is hardly any (West, 2004). And similarly, different areas of government often lack an overall coordination of their specific area and it is therefore up to the different institutions in the sector to coordinate between each other on a bilateral basis (Bellamy and Taylor, 1994). The argument is that the different enterprise levels in the public sector challenge the traditional EA literature and calls for a multi-level approach to EA. The public sector and the IT-management in public institutions is different from managing private enterprises due to the complex goal structure and the coordination challenges summarized in section 2.1.

In order to place the civilian and business needs at the centre of attention and overcome some of the coordination challenges that are generated through this arrangement, the different enterprise levels must start with a business process perspective that often cut across the traditional levels in government. The different EA levels in government may well be organized in accordance with the traditional state, regional and local categorization. But while the EA ambition is to integrate strategic and business processes with technology and data in one enterprise (Boar, 1999) – governments must do the same across different enterprise levels.

To reach this goal, (at least) three levels in a government are defined below where there is a need for an integration of business processes with technology and data though the use of EA on both logical and technical terms:

- **The national level**: At the national level, the enterprise represents all of government, and all public institutions at state, regional and local level must therefore be included in the EA management effort.

- **The sector level**: At sector levels, e.g. the health care sector, a group of public institutions across the different governmental levels constitute the enterprise that must be managed from a business process perspective focusing on the customers via EA.

- **The institutional level**: At institutional level each institution represents its own enterprise at the state, regional and local level with their own EA guidelines. An institution is de-facto part of the national level, while it can be part of one or many sectors.

The ambition with the introduction of a national level EA that explicitly includes all government institutions and the EA sector focus on business processes that span stat, regional and local institutions, is to use the multi level EA approach to facilitates a better management of e-government initiatives across the different national levels. Coordinating according to principles and the overall business processes in government should help coordinate some of the interoperability problems that arise when there are not well defined standards and guidelines describing the way in which public institutions interact with each other at the state, regional and local level.

3.2 Towards a government wide enterprise architecture – Outlining a framework for managing IT in government

To overcome some of the challenges mentioned above, governments must introduce new ways of coordinating the IT management at the different levels of government. As we have seen, one of the largest challenges in many governments today, is that government is an organization of organizations with both willing and warring federations across several units and inside each unit. Because there is often a lack of governance and coordination between the different levels in government and little have been done to support the exchange of data and the sharing of information and knowledge across IT-systems and business processes, individual e-government projects today have no national, sector, or institutional guide lines to guide them through projects and they are consequently carried out with no consideration to the overall objectives of the national e-government strategy[2]. The challenge here, however, entails more than just comparing different information systems architecture frameworks in different public institutions against each other on a bilateral basis. The process involves a rigorous research program that analyses the planning, development, and implementation of different architecture frameworks and longitudinally follows their life cycle from the formulation of as-is realities to to-be states (Bellman, 2003). The framework outlined below should therefore only be seen as an initial attempt to guide the use of EA as an information systems architecture approach to the management of information systems in government institutions that incorporates organizational as well as semantic and technological issues. In this way, the framework is not an attempt to create a new EA approach like the Zachman framework or the definition of specific EA work products, but a pragmatic framework for the coordination of different e-government initiatives across government.

---

[2] See e.g. the Bonnerup-report for a Danish illustration of this lack of coordination (Teknologirådet, 2001).

Using EA in government can help coordinate business strategy, IT strategy, and individual programs and projects in public institutions through a high-level principle driven approach, which leaves room for the bottom-up autonomy that is also a prerequisite for creating new and innovative e-government solutions (cf. Eriksén et al. 2003). To reach this goal the three enterprise-levels outlined above must be taken into consideration and different types of interoperability have to be included in a framework representing different challenges for government institutions. The European Interoperability Framework under the IDA program in EU (see europa.eu.int) outlines three types of interoperability in their definition of interoperability in the eEurope 2005 Action Plan that must be considered at the different EA-levels in government:

- **Organizational interoperability**: The coordination and alignment of business processes and information that span both intra and inter-organizational boundaries.

- **Semantic interoperability**: Ensuring that the precise meaning of exchanged information is understandable by any application or person receiving the data.

- **Technical interoperability**: The technical issues of connecting information systems for the exchange of data or functionality.

The overall objective with the European Interoperability Framework is similar to the traditional EA ambitions: the integration of business, data, information, and technology into a consistent whole. What the EU-framework adds to the traditional EA literature is the multi-level approach that spans all government institutions. By creating interoperability guidelines across the traditional organizational boundaries government institutions, with different internal organization for their operation, can collaborate to make services available, findable, accessible and user oriented while the precise meaning of exchanged information and issues of linking up IT systems and services is secured.

The framework outlined in table 1 on the next page combines the different EA levels outlined in section 3.1 with a principle driven business processes focus and the different interoperability types facilitating the sharing of knowledge, information and data.

Table 1: An initial framework for managing IT in government

	Organizational Interoperability	Semantic Interoperability	Technical Interoperability
National level	Streamlining horizontal layered business processes that are common (maybe even consistent) across all public institutions	General agreement upon data definitions across all of government via a common global information model	Agreement on technical standards used and sharing of common services and high-level infrastructure components
Sector level	Coordinate the business processes that span entire sectors (with consideration to national principles)	A sector specific information model including common metadata (with consideration to national principles)	Sector specific technical standards and common services and infrastructure components (with consideration to national principles)
Institutional level	Internal streamlining of business processes (with consideration to national and sector principles)	Institutional specific information models (with consideration to national and sector principles)	Agreement upon standards for the institution (with consideration to national and sector principles)

The suggested framework for managing IT in government in table 1 is not a top-down centralized approach. It could at first glance seem appealing to call for centralized control and top-down management in the EA governance model like many private enterprises and some government enterprises, such as the US Department of Homeland Security, have championed. But this would be a dangerous move forward in government at large. As noted by Allen et al. (2001), governments should not make misguided pleas for decentralizing planning and decision making, and go against the trends in e.g. the NPM philosophy, but rather frame new types of collaborative mechanisms.

The idea here is that government institutions should not just consider their "own architecture" when developing new e-government initiatives. The individual institutions in government must comply with the general EA guidelines for organizational, semantic and technical interoperability on the national level, and act in accordance with the guidelines laid out by the sector (or sectors) that they are a part of. Working within the framework outlined, government institutions must see them selves as "sub-suppliers" or "service-providers" at the technology as well as the semantic and organizational-levels.

Achieving the EA vision in a single public institution is a huge challenge on its own (Spewak, 1992), and the introduction of the framework above should therefore be seen as an initial attempt to integrate the business models with technology and different information models that span government institutions. The model does not call for a "big-bang" reorganization of the way government or government institutions manage IT today and it is not another EA framework with specific architectural products. The ambition has been to establish a tentative framework on the basis of the information systems management theory and institutional theory from political science to understand and guide the management of IT in government institutions at different levels.

4. Conclusion

In this paper, theory from information systems management in IS and institutional theory from political science was used to present the first deliberations on a framework for the management of IT at different levels of government. The paper illustrates the limitations in the traditional EA literature on the use of information systems architecture in private enterprises to capture the dynamic interaction between individual institutions in government, and called for a multi-dimensional EA approach in government focusing on the integration of business processes with data and technology.

e-Government research in IS has mainly focused on the interaction between governmental institutions and citizens, while the interdependence and interoperability challenges across institutions in government to a large extend has been neglected. This paper argues that there is a need for further research in the area of strategy and planning, and more emphasis must therefore be put on business strategy and information systems architecture. Public administrators and politicians now expect public administration to be as efficient and effective as the private sector and we must therefore find an integrated architecture approach that goes beyond IT and incorporates all relevant business aspects of the public sector when implementing e-government initiatives.

Still needed is a comprehensive theoretical foundation for the use of EA to manage IT in government institutions at different levels and best practices and lessons to be learnt on the existing use of EA in governmental and private institutions. Institutional theory from political science and IS theory must be combined to understand the logic of managing IT in the public sector, while the successful private sector experiences with the use of EA must be used to grasp the benefits of using EA to manage IT-resources.

References

Allen, Barbara Ann; Juillet, Luc & Paquet, Gilles & Roy, Jeffrey (2001). E-Government and government on-line in Canada: Partnerships, people and prospects, Government Information Quarterly - 18, p. 93-104.

Armour, F.J.; Kaisler, S.H. & Liu, S.Y. (1999). Building an enterprise architecture step by step, IT Professional, Vol.1 Issue.4 , pp. 31 –39, IEEE.

Baskerville, Richard L. & Myers, Michael D. (2002). IS as a Reference Discipline, MIS Quarterly Vol. 26 No. 1, pp. 1-14/March 2002.

Bekkers, V.J.J.M. (1998). Wiring Public Organizations and Changing Organizational Jurisdictions, In: Snellen, I.Th.M., W.B.H.J. van de Donk. Public Administration in an Information Age. Amsterdam: IOS Press. Pp. 57 - 77.

Bellamy, C & Taylor, J (1994). Introduction: Exploiting IT in public administration. Towards the information polity, Special Issue of Public Administration, 72, Spring.

Bellamy, C. & Taylor, J.A. (1998). Governing in the Information Age, Open University Press, Buckingham.

Bellman, Beryl (2003). The Role of Enterprise Architecture in E-Government, published in the Proceedings of PISTA, Orlando.

Boar, Bernard H. (1999). Constructing Blueprints for Enterprise IT Architectures, John Wiley & Sons.

Bogason, Peter (2003). Forvaltning og stat, Systime, Denmark: Århus.

Box, R. (1999). Running government like a business: implications for public administration theory and research. American Review of Public Administration, 29, 19–43.

Broadbent, M., & Weill, P. (1997). Management by Maxim: How Business and IT Managers Can Create IT Infrastructures, Sloan Management Review: Spring 1997, pp 77-92.

Chorafas, Dimitris N. (2002). Enterprise Architecture and New Generation Information Systems St. Lucie Press, Boca Raton.

Christensen, Jørgen Grønnegaard et al. (1998). Offentlig og effektiv? Institutionelle valg i den offentlige sektor, Gyldendal, København.

Cook, M.A. (1996). Building Enterprise Information Architectures: Reengineering Information Systems, Prentice Hall, Upper Saddle River NJ, 1996.

Davis, G. (2000). Information Systems Conceptual Foundations: Looking Backward and Forward. In: Organizational and Social Perspectives on Information Technology, R. Baskerville, J. Stage, and J. DeGross (eds.), Kluwer.

Eriksén, S., Dittrich, Y., Fiedler, M., Aurell, M. (2003). It Takes More Than Two… Developing a TANGO Arena for Regional Cooperation around E-government. In: Traunmüller, R. (ed.), Electronic Government. Second International Conference, EGOV 2003, Prague, Czech Republic, September 2003, Proceedings. LNCS 2739, pp.472-77, Springer Verlag.

Hall. Peter A. & Taylor, Rosemary C. R. (1996). Political Science and the Three New Institutions, Politcal Studies, vol. 44, no. 5, PSA & Blackwell Public.

Hamburg, Vincent & Bekkers, Victor (2002). The Back-Office of E-Government (Managing Information Domains as Political Economies), Proceedings of the 35th Hawaii International Conference on System Sciences.

Hazlett, Shirley-Ann & Hill, Frances (2003). E-government: the realities of using IT to transform the public sector, Managing Service Quality; 2003, Vol. 13 Issue 6, p445.

Hirschheim, R., Klein, H.K., & Lyytinen, K. (1995). Information Systems Development and Data Modeling: Conceptual and Philosophical Foundations, Cambridge University Press, Cambridge, 1995.

Hood, C.C. (1991). A public management for all seasons. Public Administration. Vol. 69 (Spring). Pp. 3-9.

McKeen, J., & Smith, H. (2002). New Developments in Practice IV: Managing the Technology Portfolio, Communications of the AIS (9), pp 77-89.

Moulder, E. (2001). E-government: if you build it will they come, PublicManagement, Vol. 83 No. 8, pp. 10-14.

Nolan, R.L. (1973). Managing the computer resources: A stage hypothesis, Communications of the ACM (16:7), pp 399-405.

Nolan, R.L. (1977). Restructuring the data processing organization for data resource management," in: Information Processing 77, B. Gilchrist (ed.), North-Holland, Amsterdam.

Nolan, R.L. (1979). Managing the crisis in data processing, Harvard Business Review: March/April) 1979.

Opdahl, Andreas & Päivärinta, Tero (2003). The multiple Life Cycle Perspective on Information Systems Architecture, In: Proceedings of the 26th Information Systems Research Seminar in Scandinavia (IRIS).

Schoeniger, E. (2000). Retooling government for the Internet economy, Unisys Exec, September-October, pp. 15-23.

Spewak, Steven H. (1992). Enterprise Architecture Planning – Developing a Blueprint for Data, Applications and Technology, John Wiley & Sons, Inc, New York.

Stamoulis, D; Gouscos, D; Georgiadis, P & Martakos, D (2001). Revisiting public information management for effective e-government services, Information Management & Computer Security 9/4, pp. 146 - 153, MCB University Press.

Teknologirådet, (2001). Erfaringer fra statslige IT-projekter – hvordan gør man det bedre? – Rapport og anbefalinger fra en arbejdsgruppe under Teknologirådet.

Traunmüller, R. & Wimmer , M. (2003). E-Government at a Decisive Moment: Sketching a Roadmap to Excellence. R. Traunmüller (Ed.). Proceedings of the 2nd International Conference, EGOV 2003. Springer Verlag, pp 1 – 14.

Ward, J. & Peppard, J. (2002). Strategic Planning for Information Systems, (3rd ed.) Wiley, Chichester.

Weill, P., Subramani, M., & Broadbent, M. (2002). Building IT Infrastructure for Strategic Agility," Sloan Management Review: Fall 2002, pp 57-65.

West, Darrel M. (2004). E-Government and the Transofrmation of Service Delivery and Citizen Attitudes, Public Adminstration Review, January/February 2004, Vol. 64, No. 1.

Wilson, James Q. (1989). Bureaucracy – What Government Agencies Do And Why They Do IT, Basic Books.

URL sites:

http://www.accenture.com
http://www.europa.eu.int
http://www.feapmo.gov
http://www.whitehouse.gov/omb/egov/2003egov_strat.pdf.
http://www.zifa.com

Publication II

Hjort-Madsen, K. and Burkard, J. (2006). "When Enterprise Architecture Meets Government - An Institutional Case Study Analysis," Journal of Enterprise Architecture, Volume 2, No. 2, pp. 11-25.

WHEN ENTERPRISE ARCHITECTURE MEETS GOVERNMENT: AN INSTITUTIONAL CASE STUDY ANALYSIS

Kristian Hjort-Madsen and Jakob Burkard

ABSTRACT

This study investigates the systemic challenges facing enterprise architecture programs in government. Drawing upon the institutional theory lens from the political science field, a Danish case study is used to explore why public agencies implement enterprise architecture programs and the challenges they face when governing these programs at different levels (vertically) and different functions (horizontally) of government. The analysis shows that enterprise architecture is not just a technical issue, as economic and political factors are equally important when establishing interoperable e-government services. The findings suggest that implementing enterprise architectures in government challenges the way information systems are organized and governed in public agencies. Interoperability challenges in government arise because there is no overall coordination of different information systems initiatives in the public sector and because public organizations have no economic and/or immediate political incentives to share data and business functionality with other organizations in their enterprise architecture programs.

KEYWORDS

enterprise architecture, institutional theory, interoperability, governance, e-government

INTRODUCTION

Enterprise Architecture (EA) is being embraced by many public agencies around the world as an important vehicle for e-government success (Schekkerman, 2004). With e-government progressing towards the integration of new and existing application architectures (to support different levels and functions of government services vertically and horizontally), the challenge is that government structures often impede the success of EA (Hjort-Madsen and Gøtze, 2004). Many public agencies have a highly fragmented information systems (IS) portfolio. Often no generic architecture is available to enable communication between front-office and back-office applications, between back-office applications, or with systems outside the organization (Janssen and Cresswell, 2005). Because of the systemic nature of the public sector, IS in public agencies often comprise

monolithic packages and thus are extremely difficult to reconfigure and to integrate. In short, EA programs face integration and interoperability challenges within and between public agencies that are difficult to overcome in government.

From an institutional perspective it is ironic how the introduction of new public management (NPM) reforms, which seek to modernize government by breaking-down large organizations into networks of relatively autonomous agencies, has not improved this coordination (Ferlie, Pettigrew, Ashburner, and Fitzgerald, 2004). As a result of NPM-inspired reforms in many western countries, there is often a lack of central management and individual programs are funded without regard to the overall enterprise planning perspective. Many policy processes are fragmented over several administrative agencies in "silos" that impede the government's ability to offer new,

integrated products and services, or to consolidate operations (Traunmüller and Wimmer, 2003). Introducing e-government means transforming the production processes of public services (not merely managing them, as in NPM) and public agencies are therefore exploring new ways to manage their IS assets with EA in ways that enable them to offer cross-cutting, interoperable e-government services.

Where commercial organizations are reengineering their respective enterprises to adjust to dynamically changing economic and market conditions, public agencies must adapt to support both business and civilian needs for improved services and the demands of the new e-economy (Boar, 1999). The goal is the full articulation of all levels of an enterprise, integrating the strategic and business processes with the enabling information, technology, and data systems (Ross, 2003). The purpose of an EA program is to guide an enterprise's business processes and the associated IS towards a common goal and to integrate business, data, information, and technology (Zachman, 1987; Bernard, 2005; and Schekkerman, 2005). The strength of an EA is that it embraces both the front and back office from a business *and* technology focus along with a governance model that guides the use of IS from a business perspective (Ross, 2003). Thus, many public practitioners believe that EA is the solution to the integration and interoperability challenges that the public sector is facing today.

The current approach to EA in many public agencies is that EA is defined as the planning and management of IS in a single organization (see for example, Boar, 1999). In reality, however, the management of e-government initiatives is only sparsely structured based on ad hoc cooperation in many inter-organizational settings. The principal obstacle in government is the high fragmentation, where many actors get involved when offering e-services. Having only a limited, single-organizational focus in EA projects in government agencies is a common problem of many running projects (Hjort-Madsen and Gøtze, 2004).

The development of EA management programs in public agencies is not sufficient in itself, since it is also essential to ensure implementation of the resultant EAs in government. Linking different public administrative services to provide quality and reliable e-government services requires that we understand the complex organizational cooperation – and conflicts – in public agencies (Stamoulis, Gouscos, Georgiadis, and Martakos, 2001). History has shown that the organizational use of IS is complicated. Studies show that 53 percent of all information technology (IT) projects end up as failures and only 30 percent of the implementation projects, such as Management of IS (MIS), are successful (Schultz and Boland, 2000). Thus, the development and management of appropriate EA programs and their effective implementation should be viewed as interdependent critical elements of the success of many contemporary public agencies.

Focusing on the organizational micro- and meso-level rather than national and international macro-level "interoperability frameworks," this interpretive case study explores the adoption of an EA program at Denmark's largest hospital to answer two research questions: (1) why public organizations implement EA programs; and (2) how interoperability is governed across different levels (vertical) and different functions (horizontal) of government in EA programs.

In order to examine the research questions empirically, an in-depth case study of the implementation and management of an EA at Copenhagen University Hospital (CUH) was conducted. The analysis is supported by material from the Danish government health sector and interviews with the Chief Architect from the Copenhagen Hospital Corporation (CHC) to gain an understanding of the interoperability considerations across organizational levels in EA programs. The analysis is conducted through the lens of institutional theory from the discipline of political science.

The next section of this article discusses interoperability in e-government, the EA foundation and the important concepts from institutional theory. The research method is then outlined and the case study is presented, followed by an analysis of the findings in the context of the theoretical framework. The article concludes with implications for the definition of interoperability in government and

a discussion of the extent to which the findings are generalizable for the use of EA in government.

ENTERPRISE ARCHITECTURE AND INSTITUTIONAL FORCES IN GOVERNMENT

EA is not just a technical discipline. Creating interoperable e-government services for citizens and businesses requires more than just having a common technical standard or using specific standards (e.g. WSDL) to create technical integration between two applications (Klischewski, 2003). Therefore, in government EA programs, interoperability must be defined more broadly as the ability of information systems and the business processes they support, to exchange data and enable sharing of information (see Park and Ram, 2004).

Public institutions often grow organically, fed by the current political environment (Wilson, 1983). As a result, agencies tend to merge, expand or close down, often leaving systems to be inherited by other governmental agencies. Furthermore, different institutional trends have resulted in choices of systems, not based on interoperability-enhancing reasons, but often instead on political, business, and people-influential reasons… situations in which solving an immediate technical (and political) issue has been the driving force rather than creating the best e-government services for citizens and businesses (Fountain, 2001). Over the years these factors have resulted in a large variety of systems, based the linking of almost any technology in proprietary complex spider webs on an ad hoc basis, which today need to be managed (through EA) to deliver faster and better e-government services.

Linking different administrative services to provide quality and reliable e-government services requires that we understand the complex linkages of cooperation – and conflicts – between government organizations (Traunmüller and Wimmer, 2003). The next section briefly outlines the foundation for EA and a theoretical framework based on institutional theory in the political sciences.

Enterprise Architecture

In information environments with instability, complex goal structures and strict legal norms like the public sector, equivocality is often high, and intensive communication cycles are necessary for sense making. Boar (1999) characterizes the contemporary enterprise for private companies (and many modern public agencies) as confronting hypercompetition on a global basis with temporary advantage supplanting sustainable advantage as the means to marketplace success. Boar describes how the ability to build temporary advantages is based on their agility. The ability to maneuver is a function of the malleability of IS, and this malleability is built on information systems architecture.

As an enterprise grows in size and complexity, there are several factors that impede its ability to stay agile and to solve the problems that it faces. The existence of isolated, overlapping, highly fragmented, and unrelated computerized applications within the same organization has resulted in major interoperability problems and "isolated islands of technology" (Peristera and Tarabanis, 2000). The point is rapidly reached where the factors that come into play in structuring and conducting the business of the enterprise become too numerous and complex to manage (Lyer and Gottlieb 2004).

Historically, a large part of the traditional IS planning literature has been about producing a specific system's plan (Pulkkinen and Hirvonen, 2005). When working with complex systems, designers have typically dealt with this complexity by breaking them into subsets or domains that are less complex than the original system (see, for example, Yourdon and Constantine, 1986; Gane and Sarson, 1979). For most organizations, the development of new IS is an ad hoc process that meets with only limited long-term success (Duchessi and Chengalur-Smith, 1998). It has been about producing a project plan with a single application focus, not choosing the project or providing the framework in order to choose.

With both new technologies and new ways to use IS in organizational activities, the area of IS management and planning has undergone a minor revolution during the last couple of years (McNurlin & Sprague 2002). The new trends are often associated with either EA planning, development, and management (The Open Group 2002, Pulkkinen and Hirvonen, 2005),

or Information Management (McNurlin and Sprague 2002), and Information Technology Governance (Sambamurthy and Zmud, 1999; Weill and Ross, 2004; Weill and Broadbent, 2002). While the two latter approaches take the viewpoint of the IT department and CIO in an enterprise, the EA approach stresses the planning and management of all IS assets and their architecture together with organizational structures and processes.

The challenge is that the concept of EA and IT architecture does not have a universally accepted definition in either the research or industry context (Ross, 2003). EA emerged as an independent discipline in the late 1980s with the work by Zachman (1987, 1992), and Spewak (1992) who popularized the EA term in the early 1990s. The concept has matured into a business-driven discipline, and in a recent textbook, Bernard (2005) defines EA as *"the analysis and documentation of an enterprise in its current and future state from an integrated strategy, business, and technology perspective"*

The primary strength of the EA approach is that it has greatly defined its concepts and instruments to predict and control complex technical systems. While many of the current models and concepts for the planning and management of EA in government are one-dimensional and a-contextual in scope, there seems to be no other approach that can match EA in this regard and it is therefore not surprising that it is being used in most large IS projects in the private and public sectors. The emphasis on pre-planned and well-defined procedures in EA has the clear advantage that it offers high understandability and provides a good basis for teaching and knowledge transfer. EA encompasses a holistic approach to IS planning that provides an overview of the entire enterprise – from business to technology (Schekkerman, 2004; Bernard, 2005; and Lankhorst, 2005). In this way, it is an easy approach to communicate for consultants and practitioners (as well as academics) and it gives users of IS the perception of control. Furthermore, EA is oriented toward efficiency and effectiveness in the management and implementation of IS in a way that seeks to conserve valuable resources in government. Traditional IS development and much of the IS literature about Information Engineering (Martin, 1983) and Information Systems

Architecture (Yourdon and Constantine, 1986) has a technical focus in which the basic idea is about producing a project plan, not choosing the project or, even better, providing the framework in order to choose. This type of planning is practical at the systems level but leads to lost business opportunities and incompatible systems, data stores, and architectures. Here, a typical EA encompasses an overview of the entire information systems – including software and hardware. According to Schekkerman (2004), modern EA is a master plan which *"acts as a collaboration force"* between aspects of business planning such as goals, visions, strategies and governance principles; aspects of business operations such as business terms, organizational structure, processes and data; aspects of automation such as information systems and databases; and the enabling technological infrastructures of the business such as computers, operating systems and networks. In this sense, EA is a multidimensional discipline with an extensive scope that needs to cover a wide variety of viewpoints, deliverables, and processes across the whole enterprise. A fully articulated architecture constitutes EA: the integration of business, data, information, and technology into a coherent whole (Boar, 1999).

It would be wrong to disclaim the entire IS planning heritage and to believe that we have found a new "silver bullet" that will fix our integration and interoperability problems in government tomorrow. The EA literature that we see today is important because it takes a more holistic perspective on the management of IS than we have previously seen. However, many of the concepts used today are based on ideas and concepts developed in the IS discipline – and we need to recognize that.

To date, little empirical evidence exists on the actual implementation and management of EA in government agencies. The EA literature is traditionally focused on one enterprise (Hjort-Madsen and Gøtze, 2004), and this article therefore uses institutional theory from political science perspective to capture the dynamic interaction between individual agencies in government.

Institutional Theory in e-Government
Institutional theory is a multidisciplinary field covering the fields of political science,

economics, sociology, and organizational theory (Fountain, 2001). It is not a consistent framework of analysis because there are different traditions, but in general, institutional theory in political science is concerned with the organizational structure and behaviour in public agencies (Hall and Taylor, 1996). Standing on the shoulders of the behavioural tradition, where the properties and behaviours of individuals are the main explanatory variable, institutional theory can be seen as a reaction to the "old" institutional tradition prevalent in the social sciences before the Second World War, with the focus on formal institutions (Scott, 2000).

Institutional theory seeks to explain the organization environment from a social view with a broad perspective on the contextual factors influencing organizations. Where organizations reward effectiveness, efficiency, and control over production, institutional environments reward normative requirements of appropriateness and legitimacy and, in some cases, conformity to procedures, presentations, symbols, and rhetoric. Hence, political scientists often distinguish between organizations and institutions (Fountain, 2001). According to Heclo (1974) organizations are technical instruments that produce and exchange products or services in a market and in which rewards are given for "effective and efficient control of the work process." In contrast, Fountain (2001) notes that institutions generate rules and requirements to which actors and organizations must conform if they are to receive support and be deemed legitimate in their authorized environment.

From an institutional perspective, organizations operate in a normative environment that constrains the choice of organizational actions and thus leads to organizational homogeneity within and, to some extent, across, industries (DiMaggio and Powell 1983). In this way, institutional theory is a very powerful tool when we want to understand why and how EA programs are implemented and managed in government institutions. The most valuable aspect of institutional theory for our study of EA is that it can explain why public agencies possess both organizational and institutional elements – meaning that they must both be efficient and effective in their core activities – and operate in a political environment that requires conformity to a range of requirements that have little or nothing to do with economic output. As noted by Fountain (2001), public agencies are not governed like private enterprises. Consequently, EA is not implemented and managed in public organizations as it is in private organizations.

As was mentioned at the beginning of this article, rational choice-inspired new public management reforms, which break down large organizations into networks of relatively autonomous organizational units to create economic incentives. Thus many processes are now fragmented over several administrative organizations in "silos." These e-government challenges are further exacerbated by the complex goal structure and the strict legal norms that public agencies must work under, such as delivering services to business and citizens, and securing transparency. From an institutional perspective, public agencies thus operate in a normative environment that constrains the choice of organizational actions and leads to organizational homogeneity within and, to some extent, across communities of interest.

Debates over what public agencies should do, where (e.g., at state, regional, or local level), and how they should do it are continuous, and the maintenance of support is a never-ending, time-consuming process (Wilson, 1989). Sociological institutionalism has claimed that it is possible that public agencies implement policy programs in their operations and management because of pressures of symbolic meanings (social legitimacy) and pressures to conform to commonly adopted, action-generating properties such as efficiency and productivity gains (Meyer and Rowan, 1977). This "institutional environment" both supports and produces normative pressures on an organization to perform in a legitimate fashion (Zucker 1987). In other words, public sector leaders operating in a highly uncertain environment may decide that the best response is to mimic a peer that they perceive to be an appropriate model (Hjort-Madsen & Burkard, 2005).

In these ways, an institutional perspective alerts us to the fact that government is likely to use IS differently than private firms use it. As noted by Fountain (2001), it is not likely that the development in the public sector will

resemble the extreme growth in electronic commerce. As noted earlier, public sector reforms are qualitatively different from restructuring private enterprises or industries. While dramatic higher profits, promotions, stock price increases, and market shares are drivers for reform in the private sector, this can be a showstopper in the public sector where effective IS use most often will be rewarded with budget cuts, staff reductions and loss of resources (Fountain, 2001). Our claim is that this will be even more noticeable when government processes are automated in vertical and horizontal integration stages suggested by Layne and Lee (2001). Here lies the real cost savings and efficiency gains for governments worldwide. But, here government decision makers will also rapidly experience the perversity of incentives for institutional reform in government. This, of course, has serious implications for the management and implementation of EA programs in public agencies.

RESEARCH METHOD

Given the nature of exploratory research questions underlying this study, an interpretive case study approach was selected (Walsham, 1995). Case studies can achieve a holistic understanding of cultural systems of action, and facilitate multi-perspective analyses, encompassing not just the voice and perspective of the actors, but also those of the relevant groups of actors and the interaction between them (Yin, 1994).

As active members of the EA community in Denmark, the authors were invited to observe the local implementation of an EA program at CUH in the summer of 2004. The objective was to learn more about the process of implementing and managing EA programs at the organizational level and the interoperability challenges in this context.

In total, eleven interviews were conducted in 2004 and 2005 at different stages in the EA implementation. Five interviews with the Chief Architect at CUH were supplemented with two interview sessions with the CUH IT management and three of five system category owners. Furthermore, one interview was conducted with the Chief Architect from CHC to supplement what was learned from the CUH

interviewees and to better understand the EA governance challenge in the Copenhagen hospital region.

The respondents were asked to reflect on their experiences with implementing the EA program and the interoperability and coordination challenges faced in the management of the program. Interviews were further supplemented by examining artefacts – documents, presentations, and newspaper clippings. Typically, both authors participated in the interviews. The first author concentrated on having a good dialogue and making sure that all the issues in our semi-structured interview guide were covered. In parallel, notes were taken and the interviews were taped. In some of the interviews or meetings with the senior management and the chief architect, we were not allowed to tape the interviews, and intensive notes were then taken. These diverse data sources allowed for data triangulation (Yin, 1994).

In the analytical phase of this study, the interview notes, including transcribed sections, were analyzed in an iterative process. Based on the theoretical understanding, the empirical data was analyzed by coding and systematically searching data to identify and/or categorize specific observable issues, processes and key events using the thematic network analysis methodology (Attride-Stirling, 2001). In this way, the analysis of the data collected from the various sources reflected the analytical framework in trying to identify important content, context, and process elements of the EA implementation process as perceived by the different individuals interviewed at different times in the process. However, the data also informed the framework as presented earlier, since an iterative process took place throughout the data collection and analysis phases. This qualitative research design supported the study of complex, dynamic social phenomena that were "both context and time dependent" (Orlikowski and Baroudi, 1991).

CASE STUDY:
COPENHAGEN UNIVERSITY HOSPITAL

Copenhagen University Hospital (CUH) is Denmark's largest and leading hospital for patients needing highly specialized treatment

and care. The IT Department at CUH currently employs 110 IT-professionals, supporting more than 300 IS applications, besides the central Electronic Health Record (EHR) system. The IS spans laboratory analysis applications, X-ray systems, and content management systems. These systems were developed in almost every programming language in use over the last 20 years, and the same level of heterogeneity applies for APIs and databases.

Since 1995, CUH has been part of the Copenhagen Hospital Corporation (CHC), six hospitals in the Copenhagen area working together in a loosely coupled structure. As the largest hospital in CHC, the hospital not only plays a prominent role in patient treatment but also serves as the primary hub for many shared IT-services within CHC. This development is likely to continue because CHC is expected to grow within 2-3 years as part of a large structural reform in Denmark.

Since 2002, CHC had been working on an EA, and early in 2004 it delivered a descriptive EA blueprint for EHR-systems – called "The reference architecture for EHR" – based on the national EHR process model (G-EHR) for clinical data. This architecture describes the semantic and technical requirements for the six hospitals in the Copenhagen region. The CHC architecture does not focus on other related applications besides the core modules of the EHR-system. CUH therefore decided that it needed its own EA program.

The process of implementing an EA program at CUH started in the summer of 2004. The CUH CIO and his Chief Architect initiated the work, while other parts of the IT-organization and an external IT architect acted as reviewers. The first version of the reference architecture was completed in the first quarter of 2005. The process used by CUH to establish and use the EA program is illustrated in Figure 1.
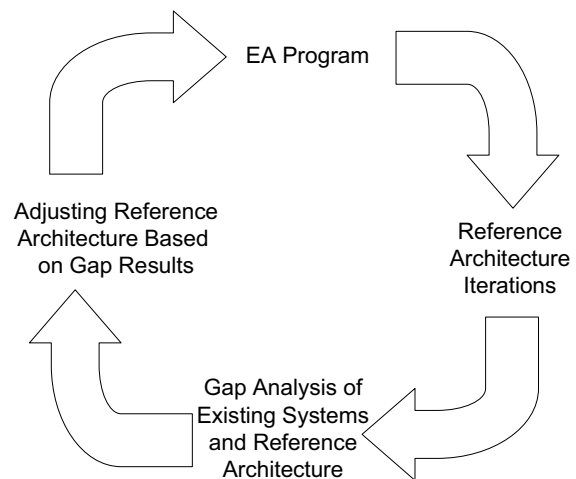
Figure 1: The Four Steps for Establishing a Reference Architecture based on EA

Figure 1 shows the process that was used for developing the first draft of a "to-be / future state" reference architecture, and possible sequential iterations. The process was based on workshops with key personnel from the CUH IT management and key persons who were engaged in solution design, technology selection, implementation and production of the systems.

Establishing the EA program was a matter of getting the right level of overview for business, systems, data, and processes. In the first step the goal was to produce the overall EA principles for the reference architecture. Gaps were then identified and initiatives were taken to adjust the EA program and subsequently the reference architecture. Depending on focus, the infrastructure can also be part of the view, but the primary focus in the CUH reference architecture was applications and systems. By making this choice, CUH was aware that fundamental choices already had been made for the infrastructure architecture (e.g., security), and had to be an integrated part of the reference architecture. These choices were approved projects, ongoing projects, or projects that had already produced central elements of the hospital's architecture. This made CUH – and the authors – come to the conclusion that the EA implementation process needed to be aware of the "moving target" projects that often make it difficult to grasp the entire enterprise in one view.

Figure 2: Governance Levels and Functions from an EA Perspective

One of the central questions that CUH had to address was how interoperability was governed across organizational domains in the EA program. In Figure 2, the three political domains influencing CUH are outlined.

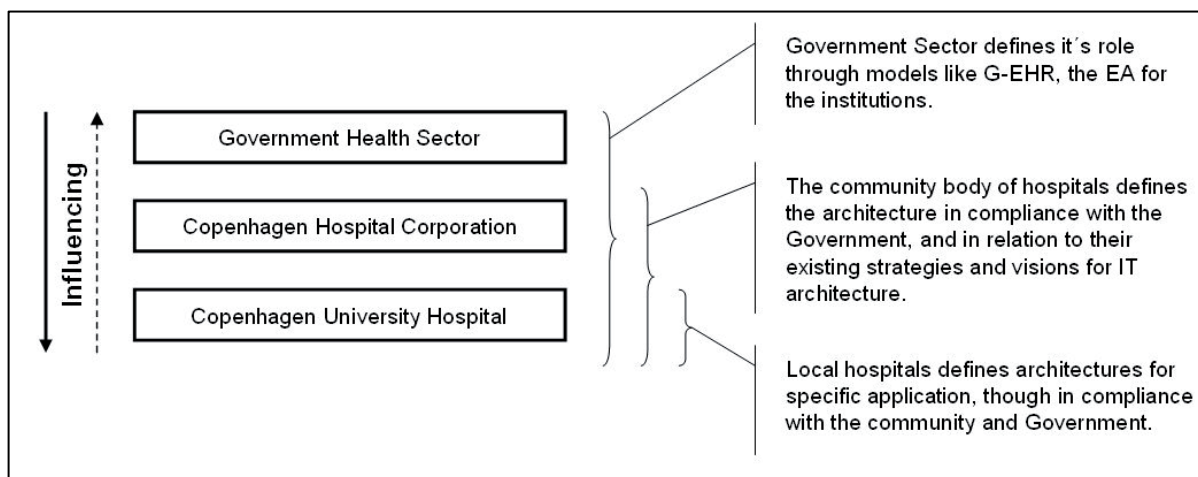The Danish National Board of Health represents the government health sector level. This level broadly defines how IS in the healthcare sector should operate through legislation and models of clinical processes for example, a national EHR process model (G-EHR) for clinical data. The community body of the hospitals in Copenhagen defines the common EA in compliance with government regulations and IT-architecture best practices. Finally, CUH defines its EA, taking into account the framework of architectures from both government and the community body.

The arrows in Figure 2 show how the government health sector and the community body can, in theory, dictate the EA programs at the lower level domains while CUH at the local level has only limited influence on the national and sector architectures. However, the analysis reveals that in practice there is no clear mandate from CHC or the government health sector for the EA interoperability requirements at the local level. In other words, the institutional structure does not dictate a clear distribution of power between the different levels and functions of the Danish health sector.

ANALYSIS: IMPLEMENTING AND MANAGING THE ENTERPRISE ARCHITECTURE PROGRAM

The initiation of the EA program at CUH was not a straightforward process. EA was a new concept to both the chief architects and the top management, and defining the objectives and the scope of the project was therefore difficult. At the outset, the chief architect said:

"For us, the primary challenge is to relate it [EA] to our strategic goals, which includes establishing and maintaining a homogeneous IT environment that works - including EHR. Therefore finding time and necessary resources and skills for this [EA] project is a challenge."

But why then implement an EA program in the first place? The next sections analyze this "why" part of the research question, while the subsequent section answers the "how" part by describing the practical interoperability coordination challenges that faced CUH in its EA program.

Strategic Drives for Implementing Enterprise Architecture
EA is a new concept in many public agencies in Denmark, and identifying the benefits and effects of having an EA program at CUH was therefore difficult to envision at the outset of the program. While the IT-management wanted a set of descriptive EA blueprints describing CUH's technical and organizational

requirements for every employee to use in his/her daily work, the system owners interviewed at the initiation of the EA program did not believe that the program would have any impact on their work. As one system owner interviewee said:

"To me the enterprise architecture will probably not mean much for my choice of application, or how the application will fit into the overall architecture."

At first, the most obvious reason for implementing the EA program at CUH seemed to be the technical interoperability challenges inferred by the new EHR systems. But from analyzing the collected data through the theoretical lens of institutional theory, it became clear that economic, political and institutional arguments for implementing the program were just as important. In the analysis phase of the research three strategic drivers were identified using thematic network analysis methodology (Attride-Stirling, 2001). The three drivers identified help us explain why public organizations implement EA programs:

1) Increased interoperability and integration requirements: The most obvious argument for implementing the EA program was an increased demand for interoperability and integration. Over time, several layers of historically separate IT-artefacts have accumulated internally. With the EA program, CUH hoped to tie the existing applications, data, and infrastructure technologies together to increase the technical interoperability internally.

Externally, the need for interoperability has grown due to increased environmental complexity and instability surrounding CUH. The structural reforms in Denmark will influence the Copenhagen hospital region, resulting in reorganizations and an increasing need for data to be exchanged in a network of private and public hospitals, medical practitioners, and specialists all over Denmark. This increases the demands for external interoperability and requires a high level of agility in the way that information systems in the health sector are organized. Thus, the EA program is aimed at improving both the internal integration and the horizontal interoperability to facilitate an agile external collaboration.

2) Pressure for economic and operational efficiency: The analysis showed that trends from the NPM tradition (i.e., strategic planning, incentive pay, performance appraisal and contracting out), were high on the CUH CIO's agenda. The EA program was seen as a tool that could consolidate the IS infrastructure. The long-term goal of this consolidation is to limit both the heterogeneity of technological platforms and the diversity in products to reduce IT-costs. As the CIO said in one of the interviews:

"This project is not only about technology and further integration. We want to save money by making our IT simpler with less vendors, less diverse applications and reduced maintainers costs in general. We must think about the future and this [EA] is a good tool for doing that."

With regard to the coming expansion of the Copenhagen health region, and the ongoing process of pulling the hospitals in the existing region closer together, it was important that specific systems were assimilated along with their knowledge into the new hospital region and/or allowed to co-exist alongside until they can be replaced without destroying valuable knowledge. The current heterogeneity between the systems made it impossible to migrate or rebuild systems at once, therefore leaving CUH no choice but to create interoperable services that are available to the healthcare region hospitals. The EA defines such common services needed and guides the acquiring, outsourcing, integrating, operating, and retiring of the IT-infrastructure.

3) The political agenda: An interesting finding in the data analysis was the consistent emphasis on political motives for implementing the EA program. In the interviews with the Chief Architect, it is evident that there was an external pressure of symbolic meaning (or social legitimacy) to conform to commonly adopted practices in the Danish public sector. The Chief Architect often referred to the national e-government work with EA. In one of the interviews, he said:

"We need to follow the recommendations in the national enterprise architecture work. This is the foundation for our understanding of government architecture and by complying with these guidelines we secure

interoperability. Also, we want to be taken seriously in our work with IT-management and this is a way to achieve that."

Also, interviews with the IT-management revealed that the national EA work and CHC's EA blueprint for EHR-systems played a role in implementing an independent EA program at CUH. As the largest hospital in Denmark, CUH has always been very independent. With the structural reforms underway in the Danish health sector, CUH again needs to position itself in a new institutional setting.

Institutional theory emphasizes how public institutions are often judged and rewarded on the basis of appearance of success. Hence, the EA program at CUH can be viewed as an attempt to keep up with the national recommendations, the EA work at CHC and other hospitals as much as "rational" motives such as increasing interoperability, consolidation and value preservation.

Governing Interoperability Across Institutional Levels and Functions

Defining how interoperability was to be governed across the organizational levels in CUH's EA programs was a difficult and time-consuming task. After a couple of months working with the EA program, the Chief Architect said:

"The largest problem for me is to define where to stop and where to start in regards to the enterprise architecture program at Copenhagen Hospital Corporation. Should I only focus on the 300 applications outside the central EHR-systems or do I include this in my program? And what does the national enterprise architecture program mean to me – if anything?"

Both the CIO and the Chief Architect at CUH were aware of the EA work conducted by CHC and the national health sector with regard to EHR. As outlined earlier in this article, government cannot always be viewed as one enterprise across horizontal and vertical functions. The CIO emphasized this:

"You need to understand the work with EA at CHC much better, because that is where 90% of the real EA work is being defined – and we just need to have that in mind all the time. We can develop applications outside the EHR-domain independently, but

when they create modules for EHR we need to be compliant all the time."

In executing the EA work, the Chief Architect therefore found it challenging to define where the two EA program domains supplemented each other and where CUH needed its own architecture. CUH is part of CHC and the national health sector, but it makes many independent IS-decisions.

While EHR-systems are patient- and treatment-centric, many of the applications surrounding the EHR-system have specific functionalities (e.g., X-ray), or are not related to the EHR at the clinical level of operations (e.g., financial system). The EHR-system architecture defined by CHC is connected to some of the 300 in-house applications at CUH and it was therefore difficult to make a clear distinction between the CUH domain and the EA for EHR-systems defined by CHC.

In the practical implementation of the EA program at CUH, many of the principles from the CHC reference architecture could be reused. But to secure the local long-term consolidation of the 300 in-house IS applications, the CUH EA needed to be broad enough to engulf the functional heterogeneity of the systems. Because of this need and the institutional structure, CUH decided to focus its EA program primarily on technical aspects in its EA, namely, applications and data.

Figure 3 on the next page illustrates how government has decentralized technical interoperability issues in the health sector and how the institutional setting determines the focus of EA programs in government. Based on the framework provided by Hjort-Madsen and Gøtze (2004), Figure 3 makes a theoretical distinction between organizational interoperability (alignment of business processes that span intra- and inter-organizational boundaries), semantic interoperability (ensuring the precise meaning of exchanged information), and technical interoperability (technical issues of connecting information systems). The data analysis showed that the interviewees at CUH and CHC also perceived interoperability more broadly than as common standards for data sharing. As the Chief Architect from CHC said:

"This is not only about technical standard setting. We want to make business process and information available across the entire Copenhagen Hospital Region – and we need a broader perspective that builds a bridge between business and technology for that."

To understand the dynamics of inter-organizational interoperability it was therefore necessary for CHC and CUH to expand their (and eventually the authors') view of interoperability to include the organizational processes, common semantics, and technical requirements. Based on the theoretical distinction between different interoperability types, Figure 3 illustrates how CUH is part of higher-level enterprises and how different levels of government have different interoperability concerns related to their specific functions.
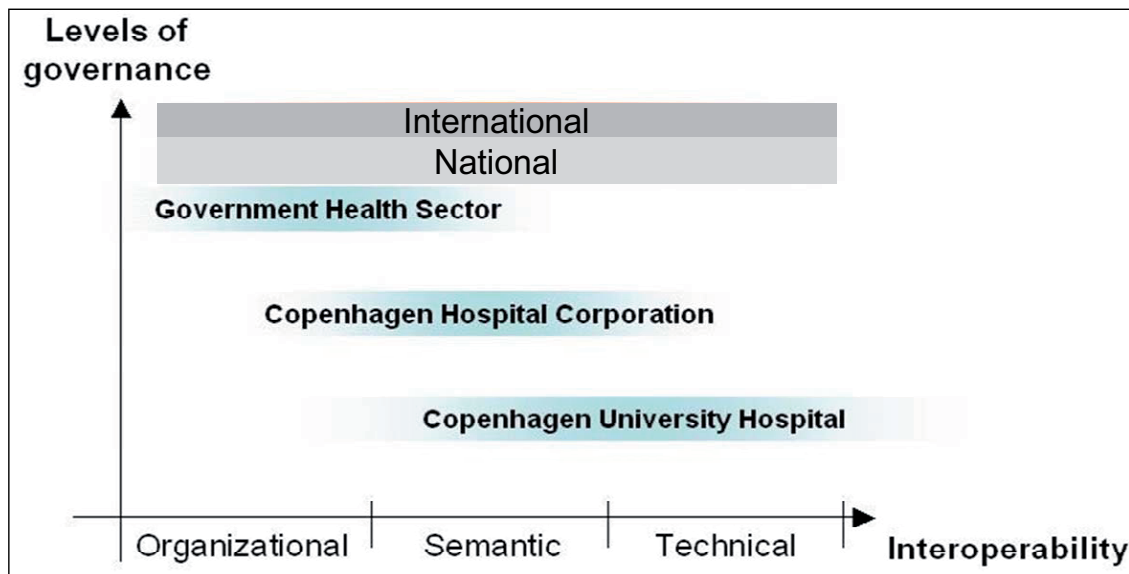
Figure 3: Three Political Domains of Interoperability

At the government level, the processes that enable specific health care "life-events" (e.g., cancer treatment) to span organizational boundaries are key, while technical aspects of actually implementing these "events" are left to the hospital corporations and/or the individual hospitals (Leben and Bohanec, 2003). The high-level semantic interoperability requirements are outlined in the national EHR process model (G-EHR) for clinical data, but the practical implementation of the semantic guidelines is left to the hospital corporations and individual hospitals. Or in the words of the Chief Architect from CHC:

"G-EHR is a model - a kind of recipe - while EHRs are the IT-systems at the hospitals. The recipe defines health care specific terms and their relationships. The recipe should help to ensure that data can be exchanged via EHR-systems where the G-EHR is used."

As a consequence of this decentralization of semantic and technical responsibilities, the analysis illustrated that CHC primarily focuses on a successful implementation of the EHR-systems. This was clear in the interview with the Chief Architect from the CHC:

"We focus on information sharing. We need to speak the same language across the Copenhagen Hospital Cooperation and a standardized language for EHR therefore seemed like the job for us."

Later in the interview he states: "We comply to the G-EHR – for practical interoperability reasons – but we must define much of the stuff ourselves".

Concentrating on semantic interoperability issues through data standardization in its EA program, CHC seeks to ensure that the precise meaning of exchanged information is understandable in and by any application or

person receiving the EHR-data across the six hospitals. The EA program includes part of the organizational and technical interoperability requirements when it comes to defining the common strategic goals for EHR-systems at the six hospitals and the technical standards used in the EHR-systems. However, in general, the hospitals in CHC are free to define their own strategic goals and the practical implementation of the IT-infrastructure.

As we have seen, CUH primarily focuses on technical interoperability issues to enable operational efficiency and external integration. Establishing the reference architecture was for CUH, however, more than a technical task mapping information, systems, and infrastructure. The analysis shows that the political and business dimension of the EA program is key in the process of understanding where and how to address the different issues of the EA in the context of CUH, the hospital community, and the national level. These three levels all operate with different focuses of direction, politics and interoperability.

Discussion
The analysis clearly illustrates that there is little coordination between the different levels and functions of the Danish health sector. The implementation and management of IS has been decentralized as part of the NPM reforms, and while CUH is a part of CHC and the national health sector at large, in reality the individual hospitals work as independent actors who can manage IS the way they want – across the different levels and types of interoperability.

For CUH, creating interoperability internally and externally is important. But the economic and political arguments for implementing the program proved to be just as important, given a situation with large structural changes around the corner creating an uncertain environment where it is difficult for the hospital to justify investments that are not directly related to the day-to-day business.

Because there is no overall coordination of the different e-government initiatives, there are no direct economic and/or immediate political incentives for CUH to share data and business functionality with other health care organizations. Hence, the EA program at CUH can be viewed as an attempt to keep up with

the national recommendations, the EA work at CHC and other hospitals as much as "rational" motives such as increasing interoperability, consolidation and value preservation.

One could ask why there is no overall coordination of this kind of e-government initiatives in the Danish health sector. One answer could be that EA is not the right tool for creating interoperability in government at large. The EA frameworks and models that we use in the public sector (e.g. Zachman, 1989) were built for private companies and have a limited organizational focus, while e-government is about seeing the "big picture" (Traunmüller and Wimmer, 2003). The interviews revealed that some of the system owners at CUH did not believe that EA would have any impact on their daily business, and we must therefore question the value of EA programs at this point.

The primary strength of the EA approach is that it has greatly defined its concepts and instruments to predict and control complex technical systems. However, EA programs might demand so much rigor and organizational coherence that they impair organizational agility. The question is whether EA is the right medicine for public organizations? Rigorous EA frameworks, vague definitions and organizational adoption are some of the largest challenges. Tomorrow's EA programs in government must therefore encompass public sector dynamics (and limitations) as well as be agile in the application of interoperable e-government services.

Along this argument, another answer could be that the context of government is simply very different from the context in which the general EA discipline was originally developed. The institutional perspective alerts us to the fact that government is likely to use IS differently than private firms would use it. Institutional theory offers insight by conceiving EA programs as having institutional elements of their own, while also being subject to institutional pressures from public organizations. As noted earlier in this article, it is not likely that the development in the public sector will resemble the extreme growth in electronic commerce. Public sector reforms are qualitatively different from restructuring private enterprises or industries. While dramatic higher profits, promotions, stock price

increases, and market shares are drivers for reform in the private sector, this can be a showstopper in the public sector where effective IS use most often will be rewarded with budget cuts, staff reductions, loss of resources, and consolidation of programs. Our claim is that this will be even more noticeable when government processes are automated in the vertical and horizontal integration stages in which different levels and functions of government services are integrated. Here lies the real cost savings and efficiency gains for governments worldwide. However, here government decision makers will also rapidly experience the perversity of incentives for institutional reform in government.

The reality in most e-government settings is that there is a complex goal structure and strict legal norms (Traunmüller and Wimmer, 2003), while interoperable services must still be delivered in a secure and transparent way. Narrowly defined, EA is about implementing IS architectures and interfaces, and this might not be sufficient to capture the complex dynamics in e-government systems development and management. The a-contextual attitude in many public sector EA programs is effective in spreading powerful messages about the benefits of using strategic IS planning as a tool to create interoperability and integration in government. However, they also entail a high risk of misguiding and frustrating local efforts to make sense and appropriate the new phenomena.

As noted by Hjort-Madsen and Gøtze (2004), government cannot be seen as one enterprise. This case study therefore calls for a broader definition of interoperability in networks of cooperation where information and business processes are governed more rigorously across different levels (vertical) and functions (horizontal) of government.

CONCLUSION

This case study illustrates how public sector EA initiatives can no longer be developed in "silos" without regard to other parts of government. Interoperability and integration is becoming increasingly important in EA when public organizations implement and manage EA programs, because technical and organizational processes now span different organizations at different interdependent levels (vertical) and different functions (horizontal) of government.

Governing interoperability across multiple organizational domains in EA programs requires that public agencies constitute their EA programs with regard to other parts of the public sector. The analysis revealed different interoperability concerns at different levels of government. We therefore need to expand the traditional understanding of interoperability in public sector EA programs to embrace organizational, semantic, and technical issues.

Interestingly, the analysis found that interoperability and integration was not the only argument for implementing the EA program at CUH. Government pressures for consolidation and value preservation and political motives also drive the EA development. Many of the interoperability challenges arise because the management of IS has been decentralized in the health sector. The analysis of the case study illustrates that public organizations are very autonomous in the management of EA programs and that there is no overall coordination of the different initiatives. This reveals a gap - and even possible counter-productive elements - in what the NPM reforms of the public sector are doing and it questions the effects of current approaches to implementing and managing EA programs in public agencies.

The analysis implies that we must reconsider the way that IS is organized and governed in an e-government context. Taking into account the single case focus, CUH's EA implementation and management implies that the current institutional structures in the public sector are not creating the desired incentives for developing interoperable e-government services. The findings call for a broader definition of interoperability in government EA programs that embrace organizational, semantic, and technical issues to incorporate the interoperability concerns at different levels and functions of government. The question is whether our traditional EA frameworks can overcome this challenge when we strive to develop interoperability in networks of cooperation where information and business processes are governed across autonomous organizational levels and functions in government. We think they can – but we need

to understand the systemic challenges when EA meets government!

AUTHOR BIOGRAPHY

Kristian Hjort-Madsen is a strategic enterprise architect with Denmark's national e-government office in the Danish Ministry of Science, Technology and Innovation. Mr. Hjort-Madsen is currently completing his Ph.D. in combination with his work in a public-private partnership between the Ministry of Science, Technology and Innovation, the IT-University of Copenhagen, IBM Denmark, and KMD. His works focus on the actual implementation and management of EA processes in public agencies and he is widely used as a guest lecturer, coach and strategic advisor on EA related matters. Prior to his work in the Ministry of Science, Technology and Innovation, Mr. Hjort-Madsen perused a bachelor degree in political science from Aarhus University and a master degree in information systems from the IT-University of Copenhagen. He can be reached at khm@itst.dk. A more detailed bio and significant publications can be found on Mr. Hjort-Madsen's blog at: www.EAGov.com.

Jakob Burkard has several years of experience working with EA methodologies, specifically IAF and TOGAF. He has been practicing the role of solution architect for almost a decade, specializing in information and integration. He holds a Masters of Information Science, and is working as Chief Architect and Business Unit Manager for Solution Architecture Services within Capgemini, Denmark. Mr. Burkard can be reached at: jakob.burkard@capgemini.com.

REFERENCES

Attride-Stirling, J. (2001). Thematic networks: Ananalytic tool for qualitative research. *Qualitative Research*, 1(3), pp. 385-405.

Bernard, S. (2005). *An introduction to enterprise architecture* (2nd Edition). Bloomington, IN: Author House.

Boar, B. (1999) *Constructing blueprints for enterprise IT architectures.* New York, NY: John Wiley & Sons.

Ferlie, E., Pettigrew, A., Ashburner, L. and Fitzgerald, L. (1996). *The new public management in action.* New York, NY: Oxford University Press.

Fountain, J. (2002). *Building the virtual state: Information technology and institutional change*. Washington DC: Brookings Institute Press.

Hall. Peter A. and Taylor, R. (1996). Political science and the three new institutions. *Political Studies*, *44(5)*.

Hjort-Madsen, K. and Gøtze, J. (2004) Enterprise architecture in government - Towards a multi-level framework for managing IT in government. *Proceedings of ECEG04, Dublin, Ireland,* pp. 365-374.

Iyer, B. and Gottlieb, R. (2004). The four-domain architecture: An approach to support enterprise architecture design. *IBM Systems Journal, 43, (3)*, pp. 587-597.

Janssen, M. and Cresswell, A. (2005). The development of a reference architecture for local government. *Proceedings of the 38th Annual Hawaii International Conference on System Sciences*.

Janssen, M., Wagenaar, R. and Beerens, J. (2003). Towards a flexible ICT-architecture for multi-channel e-government service provisioning. *Proceedings of the 36th Hawaii International Conference on System Sciences*.

Klischewski, R. (2003). Top down or bottom up. In R. Traunmüller & M. Palmirani (Eds.) Proceedings *of 1st International Workshop on E-Government at ICAIL*, pp.17-26.

Lankhorst, M. (2005). *Enterprise architecture at work*. Heidelberg: Springer Verlag.

Layne, K. and Lee, J. (2001) Developing fully functional e-government: A four stage model. *Government Information Quarterly, 18*, pp. 122-136.

Leben, A. and Bohanec, M. (2003). Evaluation of life-event portals: Multi-attribute model and case study. *Lecture Notes in Computer Science, 2645*, pp. 25-36.

March, J. and Olsen, J. (1989). *Rediscovering institutions: The organizational basis of politics.* New York: The Free Press,

McNurlin, B., and Sprague R. (2002). *Information systems management*, (5th Edition). Prentice Hall, Pearson Education, Englewood Cliffs, NJ.

Meyer, J., and Rowan, B. (1977). Institutionalized organizations: Formal structure as myth and ceremony. *American Journal of Sociology, 83*, pp. 340-363.

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

Ostrom, E. (1986). *An agenda for the study of institutions, public choice.* Martin Nijhoff.

Papazoglou, M., and Georgakopoulos, D. (2003). Service oriented computing: Introduction. *Communications of the ACM, 46(10)*, pp. 25-28.

Park, J. and Ram, S. (2004). Information systems interoperability: What lies beneath? *ACM Transactions on Information Systems, 22(4)*, pp. 595-632.

Peristera V. and Tarabanis K. (2000). Towards an enterprise architecture for public administration using a top-down approach. *European Journal of Information Systems, 9,* pp. 252-260.

Pulkkinen, M. and Hirvonen, A. (2005). EA planning, development and management process for agile enterprise development. *Proceedings of the 38th Annual Hawaii International Conference on System Sciences*.

Ross, J. (2003). Creating a strategic IT architecture competency: Learning in stages. *MISQ Executive, 2(1)*.

Schekkerman, J. (2004). *How to survive in the jungle of enterprise architecture frameworks.* Victoria, BC: Trafford.
Schultz, U. and Boland R. Jr. (2000). Knowledge management technology and the reproduction of knowledge work practice.

Journal of Strategic Information Systems, 9, pp. 193-212.

Stamoulis, D., Gouscos, D., Georgiadis, P. and Martakos, D. (2001). Revisiting public information management for effective e-government services. *Information Management & Computer Security 9(4),* pp. 146-153.

Traunmüller, R. and Wimmer, M. (2003). E-government at a decisive moment: Sketching a roadmap to excellence. In R. Traunmüller (Ed*.). Proceedings of the 2nd International Conference, EGOV, Springer Verlag.* pp. 1-14.

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

Ward, J. and Peppard, J. (2002). *Strategic planning for information systems,* (3rd Edition). Chichester, UK. John Wiley & Sons.

Weill, P. and Ross, J. W. (2004). *IT governance - How top performers manage IT decision rights for superior results.* Boston, MA: Harvard Business School Pres.

Wilson, J. (1989). *Bureaucracy - what government agencies do and why they do it.* New York: Basic Books.

Yin, R. (1994). *Case study research - design and methods*. Thousand Oaks, CA: Sage.

Yourdon, E. and Constantine, L. (1986). *Structured design: Fundamentals of a discipline of computer program and systems design.* Englewood Cliffs, NJ: Yourdon.

Zachman, J. (1987). A framework for information systems architecture. *IBM Systems Journal, 26(3)*.

Publication III

Janssen, M. and Hjort-Madsen, K. (2007). "Analyzing Enterprise Architecture in National Governments: The cases of Denmark and the Netherlands," Proceedings of the 40th Hawaii International Conference on System Sciences, Big Island, Hawaii.

Analyzing Enterprise Architecture in National Governments: The cases of Denmark and the Netherlands

Marijn Janssen
School of Technology, Policy and Management
Delft University of Technology
Jaffalaan 5, NL-2600 GA, Delft
The Netherlands
Tel. +31 (15) 278 1140
Marijnj@tbm.tudelft.nl

Kristian Hjort-Madsen
National IT and Telecom Agency &
IT-University of Copenhagen
Holsteinsgade 63
1260 Copenhagen
Denmark
Tel: + 45 (28) 582 582
khm@itst.dk

Abstract

National enterprise architectures (NEA) promise to fill the gap between policy and implementation. NEAs are embedded within an institutional environment consisting of active players capable of responding strategically and innovatively to architectural initiatives, which might complicate NEA adoption.

In this paper we analyze the efforts of two European national governments in developing enterprise architecture. Grounded in institutional theory and practice we develop an analytical framework and use this framework to analyze the efforts of two countries, Denmark and the Netherlands. Our framework and analysis draws the attention to the need to take a broader perspective on enterprise architecture, especially governance aspects determine the adoption and diffusion of NEA.

1. Introduction

Governments around the world increasingly recognize the significance of enterprise architectures as leading-edge practice to improve services and efficiencies [13][14]. As part of public modernization plans, governments seek to offer citizens and businesses seamless on-line service by improving horizontal and vertical relationships and linking independently developed processes and information systems. In each country this has resulted in a wealth of independent e-government projects, which often have limited coherence and remain largely uncoordinated (e.g. [6],[9]). Current efforts are focused on coordinating the projects and providing a framework functioning as an umbrella for explaining the relationships among the projects and managing change. These kinds of frameworks are often denoted as *national enterprise architecture* (NEA). In this view, public administration is seen as a collection of a large number of heterogeneous organizations having different business processes and information systems. NEAs are aimed at ensuring interoperability, avoiding duplication of efforts and enable government-wide reuse.

In Europe several countries have initiated NEA initiatives over the past years [14]. These initiatives have been developed independent of each other. The research described in this paper is aimed at deepening our understanding of NEA. We do this by analyzing and comparing the NEA efforts of two European countries, which are well advanced with the development of their NEA and have a similar political and institutional structure. Both countries can be considered locomotives for developing NEA in the EU.

This paper is structured as follows. In the following section we discuss related literature. In section three we develop our analytical framework. In section four we use the framework to analyze the NEA of Denmark and the Netherlands. In section five the two countries are then compared. Then, in section six, the findings are discussed, and finally, conclusions are drawn in section seven.

2. Enterprise architectures in government

Enterprise architecture (EA) lacks a universally accepted definition [18]. An EA identifies the main components of the enterprise, its information systems, the ways in which these components work together in order to achieve defined objectives and the way in which the systems support business processes [10]. EA has been characterized as a system of systems [10], as the "master plan" or "city plan" [18] that detail

policies and standards for the design of infrastructure technologies, databases, and applications [3],[20]. Architecture aims at creating some kind of coherence and structure in a chaotic environment using systematic approaches [1]. The term "enterprise" refers to the scope of the architecture, dealing with the organization as a whole or, in case of NEA, dealing with multiple agencies rather than with a small part. Architecture consists of statements of how an enterprise wants to use IT, not on what and how information has to be made available. The strategy and institutional setting provide the contexts for the architectural design choices and decisions.

Enterprise architecture frameworks and models provide ways to deal with the complexity including work (who, where), function (how), information (what) and infrastructure (how to) [20]. EA is aimed at guiding decision-making. Ross [20] criticized enterprise frameworks for taking a technologist view. Frameworks do not highlight the role of institutions and capabilities critical to enabling the governance, adoption and diffusion of NEA.

Institutions are social structures that have attained a high degree of resilience [21]. Institutional theory attends to the deeper and more resilient aspects of social structure by considering the processes by which structures become established. Neoinstitutionalist view organizations not as passive pawns that can be changed by new management paradigms, but as active players capable of responding strategically and innovatively to new changes in their environment [21]. Political scientists often distinguish between organizations and institutions [5]. Whereas organizations reward effectiveness, efficiency, and control over production, institutional environments reward normative requirements of appropriateness and legitimacy and, in some cases, conformity to procedures, presentations, symbols, and rhetoric. Institutional environment facilitate or retard processes of technical and structural change, coordination, and dynamic adjustment [11]. It considers not only consensus and conformity but also conflict and change in social structures. In this respect institution both enable and constrain architectural reform and the adoption of enterprise architectures.

3. Framework

Our framework for comparing NEAs is aimed at a taking a broad view on NEA within the public administration. Inspired by neo-institutional theory, enterprise architecture literature and the experiences of the authors with enterprise architecture in practice, a framework for analyzing NEAs was developed.

Architecting public administration involves designing public administrations to reflect the political and public managers' decisions at a strategic level in operational activities and decisions. As such NEA promises to fills the gap between policy and implementation. NEAs are often initiated at the political levels and diffused using different governance mechanisms. An NEA is meaningless if it is not adopted and used by public agencies. Architecture models, principles and standards make up the content of a NEA. This resulted in the following aspects that need to be analyzed to understand NEA.

1. *Policies, actors and structures:* This aspect encompasses the environmental and political drivers for EA. The strategic objectives for architecture are provided by political actors and constrained by democratic structures;
2. *Governance*: Architectures evolve over time and consequently governance structures and mechanisms are important to guide and encourage desired behavior;
3. *Architecture frameworks and methodologies*: Architecting takes a resource-based view on public administration and use frameworks and planning process methodologies;
4. *Architecture principles and standards*: Architects uses standards, principles and guidelines for guiding implementation;
5. *Implementations*: The scope operate across multiple implementations among many agencies and disciplines;
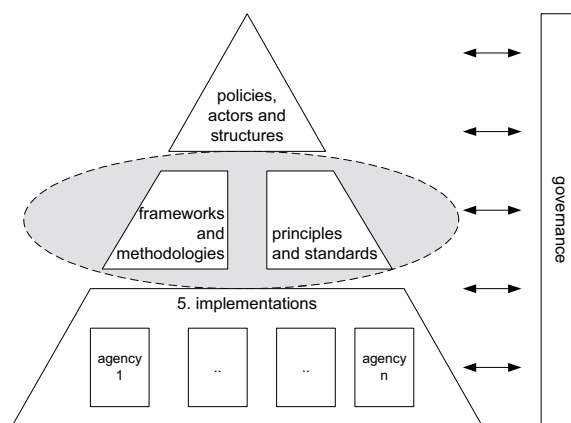

Figure 1: Framework for analyzing NEAs

Figure 1 shows the elements related to NEA. The grey circle shows the position where the architecting is performed; strategic decision and plans are translated into operational decisions and implementation using enterprise models, standards and architectural

principles. In the following subsections we will further detail the elements of the framework.

3.1. Policies, actors and structures

The underlying premise for our analysis is that the institutional environment facilitates or retard processes of technical and structural change, coordination, and dynamic adjustment. Based on this institutional perspective, we expect that actors, structures and political vision affect the configurations of NEA programs. The national politics determine the level of ambition. The objectives of NEAs might vary considerably among countries. Similar, the number and types of agencies involved in enterprise architecture might be considerably different. NEAs might be guided and initiated at the political level or by public managers. In addition, governments might use Chief Information Officers (CIOs) to allocate responsibilities for adopting the NEA.

The structure of the public administration determines the way NEA programs can be designed, disseminated and adopted. The institutional structure needs mechanisms to govern NEA programs.

3.2. Governance

Governance represents the framework for decision rights and accountabilities to encourage desirable behavior in the use of IT resources [23]. Enterprises generally design three kinds of governance mechanisms: decision-making structures, alignment processes and formal communications [24].

Decision rights might be regulated and determined by laws. Agencies might adopt enterprise architectures on a voluntary basis, or have to comply with regulations and legislations. NEA might be initiated top-down or bottom-up. *Alignment processes* are techniques for securing widespread and effective involvement in governance decisions and their implementations. This includes the way the funding model of is organized. *Formal communications* concern two-way communication and good participation/collaboration relationships.

3.3. Enterprise frameworks and methodology

Zachman [24] introduced the concept of enterprise frameworks that provide multiple views on information systems. Frameworks are used for describing and understanding EA [10]. The NEA model(s) chosen determine what aspects can be captured at what level of abstraction. Spewak [22] added th planning process aspect to EA. As such NEA

can take a framework or methodology oriented approach having various foci and levels of abstractions.

3.4. Architectural principles and standards

Architectural principles are statements that describe the constraints imposed upon the organization, and/or the decisions taken in support of realizing the business strategies. Principles restrict architectures and set the direction for the future. Architectural descriptions can form the basis for the implementation and transformation of existing structure into the desired architecture. Standards can be enforced at various levels, including standard business processes, standard technical building blocks and standardization of interfaces and interaction patterns.

3.5. Implementation

An EA can be viewed as the plan for the next infrastructure [20]. Implementation concerns the use and translation of the NEA models and principles to the situation of public agencies. This aspect provides indications for how (parts of) the NEA are adopted, used and updated. It also contains change support to enable the adoption and diffusion of the NEA

Implementation also includes the development and use of central facilities and infrastructures. Central facilities might be used by local agencies to support the development of their systems architecture. Also infrastructure might be provided by central government and readily available for use by local agencies.

4. National government case studies

We investigated the enterprise architecture efforts in Denmark and the Netherlands using our framework. Both countries have a capitalist production system and a parliamentary democracy. Furthermore, both Denmark and the Netherlands rank among the top-10 countries when it comes to maturity in the survey of Accenture [1]. Consequently there NEA efforts might be comparable and the two countries might be able to learn from each other.

Denmark is a small country with 5,5 million citizens and the Netherlands has 16,3 million citizens. 83% of Danes and 90% of the Dutch have Internet access at home.

Table 1 shows a comparison of the demographic data of both countries based on data collected in 2005. The Netherlands has three times the number of citizens of Denmark and also thee times the ICT budget of

Denmark. The total number of employees working in government and related agencies is difficult to compare, as in the Netherlands there are many public-private partnerships and autonomous agencies that are not included in the statistics. In general the public sector in Denmark is a bit larger then in Netherlands, as might become clear from the public administration spending.

Table 1. Demographic data (www.cbs.nl; www.dst.dk)

	Denmark	the Netherlands
Citizens (millions)	5,41	16,34
Gross domestic product (GDP) per capita in Purchasing Power Standards (PPS), (EU-25 = 100)	124.3	123.3
Unemployment rates represent unemployed persons as a percentage of the labour force (%)	4,8	4,7
Public administration spending (% of GDP)	53.2	45,7
Gross domestic expenditure on R&D (GERD) As a percentage of GDP (of businesses)	2.56	1,76
Number of public servants (FTE)	845.000	400.000
Central government employees (FTE)	80.000	120.000
Number of ministries (number)	19	13
Annual IT budget government (Billion Euro's)	0.8	2.3
Percentage online services in October 2004 (%)	82	70
Households with Internet connectivity (%)	83	90
Households with broadband connectivity (%)	40	50

Public reports about NEA were studied in both countries and we conducted in total 18 interviews with governmental representatives and users involved in enterprise architecture at the national level.

4.1. Denmark

Denmark is Europe's frontrunner in the use of NEA. The general challenges for the Danish e-government project are the major restructuring of responsibilities across levels of government and improving cooperation between independent agencies. A recent OECD review of Denmark's e-government program [14] emphasized that, while the NEA and supporting standards and frameworks have been very well developed at the conceptual level, they are proving more difficult to translate into the actual standards and schemas required for implementation.

4.1.1 Policies, actors and structures, The main vision for Denmark's NEA efforts was formulated in a White Paper in 2003 [13]. The main recommendations of the white paper are that the public sector should take more active responsibility for its own enterprise architecture, a common enterprise architecture framework should be established for planning public sector IT systems and ensuring interoperability and there should be a concerted effort to shared knowledge among agencies.

The NEA white paper was published by the Coordinating Information Committee – a cross-public sector body with representatives from all levels of government. Top-level responsibility for e-government resides with the Danish Ministry of Finance (MF). However, the NEA work is performed in the Ministry of Science, Technology and Innovation (MVTU). MVTU also leads the national Enterprise Architecture Committee reporting to the Coordinating Information Committee and defines the policies for NEA.

EA has been an important but not a driving force in the development of e-government in Denmark. Different common infrastructure elements like common access management and a new infrastructure for business messages to the government (e.g. electronic invoices) have been initiated outside the NEA program. As a result there are different perceptions of what NEA is and what it is not. The cooperation for Danish Municipalities works closely with MVTU, but so far guidelines for the NEA at the municipal level have not been developed.

4.1.2 Governance, The Danish approach to NEA is driven by incentives, i.e. there are no legislation or regulations governing standards and principles for NEA development in government. The adoption of NEA is based on voluntarism and it is up to each public organization to assess their need for an NEA and decisions related to it. There are no financial incentives to adopt the NEA. NEA is primarily driven by the need for interoperability and adoption of best practices.

This decentralized governance model driven by incentives is also evident in our findings where individual municipalities described their EA planning efforts as relatively independently of other municipalities. Their relatively small size limits their

financial and human resource capacities to adopt and use ICT strategically and there are therefore few common ICT systems and frameworks that have been developed by municipalities themselves.

MVTU works closely with other parts of government in the coordinating information committee and the enterprise architecture committee. MVTU hosts a yearly NEA conference, publishes EA guidelines, and on a national website (www.oio.dk) EA recommendations are posted and stakeholders can subscribe to a monthly newsletter. Furthermore, a NEA repository for architectural knowledge sharing and maturity assessments is currently in its beta version.

4.1.3 Architecture frameworks and methodologies, In 2003, the NEA white paper a high-level process model was introduced. Since then a handbook on NEA implementation, also published by MVTU, has defined a generic architectural process for NEA. The basic NEA process model is illustrated in figure 2 below.
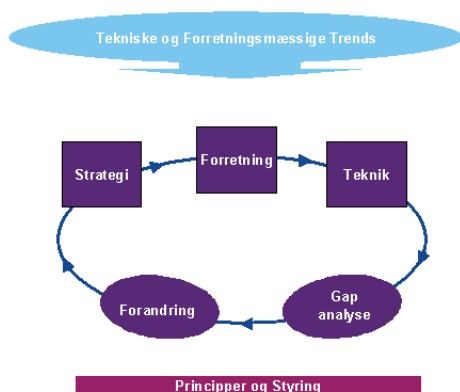
Figure 2: The NEA process model of Denmark [12]

The NEA model prescribed by MVTU is based on the Zachman framework (e.g. [24]), but it focuses more on the planning process as proposed by Spewak [22] than the artifacts within the different cells of the Zachman framework. The model is viewed as a starting point by MVTU for initiating the EA program.

4.1.4 Architecture principles and standards, The NEA process model deals with non-mandatory principles and the selection of standards. In the NEA white paper published in 2003 [13] five categories of principles were suggested: interoperability, security, openness, flexibility and scalability.

Although these principles are not mandated by, our interviewees indicated that they have had a large effect on the NEA development. One of the respondents described it: *"We use the recommendations in the White Paper a lot… I know that everybody looks at these five principles every time they make requirements for a new IT-project and talks to vendors"*.

A national interoperability framework has been established to support standards decisions in NEA programs. MVTU is in charge of this interoperability framework and makes recommendations about 609 selected standards, specifications and technologies used in e-government solutions. As part of the framework a different decision support tools e.g. for multimedia standards are published dynamically. Again the recommendations are not mandated by regulations or legislation, the Danish approach is primarily based on incentives.

4.1.5 Implementations, As governance model is based on incentives rather than laws and regulations, the implementation of NEA in Danish public agencies is rather fragmented. Many of the NEA initiatives, like common access management, are based on ad-hoc decision processes and not a national to-be architectural vision. Furthermore, initiatives like the interoperability framework and a new initiative for public procurement are only loosely integrated with the proposed NEA models prescribed by MVTU.

At the decentralized level some agencies have very advanced NEA programs with strict EA policies for the organizational and technical standards and principles governing the IS development, while others have not even established a program. Service-Oriented architecture (SOA) has been promoted as the preferred architectural style for government [14] and many agencies are currently modernizing their IT-infrastructure based on SOA principles.

4.2. The Netherlands

The Netherlands was a frontrunner in the field of e-government at the beginning of this century and although there are many examples of innovative projects, the current e-government efforts lag behind the ambitions [14]. In 2004 the Ministry of government reforms initiated a NEA. The aim of the NEA program is to reduce red tap, as calculations showed that cutting red tape will have positive long-term effects on economic growth, employment and income [15].

4.2.1   Policies, actors and structures, Within the existing laws and financial regulations of the Netherlands, the local governments enjoy a high degree of autonomy in making their own decisions. They have their own budgetary control and can make independent IT investment decisions. The local governments are hierarchically organized with varying degrees of coupling and autonomous coordination.

The NEA program was aimed at capitalizing the best practices. The basic idea is to stimulate many heterogeneous and similar projects at the decentral level. After a while a project might become successful and similar initiatives are not supported anymore and the project results become part of the NEA and disseminated as a best practice. The strategy is "grow many plans and harvest only one"[9].

4.2.2   Governance, The enterprise architecture developed at the national level is aimed at guiding the directions of other agencies. The policies and laws are focused on stimulating online-services provisioning, the reuse of data and the creation of a one-stop shop [14]. How this is realized (e.g. standards, shared services) is left to the organizations, except the use of vital record registries, which is determined by law.

There are a large number of centralized programs. They regularly held workshops, write reports and distribute newsletters to inform governmental agencies. There is no overall coordination, as a result, some interviewees indicated that they are sometimes overwhelmed by the large number of initiatives and do not understand the dependencies among all the programs.

The transformation process is completely left over to the local agencies. Various ministries have not allocated budget to create 'change support teams' that should help to implement parts of the application architecture. It is especially focused on stimulating the use of the infrastructure building blocks. One representative of a municipality stated that "*Architecture should prescribe the use of standards and applications and all agencies should comply to that*". The rational is that municipalities have huge problems with integrating their systems with other municipalities.

4.2.3   Architecture   frameworks   and methodologies, The NEA program is based on adopting one part of the Zachman model as shown in figure 3. The architecture is driven by requirement for EU, Dutch government, businesses and citizens. On the vertical axis business, information and technical architecture are shown on the horizontal axis contains who? what? and how? questions. Control and

maintenance and security are given special attention.
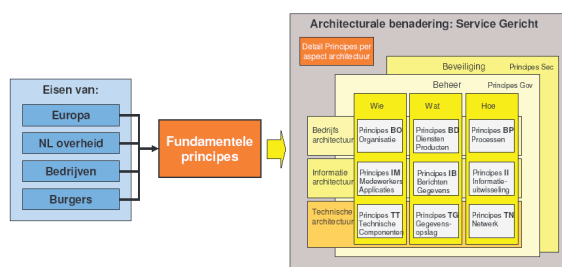
Figure 3: NEA framework of the Netherlands

The model is primarily used as a way to structure architecture principles and best practices. The web-based version contains hyperlinks to these principles and practices. The interviewees indicated that "*the Zachman framework is too complex to support communication…. it is too abstract to capture our architectural problems*".

4.2.4   Architecture principles and standards, The NEA contains over 160 principles [7]. However, some are overlapping and the principles also include policies like 60% of the services should be provided online [15]. The interviewees commented that the principles are rather at a high and abstract level, as an example was given the principles "one stop shop" (which is also a policy), 'separate status and content data" (already known for decades) and 'make maximum use of vital records' (indeed as much information should be reused as possible). On the other hand they found it very useful that all principles are collected, maintained and disseminated by one department.

There are a number of standards, however, the organizations responsible for developing and maintaining these standards have no direct link to the NEA program. The program does refer to these standards and encourages the use of these standards. The interviewees representing municipalities found it very hard to find the right standards, "*Isn't it annoying when you can't find a standard you expect or even better   know   to   be   out there?*".

4.2.5   Implementations, The architecture efforts are fragmented and, except for documentation, there is no focal point [8]. Most of the initiatives are implemented after spotting the success of local agencies or at other countries. A complete picture is currently lacking, however, a program has been initiated to craft the relationships among projects.

There is a NEA at the central level, and several,

relatively large, agencies have their own EA. Often these do not comply with the centralized EA. Moreover agencies are starting to implement new initiatives without considering the NEA. An often-heard complaint is that "*again the problems and unique characteristics of the local level are ignored*", however, also was stated that "*the local level is not as unique as we think we are. Collaboration, standards and sharing of systems should be compulsory*" .It seems there are persons having a skeptic view on NEA, but also persons having a positive view. "*The use of the NEA pictures, models and visualizations supports the discussions with our decision-makers. We can use it to explain the impact of decisions…. It enables us to speak the same language*".

The NEA program has adopted the service-oriented architecture paradigm and the complete reference application architecture is SOA-oriented. The NEA program includes basic infrastructure building blocks, which are implemented by other programs of the ICTU.

5. Cross-country comparison

The NEA program in both countries consists of many interdependent projects resembling many similarities. This does not come as a surprise as the two countries have similar democratic systems, are comparable in size and NEA is developed to deal with similar problems. The readiness of the public sector is comparable as the public sector structure is similar. There are, however, also several differences. Table 2 depicts a systematic comparison using our framework.

The main concern of the Danish government is ensuring interoperability, whereas in the Netherlands the development of the NEA is largely driven by the need to reduce red tape. Both strategies are incremental strategies and try to deal with the existing organizations and installed systems. Denmark is a frontrunner in using architecture and encounters several early adapter problems. The NEA program was – and is – not well integrated with other e-government initiatives. In the Netherlands the NEA is primarily build on practices that are only integrated in the NEA after proven success. If for a certain area, no proven practices can be found, many small projects are stimulated, which should result in the creation of a new proven practice. This is largely a risk-avoiding strategy and takes a much longer time to develop. In some respect Denmark is used as a leadership for the Dutch NEA as several of the building blocks are based on best practices found in Denmark.

Table 2. Cross-country comparison of the NEA's of Denmark and the Netherlands

	Denmark	the Netherlands
1. Policies, actors and structures	The Ministry of Science, Technology and Innovation drive Enterprise Architecture initiatives. Strong collaboration with Danish Municipalities and the Ministry of Finance. Focus on interoperability	Initiated by the Ministry of Government Modernization and Innovation. Strong focus on reducing the administrative burden for companies and public agencies (red tape).
2. Governance	The NEA governance model is based on incentives. Agencies are free to design their own architecture. No legislation or regulations dictate the NEA adoption.	The NEA program is centrally initiated and coordinated. No mandatory use of NEA. Agencies are free to design their own architecture. Change support teams have been created to help agencies to adopt the EA.
3. Architecture models	A generic NEA model was published in a 2003 White Paper on NEA and a 2004 Handbook outlines the methodology. The NEA model is based on the Zachman framework, but is primarily focused on the planning process dimension.	A simplified version of the Zachman model is used to structure the architectural principles. The NEA program uses no architectural models. At the local level public agencies have adopted a variety of architecture models.
4. Architecture principles and standards	A national Interoperability Framework guides the use of technical standards based on recommendations (no clear integration with NEA). The White Paper defines high-level principles for NEA.	A set of high-level principles and guidelines. Most of the principles are derived using a bottom-up approach. Setting standards is largely avoided. NEA efforts are primarily consensus based.
5. Implementations	Service-oriented architecture is the dominant paradigm. Development and implementation of standard building blocks are adopted in an ad-hoc manner.	Service-oriented architecture is the dominant paradigm. Development and implementation of standard building blocks is adopted.

Both countries are struggling to ensure that NEA becomes more than just a paper exercise. The local autonomy limits the take up and no formal CIOs are responsible for EA in any of the countries. In both countries this also means that the NEA must be comprehensive and understandable – something that both countries are struggling with. The Dutch NEA is consensus-based and conflict avoidance. It contains only elements where there is consensus among all actors, elements that might be subject of discussion are left out. Consequently, the enterprise architecture lags behind innovative projects and the added value is limited for the early adopters in the local governments. It is primarily of interest for public organizations in the backfield of e-government developments, which makes up the largest amount of agencies. As such this strategy is right for ensuring homogeneity among the late adopters, but does not match the high-ambition of the politicians.

In the Netherlands the present NEA efforts tend to be designed primarily to solve actual problems, whereas the longer term goal remain more abstract, such as gain large economic and social benefits, ensure accessible and usable by all. The Danish NEA takes a more integral view even though the overall coordination of initiatives is difficult. The decentralized governance model based on incentives offers public agencies no direct economic and/or immediate political incentives to establish EA programs and the adoption is therefore entirely based on the voluntary adoption of "best practice".

The development of architecture models is problematic in both countries. The Zachman framework is used as a starting point in both countries. However, it is criticized for capturing not the complete picture, being too abstract and not supporting communication. Both countries take a different route to using NEA. Denmark efforts are concentrated on the planning process dimension, whereas the Dutch NEA is primarily a set of principles and guidelines structured using a framework based on the Zachman model.

In both countries implementation is based on service-oriented architecture paradigm, where centrally defined building blocks can be reused among the different government domains. Despite the similarities the actual implementations vary considerably among the countries. This comes due to the fragmented adoption patters we observed and the lack of a centrally mandated EA strategy and strong leadership.

In conclusion, there are similarities and differences among the countries. Denmark can learn a lot from the Netherlands' approach to harvesting best practices in the NEA program and the strong focus on red tape

reduction. The Netherlands can learn from the interoperability elements and the planning process focus on the Danish NEA. The most conspicuous similarities are that both countries do not have centrally enforced NEA models and that both countries are struggling with the governance and implementation of the national architecture. Architectural models are perceived as difficult, too abstract and consequently are only used to provide structure to the NEA efforts. The governance seem their main problem to advance NEA efforts. As such, the NEAs become a product of the institutional environment that they are infused into and the organizational negotiation at different levels of government.

6. Discussion

NEA planning and development efforts are huge and complex encompassing many projects and the involvement of many public agencies. In Denmark and the Netherlands we witness the influence of the politicians' ambition to reinvent government with EA. As we know from the public policy literature, public agencies are, however, not always able to implement all initiatives and influencing this vision by blocking actors [16]. Especially the autonomy of municipalities blocks several initiatives taken at the high level.

In both countries enterprise architecture is encoded into institutions through a socialization process. When internalized, the use of NEA transforms behavior. When the actor behaves according to the NEA, the institution is enacted. In the Netherlands and Denmark we found agencies, who enacted the NEA, but also agencies who resisted and rejected the NEA. Resistance might be based on rational elements, for example systems are different, or on non-rational elements, like the not-invented here syndrome. After some time, we expect that parts of the NEA become sediment and taken for-granted, while other might change and be updated. Then, the behavior of actors will be partly influenced by the NEA and the NEA will become institutionalized. Acting in accordance with the NEA is viewed as rational by those who share the way of thinking, however, the creation of a shared visions is problematic. "*It was all a bit of a muddling through*" stated a representative of the local level who was trying to implement the NEA in his agency.

In 2003 Denmark developed a generic NEA model and has a handbook outlining the methodology, including building blocks to support the efforts. The Dutch created a high level model. However, the Dutch architecture is mainly a collection of principles and guidelines supported by several implemented building

blocks. There are standards available, however, the standardization efforts are not interrelated. For example standards for social security are developed independent of standards for citizens' data. Only in April 2006 the funding for creating change support teams has been allocated. The Dutch strategy taken is a risk-avoiding strategy, based on proven examples. Consequently there are hardly any project failures at the national level.

In Denmark the main concern is interoperability, which requires a holistic view on the public organizations. However, this requires a strong governance model – something that Denmark does not have. Many public managers have questioned EA as the right instrument for creating interoperability in government at large. The EA frameworks and models that we use in the public sector were built for private companies and have a limited scope, while e-government is about a large set of organizations, including many autonomous agencies having various levels of readiness and different circumstances, governed by a democratic system and embedded in a certain institutional situation. Like the Netherlands, Denmark must work with the integration of different e-government into the NEA if they want to succeed, and much more attention must be given to the actual implementation of the NEA.

For the Danish and Dutch public managers a huge challenge is to keep up with the many initiatives and improve their systems to reduce red tape. One interviewee stated "*you may not think architecture is critical, but look at the chaos without it*". About the questions about the performance the uncertainty dominates. As one interviewee stated "*it is better to have any guidance than none at all*". Moreover although the building blocks are not suitable for all organization, several interviewees stated "*the modules enables us to reduce development costs and ensure we can implement e-government requirements*". The question remains whether EA is the right medicine for public organizations? Rigorous EA frameworks, vague definitions and organizational adoption are some of the largest challenges. Tomorrow's NEA programs in government must therefore encompass institutional dynamics as well as be agile in the application of interoperable e-government services.

One of our starting points is that a broader view on NEA should be taken. NEAs are intertwined with many other aspects and analyzing one aspect without considering the others is a too narrow view on NEA. Both countries are struggling to ensure that NEA becomes more than just a paper exercise. Therefore a broader look should be taken at NEA. NEA evaluation should also involve the governance aspects, including

decision-making structures, alignment processes and formal communications, and the take-up of the NEA by studying the implementations. As one of the interviewees phrased it "*a NEA without governance mechanisms ensuring the adoption is like a restaurant without providing any food*".

The advantage of our framework is it draws the attention to the need take a broader view on NEA than is usually taken by enterprise architects. The analysis framework offers a contextual understanding of the NEA efforts, which is closely related to the understanding of public managers and architects. The context of government is simply very different from the (private sector) context in which the general EA discipline was originally developed. The institutional perspective alerts us to the fact that government is likely to use IS differently than private firms would use it. Institutional theory offers insight by conceiving EA programs as having institutional elements of their own, while also being subject to institutional pressures from public organizations.

7. Conclusions

In this paper we developed a broader understanding of NEA by first developing a framework to analyze national enterprise architecture and then using this framework to analyze the NEA initiatives in Denmark and the Netherlands. Denmark kicked off NEA very early in 2003 and the Netherlands waited for EA to mature and has a risk-avoiding strategy. Denmark is a frontrunner and seems to be loosing a bit of its first mover momentum. Both countries studied here are increasingly using their NEA programs as instruments to govern the public-sector organizational network from an integrated strategy, business and technology perspective.

The Netherlands can learn from the use of NEA frameworks and models from Denmark, whereas Denmark can draw lessons from the governance in the Netherlands. Both countries are struggling with the governance of their NEA efforts, mainly due to the local autonomy of public agencies. Denmark has better collaboration and communication within levels of government, whereas the Netherlands have a better governance structure using funding control and portfolio management.

As the underlying premise for our analysis we took the institutional view, which predicts that, the configuration of NEA programs are significantly affected by actors, structures and political vision. Both case studies confirm this premise. In our case studies we found that NEA must be viewed broader than just a

"city plan". In our framework we proposed that at least 5 elements should be considered 1) Policies, actors and structures, 2) Governance 3) Architecture model 4) Architecture principles and standards and 5) Implementations. Our analysis of the NEA confirms that there is a need for a broader perspective on NEA. The question is not only what the NEA is, but also how the NEA is used and governed over-time given the institutional setting. Analyzing NEAs should include the institutional environment, governance ts and the take-up of the NEA by studying implementations.

8. References

[1] Accenture. *Leadership in Customer Service: New Expectations, New Experiences*. [Web: www.accenture.com/Global/Research_and_Insights/, last accessed June, 2006]

[2] F.J Armour,. and S.H Kaisler, "Enterprise Architectures: Agile transition and Implementation", *IEEE IT Professional*, Vol. 2, No. 6, 2001, pp. 30-37.

[3] S.B. Bernard, *An introduction to Enterprise Architecture*. Authorhouse, 2004.

[4] J.A. Carbone, *IT Architecture Toolkit*. Prentice HallPTR, Upper Saddle River, NJ, 2004.

[5] J. Fountain, *Building the virtual state. Information technology and institutional change*. Washington DC: Brookings Institution Press, 2001.

[6] K. Hjort-Madsen, "Enterprise Architecture Implementation and Management: A Case Study On Interoperability", *Proceedings of the 39th Annual Hawaii International Conference on System Sciences,* 2006.

[7] ICTU, *Nederlands OverheidsReferentieArchitectuur. Samenhang en samenwerken binnen de elektronische overhead*. ICT Programma Architectuur Elektronische overhead, [http://elo.asp4all.nl/atlas/referentiearchitectuur/ Last accessed April, 2006] (in Dutch).

[8] M. Janssen and A. Cresswell, "An Enterprise Application Integration Methodology for E-Government", *Journal of Enterprise Information Management,* Vol. 18, no. 5, 2005, pp. 531-547.

[9] M. Janssen and G. Kuk, "A Complex Adaptive System Perspective of Enterprise Architecture in Electronic Government", *Hawaii International Conference on System Sciences* (HICSS-39), January 5-7, Kauai, Hawaii, 2006.

[10] S.H. Kaisler, F. Armour and M. Valivullah, "Enterprise Architecting: Critical problems", *Proceedings of the 38th Hawaii International Conference on System sciences,* 2005.

[11] J. L. King, V. Gurbaxani, K.L. Kraemer, F.W. McFarlan, K.S. Raman, and Yap, C. S. "Institutional Factors in Information Technology Innovation", *Information Systems Research, vol.* (5 no. 2, 1994, pp. 139-169.

[12] Ministry of Science, Technology and Innovation. *Handbook on Enterprise Architecture* [Web: www.oio.dk/arkitektur/publikationer/haandbog, last accessed June 2006] (in Danish).

[13] Ministry of Science, Technology and Innovation (2003). *Whitepaper on Enterprise Architecture*. [Web: www.oio.dk/arkitektur/english, last accessed June 2006].

[14] OECD. *OECD peer review of e-government in Denmark*. [www.oecd.org, last accessed June 2006]

[15] Pechtold, A. *Resultaten van de onderzoeken naar administratieve lasten*. Letter to the parliament of the Minister of Innovation,[http://www.lastvandeoverheid.nl/LVDO/Web/Resultate n/Pechtold+brengt+bureaucratie+voor+burgers+in+kaar t/, last accessed January 2006] (in Dutch).

[16] J.L. Pressman and A. Wildavsky, *Implementation – How Great Expectations in Washington Are Dashed in Oakland*. University of California Press, London 1984.

[17] V. Peristera, and K. Tarabanis, "Towards an enterprise architecture for public administration using a top-down approach", *European Journal of Information Systems*, vol. 9, 2000, pp. 252-260.

[18] Rohloff, M. "Enterprise architecture: Framework and methodology for the design of architecture in the large", *European Conference on Information Systems*, 2005.

[19] Maier, M.W. & Rechtin, E. (2002). *The art of System architecting*. CRC press Boca Raton, Florida

[20] J Ross, "Creating a strategic IT architecture competency: Learning in stages", *MISQ Quarterly Executive*, vol. 2, no. 1, 2003, pp. 31-43.

[21] W.R. Scott *Institutions and Organizations. Thousand Oaks*, CA, Sage, 1995.

[22] S.H. Spewak, *Enterprise Architecture Planning*. New York: John Wiley & Sons 1992.

[23] P. Weill "Don't Just Lead, Govern: How best Performing Organizations Govern IT", *MIS Quarterly Executive,* Vol. 3, no. 1, 2004, pp. 1-17.

[24] P. Weill and J. Ross "A matrixed approach to designing IT governance", *MIT Sloan Management Review*, 46, 2, 2005, pp. 26–34.

[25] J.A. Zachman, "A Framework for Information Systems Architecture", *IBM Systems Journal*, Vol. 26, No. 3, 1987, pp. 276-292.

Hjort-Madsen, K. (2007). "Institutional Patterns of Enterprise Architecture Adoption in Government," Transforming Government: People, Process and Policy, vol. 1, no. 4, pp. 333-349.

Institutional patterns of enterprise architecture adoption in government

Kristian Hjort-Madsen

IT-University of Copenhagen, Copenhagen, Denmark

Abstract

Purpose – The purpose of this paper is to understand why, and under which circumstances, enterprise architecture (EA) planning adoption improves information systems (IS) planning and supports administrative transformation in government.

Design/methodology/approach – About 12 cases in the USA were approached with a preliminary theoretical framework derived from the extant literature. Theory building had affinities with grounded-theory approaches and came out of numerous iterations between the "deep cases" and the extant theory.

Findings – Three adoption patterns illustrate that the adoption of a new IS planning innovation does not create administrative or political transformation in itself. Compliance and imitation primarily drives the adoption process, while fundamental transformation to the tasks performed in government is only achieved if the institutional force at the micro-and macro-level promotes transformation.

Research limitations/implications – The neoinstitutional perspective proposed can be of value to other IS researchers as a basis for empirical work in other situations; the implications of the case study can be taken as starting point for further research into the important topic of IS-based administrative transformation.

Practical implications – The research illustrate that EA adoption is an emergent, evolving, embedded, fragmented, and provisional social production that is shaped as much by cultural and structural forces in the organizational context in which they are implemented as rational technical and economic ones. The findings helps public organizations better understand and manage the adoption of new IS planning innovations.

Originality/value – In the IS literature, very few have recognized the contribution of "new" institutional theory. Thus, this paper helps us understand how administrative and political transformation is adopted in government from a new perspective.

Keywords Organizational theory, Information systems, Public sector reform, United States of America

Paper type Research paper

Introduction

The information systems (IS) planning field has undergone a minor revolution during the last couple of years featuring new trends such as IT-governance (Weill and Ross, 2004), Service-oriented architecture (Datz, 2004) and enterprise architecture (EA) planning (Ross, 2003). In the seeming confusion of an e-government atmosphere, thick with hyperbole about public IS-based reform initiatives, the question is how IS planning innovations are adopted in public sector agencies and how these impact organizational processes and policy? This paper offers a neoinstitutional perspective on this grand question by emphasizing how patterns of adoption are not produced solely by the aggregation of individual and organizational behavior but by institutions that structure and govern action.

Practitioners (Hite, 2003), researchers (Ross, 2003; Peristera and Tarabanis, 2000; Richardson *et al.*, 1990), and standardization organizations (e.g. The Open Group) have promoted EA planning, claiming that it can help public and private organizations guide executive decisions and manage IS resources better, as well as facilitate administrative reforms. EA planning is defined as "the analysis and documentation of an enterprise in its current and future state from an integrated strategy, business and technology perspective" (Bernard, 2005). EA planning prescribes an enterprise-wide documentation, analysis and planning approach seeking to align IS resources with the organization's business strategy (Spewak, 1992; Ross, 2003; Iyer and Gottlieb, 2004). As such, EA planning can be considered an IS planning innovation in public organizations because it requires a new line of thinking with the definition and organizational tailoring of new IS planning processes (Damanpour and Gopalakrishnan, 2001).

The grand question presented above is explored further in this paper through 12 case studies in Federal agencies in the USA. Empirically grounded, the paper seeks to understand why, and under which circumstances, EA planning adoption impacts IS planning and supports administrative transformation in government?

Not many public or private organizations have been able to reap the benefits of EA planning (Hjort-Madsen and Burkard, 2006; Ross, 2003), and with few exceptions (Barrett and Walsham, 1999; King *et al.*, 1994; Kling and Iacono, 1988) IS research has yet to answer how institutions influence the design, use, and consequences of IS planning initiatives, either within or across organizations. The sociological, neoinstitutional perspective perused in this paper offers a vantage point for conceptualizing EA planning adoption as an emergent, evolving, embedded, fragmented, and provisional social production that is shaped as much by cultural and structural forces in the organizational context, in which they are implemented, as rational, technical and economic ones. The neoinstitutional perspective proposed can be of value to other IS researchers as a basis for empirical work in other situations; the implications of the case study can be taken as starting point for further research into the important topic of IS-based administrative transformation in the public sector.

Theoretical framework
EA planning is part of a reform paradigm in e-government where IS is perceived a central vehicle in administrative reforms and transformation. Many researchers have argued that IS is an instrument to drive administrative reforms and transformation (Weiner, 1969; Reinermann, 1988; Gasco, 2003; Fountain, 2002; Garson, 2004; Scholl, 2005). Others have, however, found few empirical studies that document the impacts of IS on public administration, and it has been argued that most government managers want to keep things the way they are (Kraemer and King, 2006; Norris and Moon, 2005; Gronlund, 2005; Danziger and Andersen, 2002). The question is what kind of administrative reform and transformation we can expect to be part of IS planning innovations in government? This paper offers an institutional perspective of this question.

An institiutional framework for analysis
Institutional theory is dispersed over a heterogeneous body of literature. Many disciplines have institutional strands of theory and particular representatives of

institutional thought, economics (Williamson, 1975; North, 1990), political science (Evans *et al.*, 1985; Wildavsky, 1987), sociology (Scott and Meyer, 1994), business sciences (March and Polsen, 1989), and anthropological sciences (Douglas, 1986) all have each their own perspective. However, many have made a distinction between the "old" and the "new" interrelated institutionalisms (Pedersen and Dobbin, 2006; Hirsch and Lounsbury, 1997; DiMaggio and Powell, 1991).

In the IS literature, very few have recognized the contribution of "new" institutional theory (Magnusson and Nilsson, 2006; Kling and Iacono, 1988; King *et al.*, 1994; Barrett and Walsham, 1999; Gosain, 2004; Crowston and Myers, 2004). Lyytinen and Damsgaard (2001) and others have criticized the widely used diffusion of innovation research (Hai, 1998; Premkumar *et al.*, 1994; Rogers, 1995; Tornatzky and Klein, 1982) for associating an innovation with distinct and measurable features. The "new" sociological institutional theory (or neoinstitutional theory) answers this call for a new understanding of IS innovation adoption by emphasizing the critical question of meaning as a vital force in the evolving tradition of action explanation (DiMaggio and Powell, 1983). Contemporary neoinstitutionalism in sociology (Dobbin, 1994; Powell, 1991) argues that social action is powerfully shaped by the social context, and that adoption is not always intestinal or rational. The social "reality" in which individuals, groups, and organizations function is viewed as a highly plastic constructs that simultaneously enforces behavior on many dimensions while being altered to accept previous disallowed behaviors on many others. For instance, Zucker (1983) argue that stability and resistance in organizations rests on beliefs, which are developed and maintained across generations of organizational actors resisting change. Similarly, DiMaggio and Powell (1983) accounted for the homogeneity of organizational structures and practices by pointing to coercive and mimetic processes that drive organizations to adopt culturally legitimate norms and routines – resisting changes that are not aligned with these.

Institutional influences both enable and constrain reform and transformation. Neoinstitutionalists view organizations not as passive pawns that can be changed by new management paradigms, but as active players capable of responding strategically and innovatively to new changes in their environment (Scott, 2001). Unlike the "old," rationalist worldview, sociological neoinstitutionalism sees the evolution of organizational form as haphazard, rather than a linear progression toward increasingly efficient practices (Dobbin, 1994). Neoinstitutional theory was therefore chosen as the basis for the research reported here to trace the dynamic interlinking among elements of IS planning and the different levels of organizational and field contexts. The framework adopted for this study is summarized in Table I.

The first component of our framework is the institutional field. DiMaggio and Powell (1983, p. 143) define an organizational field as:

> . . . those organizations that, in the aggregate, constitute a recognized area of institutional life; key suppliers, resource and product consumers, regulatory agencies, and other organizations that produce similar services and products.

Others have similar definitions of the field and the forces that can transform the social "reality" in a field where innovations are adopted (Powell, 1991; Scott *et al.*, 2000; Dacin *et al.*, 2002). Among these, three factors are dominant in the literature (Mazza and Pedersen, 2004): The first factor is boundary rearrangements, through which new

Components	Definition	Associated elements
Institutional field	National strategy, key players in the market, and organizational interdependencies	Boundary rearrangements External shocks Ineffective isomorphism
Organizational isomorphism	The reproduction of organizational values and norms, imitation and general resistance to change	Coercive isomorphism Normative isomorphism Mimic isomorphism
Innovative forces	The particular template for IS planning activates prescribed by the new planning innovation	Persistent routines Persistent social structures Persistent norms and values

Table I.
Framework for analysis

Source: Based on DiMaggio and Powell (1983, 1991)

regulatory and legal frameworks are introduced that can reduce the relevance of existing norms, put at stake the existing power-dependence relations (Pfeffeer and Salancik, 1978), and question the legitimacy of institutions (Meyer and Rowan, 1977). Instructions will thus change to keep an active role in the environment. The second change factor is Fligstein's (1991) conceptualization of external shocks provided by macrocosmic conditions, the state or other organizations powerfully shapes dynamics among actors and the direction of the change. The third factor emphasized in the neoinstitutional theory is the concept of ineffective isomorphism, where pressures from existing institutions do not seem to be relevant; changes are more likely to occur at the organizational level (Scott *et al.*, 2000).

The second component is the organizational isomorphism. DiMaggio and Powell (1991) notes that organizations in the same institutional field adopt the same structures and ways of working in order to survive as a constraining process, that forces one unit in a population to resemble other units that face the same set of environmental conditions. Imitation occurs through three mechanisms (DiMaggio and Powell, 1991): coercive isomorphism implies that other powerful organizations demand adoption of an innovation either through regulation or by means of financial support. Mimetic isomorphism is a way to deal with uncertainty, i.e. a loss of legitimacy, by imitating what other organizations that are perceived as successful have done. Normative isomorphism is the result of professionalizing. Normative isomorphism results from the training, or socialization of managers, the interactions between members of professions and the hiring of external consultants. Consequently, as more and more organizations adopt an IS planning innovation – either through coercion or imitation – they become a legitimate mode of operation for single organizations.

The last component in our analytical framework deals with the nature of the IS planning innovation. Even though neoinstitutionalism emphasizes stability and isomorphic forces, planning innovations also represents a particular template for the conduct of IS planning activities in public organizations. Inspired by Gosain (2004) and DiMaggio and Powell (1991), three institutional logics can be identified: persistent routines in planning innovations will (potentially) encode institutionalized principles

into the IS planning process and constrain the routines of organizational actors. Persistent social structures will (potentially) be institutionalized in the planning programs and lead to enactment of patterned behaviors in the IS planning. Persistent norms and values affect the rules of social conduct (DiMaggio and Powell, 1983). EA planning represents new norms and values based on policies and technical choices that gradually becomes "taken for granted" in the IS planning processes.

From this perspective, planning innovations in public agencies can be seen an important incarnation of institutional commitments (e.g. standards determination, financial IS control and other governance instruments), while they are also adapted to the institutional forces and processes already enacted in these agencies. The adoption process cannot be considered linear, as the organizational response to each misalignment is the result of a process of interaction and negotiation among various parties, including management, users, IS personnel, and consultants.

Research design
Aiming at making a contribution to the understanding of how IS planning innovations are adopted in public agencies, a multiple case study of EA planning was undertaken. The US Federal Government was chosen as the unit of analysis for the study because of the country's early enthusiasm about using IS in government (Kraemer and King, 2006) and the early focus on IS planning in the American public sector (Eseryel and Wolff, 2005).

The 12 cases were approached with a preliminary theoretical framework derived from the extant literature (Yin, 1994; Brown and Eisenhardt, 1998). Theory building had affinities with grounded-theory approaches and came out of numerous iterations between the "deep cases" and the extant theory (Strauss and Corbin, 1998; Dyer and Wilkins, 1991).

Data and methods
The study triangulated sources of evidence and methods for data collection (Yin, 1994). About 21 people from 12 federal agencies and the Office of Management and Budget (OMB) were interviewed in the fall of 2005 and spring of 2006 about the adoption of EA planning. The interviews were supplemented by examining documents, presentations, and newspaper clippings from all agencies as well as the historical (field) development in US Federal IS planning. In this way, every effort was made in the historical reconstruction to try to check the participants' views at some historical time against documentation.

In selecting cases, replication logic was followed to deal with contradictory experimental findings in the field study (Miles and Huberman, 1994; Yin, 1994). Ten of the agencies in the analysis are cabinet level agencies, while the last two are very large agencies that play a dominant role in the Federal IT-budget. The primary contact persons in all agencies were the chief enterprise architects, while six chief information officers (CIO's) in the agencies and lawyers from two of the agencies' General Council Offices were interviewed to supplement and verify/falsify the information provided. At OMB the chief enterprise architect for the federal government was interviewed three times. Based on the theoretical framework, semi-structured interview guides were used to guide the interview sessions and all interviews were tape-recorded and subsequently transcribed in their full length.

As is typical of inductive research, to advance theory out of "staggering volume of data" (Eisenhardt, 1989), the rich information gathered was coded in Atlas.ti and write-ups for each case was conducted. Data from all sources – interviews, documents, presentations, and newspaper clippings – were synthesized in the case-study write-ups and structured according to the major variables in the neoinstitutional analytical framework. Then, within and across-case analyses were performed to extract and reorganize information from the case study write-ups into a cross-case comparative format, following design indications for comparative qualitative research by Miles and Huberman (1994). Comparative displays were used for clarifying main points of convergence and divergence. In addition to initially specified issues of interest, new themes were also allowed to emerge from the data.

In this way, the analysis of the data collected from the various sources reflected and expanded the analytical framework in trying to identify important content, context, and process elements of the EA planning adoption process. Theory building from cases was based on analytic generalization, "in which previously developed theory is used as a template with which to compare the empirical results of the case study" (Yin, 1994).

Analysis

This section analyzes the way that EA planning is both an object and a carrier of institutional forces as an IS planning innovation in 12 US Federal agencies. The analysis focuses on the major changes in the IS planning field from 2002 to 2006 and the adoption process in the agencies.

Before 2002, Federal agencies were required to have a CIO responsible for IS-architecture planning (the Clinger-Cohen Act from 1996). Formal IS planning in the Federal government was however modest and confined to a technical application focus (Eseryel and Wolff, 2005). In 2002, the OMB established the federal enterprise architecture (FEA) as part of the E-Government Act (E-Gov, 2002) to guide the Federal IS planning. The FEA prescribes how IS planning should be performed in Federal agencies; it is not an architecture in itself, but a collection of five reference models, which are intended to facilitate government-wide improvement through cross-agency analysis and the identification of duplicative investments, gaps, and opportunities for collaboration, interoperability, and integration within and across government agencies (OMB, 2002). Every year OMB sends out a circular (A-11) providing a standard template for Federal agencies to use in requesting IS program funding. All Federal IS investments must now comply with the FEA as part of the annual out-year budget submission, and OMB assesses each agency's compliance with the five reference models – an important change in the Federal IS planning field.

Three patterns of adoption

One of the striking observations in the first round of interviews was the rather similar definitions and yet very different implementations of EA planning in the twelve public agencies. The write-ups for each case illustrates that, even though OMB has a rather precise definition of EA, the agencies have their individual way to implement EA planning in their IS planning efforts – ranging from a narrow technical focus to a business/transformation-driven EA planning focus. Searching for cross-case patterns shows no clear link between status and size of the agencies and the way EA planning is defined and implemented. However, by selecting pairs of cases and comparing them as

prescribed by Miles and Huberman (1994), subtle differences between the 12 cases were identified. Based on the case-study, data for each agency and the theoretical and empirical information gathered, a categorization system for each of the major variables in the neoinstitutional framework was developed (the data and methods subsection). The write-ups from each case were used to organize the data from each case-study into the categorization system. In this way, searching the multiple data sources in Atlas.ti allowed us to play with different categories, forced us to go beyond initial impressions, and improved the fit between the theoretical framework and the rich data collected. After the in-depth categorization and data-analysis exercise, three generic patterns for the adoption of EA planning in the 12 agencies studied were identified. Table II summarizes the three patters for adoption based on the theoretical framework, and the patterns are subsequently described in detail.

Accepters. We need to do this [EA planning] to get funding for our IT-projects (Chief Information Officer).

Three of the agencies studied can be described as "Accepters" because they only have implemented EA planning as OMB forces them to comply with the FEA. The organizations have CIOs and conduct IS planning as prescribed by the Clinger-Cohen Act from 1996, but the formal introduction of EA planning in 2002 has had little or no effect on the IS planning conducted in the agencies. As the introductory quote from one of the three CIOs in this pattern illustrates, the "Accepters" initially implement EA planning because they need to secure funding from OMB for IS projects in their organizations.

	Accepters (3)	Improvers (7)	Transformers (2)
Institutional field	Minimum compliance with the Federal IS planning agenda	The Federal IS planning agenda is used to change the internal IS planning agenda	The internal agenda for EA planning is confirmed by the Federal IS planning initiatives
Organizational isomorphism	Strong institutionalized norms and routines internally resist changes to the IS planning agenda	IS-departments follow the field development and imitate other agencies Bureaucratic norms and routines resist changes to administrative arrangements	Environmental pressures to the organizations promote administrative reforms via IS planning Strong IS-departments exploit the "window of opportunity"
Innovative forces	IS planning programs are shaped by existing organizational institutions	IS planning programs are shaped by existing institutions	IS planning programs support administrative reform agendas by pushing IS-based transformation
	Limited effects on routines and norms for IS planning	Incremental improvements of technical routines and norms for IS planning	Persistent IS planning routines champion business process management

Table II.
Three patterns
of adoption

For the "Accepters" the boundary rearrangements at the field level in the Federal IS planning field generally has had little effect. The main reason for the resistance to change in this pattern is the ineffective isomorphic pressures. All three organizations are large and well established with a long history of independence, and mimic isomorphism – that prescribe government organizations to model themselves after similar organizations – are therefore weak in these organizations. The coercive isomorphism that formally forces Federal agencies to conduct EA planning is present, but because these organizations have a strong internal normative isomorphic standpoint for professional norms of public service based on a strict hierarchical understanding, the field agenda plays a minor role in these organizations social "reality." A chief enterprise architect from one of the three agencies summarized the institutional setting:

> We [the IT department] are seen as technical specialists. We are not talking much with the program people because they don't want to talk with us. . . That is just the way it has always been and I think it will be difficult to change that mentality (Chief Enterprise Architect).

The institutional norms in these organizations simply resists IS as a change factor because the norms and routines prescribe IS to be something technical that "just works." This is illustrated by the mandate of the CIO offices in the three organizations; none of the CIO offices in this pattern have control over the IS-budget. IS planning is performed as a pure technical exercise, and all decisions about funding of IS are made outside the CIO office with no regard to EA planning. Owing to these strong institutional forces the EA planning innovation is reduced to a purely technical issue in these organizations. The agencies are forced to accept the new agenda for IS planning that OMB has established with the FEA, but the EA planning implementation in these agencies only have little effect on the technical IS planning routines and norms. The data material documents resources reductions due to the formal policies and technical choices in the EA planning program, but these improvements are limited and far from the EA planning rhetoric at the field level.

In summary, the pattern for these three Federal agencies does not indicate that EA planning is generating any type of administrative transformation. The adoption process is caught up in an organizational negotiation where the internal mimic and normative isomorphic forces resist change. The findings show that the EA planning innovation might improve the technical planning and resource management efforts due to the increased IS planning awareness forced by OMB. One could however argue that this "planning awareness" in the three agencies would also have existed if EA planning had not been introduced.

> *Improvers*. This [the EA planning program] is a good tool and we see many benefits. It has not revolutionized our daily activities, but it has created considerable management awareness because of the OMB push and the new ways of planning our IT-investments (CIO).

Seven of the agencies studied are identified as "Improvers" because they have not merely accepted the EA planning innovation, but actually used it to improve their IS planning efforts. As the quote above from one of the CIOs in this pattern illustrates, the EA planning agenda has increased the executive interest in IS planning and many of the CIOs in this pattern have gained considerable momentum in their efforts to use IS planning as a strategic tool. The impact of EA planning is, however, primarily

identified at the technical level where these agencies have used EA planning to reduce the diversity of technologies and eliminating redundant or obsolete applications.

For the "Improvers" the boundary rearmaments caused by the FEA has been decisive for the adoption of EA planning; social norms and structures at the organizational level were found to be rather ineffective in these organizations. All organizations describe a constant organizational negotiation going on between the institutionalized organizational stability found in the "Accepters" pattern and the EA planning innovation. CIOs and chief enterprise architects in this pattern where, however, not heavily socialized into a traditional, change resistant IS planning approach. What creates incremental changes to the IS planning agenda in these agencies is strong mimic and normative isomorphism. The IS departments are very aware of the coercive forces at the field level and they have used the external shock that the FEA provided in 2002 to gain momentum in their organizations. Looking back one of the CIOs defined the internal strategy in the following way:

> The FEA pushed us in the right direction ... OMB gave us a powerful platform internally because we had to do it [EA]. I am not sure that the management still really understands what this is all about, except compliance, but they seem to be trying. I believe in it [EA] and I am sure that the value will be apparent to all in a couple of years (CIO).

Contrary to the "Accepters," normative isomorphism can be traced to the field level where, especially, the seven chief enterprise architects feel a strong association with the professional norms and values for "best practice" EA planning conceptualized by OMB, academics and consultants in the field. The seven EA planning programs in this pattern look very similar and this indicates strong mimic isomorphism; these agencies follow the field development very closely, and many of the respondents explicitly note that parts of their own EA planning programs are "borrowed" from other agencies. As a consequence, of this development, the normative prescriptions that are part of the EA planning innovation have been embraced extensively in this pattern. Only two of the seven IS departments in this pattern have control over the IS budget. But all agencies use a formal EA planning framework with an enterprise-wide focus on business and technology that have created persistent routines for such tings as the EA planning involvement in IS projects and the selection of technical standards. The social structures and norms for IS planning have however not yet been changed according to the EA planning ideals and all agencies are struggling to get access to the strategic planning process in their organizations where EA planning (potentially) can facilitate administrative transformation.

The pattern for "Improvers" is supporting the claim that EA planning helps guide executive decisions. With the push from OMB, the seven agencies have been able to activate the top management in the IS planning process. The claim that EA planning drives administrative transformation is however not supported. The seven "Improvers" have enhanced their general IS planning efforts, but EA planning does not transform the agencies by replacing traditional hierarchies with leaner structures or less middle managers. To some extent the EA planning agenda drives technical reforms and improves resource management for agencies in this pattern.

Transformers. EA planning is the perfect tool when you need to change the way government works. It took a while for the management to understand the benefits, but now they listen when we [the EA team] talk (Chief Enterprise Architect).

Only two of the agencies studied can be described as "Transformers" because they have used EA planning to transform their administration and the way IS planning is conducted in their organizations. In these, agencies EA planning has facilitated transformation of long-established practices in their organizations and built new leaner structures for the service provision in their agencies. As the quote above from one of the two chief enterprise architects in this pattern illustrates, EA planning is seen as the transformation tool. The interesting finding is, however, that it is not EA planning that forced administrative reforms in itself, it was external shocks and subsequent mimic isomorphic pressures.

The boundary rearrangements caused by OMB in 2002 were well accepted by the two "Transformers." The IS departments in these agencies had championed the EA planning agenda since the rise of the new IS paradigm, and they both tried to translate the FEA as an "external shock" in their organizations. At first, however, this was not successful; both agencies are very large and there were strong institutionalized norms and routines similar to those found in the two other patterns. The IS departments were perceived as something technical that "just works" for a long time in these agencies and the EA planning only gained momentum as a reform tool when their organizations were forced to change. Both organizations in this pattern were under extreme environmental pressure to change their modes of delivery to citizens and their financial management (in 2002 and 2003, respectively) that forced the change. In other words, the EA planning was used to facilitate administrative and technical reform, but only because a "window of opportunity" was established by other forces in the organizations. One of the CIOs described the situation very well:

> The EA program really gained momentum in 2003 when our department funding was shot down by Congress because of our poor financial performance management. As you know, I had been preaching EA for some time internally, but the management did not really understand it. After the battle with Congress they had to understand the value of it [EA].

The EA planning innovation was also successful in these agencies because the isomorphic pressures from similar organizations (accepters and improvers) were rather ineffective. The "Transformers" used the momentum that the organizational reform agenda had established to institutionalize EA planning programs that were built to support transformation. Contrary to the ten EA planning programs found in the two other patterns, EA planning was used to transform the existing IS planning practices into persistent routines that championed business process management as a central part of the EA planning process, and the social structures in the IS department were changed to be much more business/transformation focused than in any of the ten other cases studied. Still a rather new concept, EA planning has, in other words, been allowed access to the business/transformation planning agenda in the two agencies in this pattern, and have changed the norms and values traditionally associated with public IS planning.

In summary, the two "Transformers" in this study were the only agencies that used EA planning to drive administrative transformation, guide executive decisions, and improve recourse management. The interesting thing about this pattern is however that EA planning was only a vehicle for change in the two agencies and that it was other institutional forces in the organizational context that really made the transformation possible. In the following section we look at the implications of these findings for public IS planning in general.

Implications for IS planning in the public sector

The analysis illustrates how institutional forces at the macro-and micro-level powerfully shape the adoption of IS planning innovations in public organizations. EA planning is not, in itself, improving executive decisions and resource management, nor is it generating administrative reforms that replace traditional hierarchies with leaner structures or less middle managers. As the three patterns illustrate, the EA planning innovation is reinvented and reshaped in public organizations by institutional forces.

The analysis first of all illustrates how the macro environment shapes organizational adoption of an IS planning innovation in government. There is a striking homogeneity in the way that the 12 EA planning programs are defined because they are all part of the same field with formalized and non-formalized institutional forces that create a mutual orientation. The FEA created an external shock to many Federal organizations by changing the boundaries for the Federal IS planning field. But, the analysis also illustrated how the field is isomorphic in the way that CIOs and chief enterprise architects gain recognition in the eyes of other CIOs and chief enterprise architects in the Federal IS planning arena. "Accepters," "Improvers" and "Transformers" are all guided as much by legitimated elements at the field level – from standard operating procedures defined in the FEA to professional EA norms and values – as rational technical and economic elements that improve the actual IS planning performance. It is important to understand how these legitimated elements at the macro level guide public IS planning adoption because they tend to directing attention away from task performance. Our analysis suggests that many of the Federal organizations studied use EA planning in their operations and management because of pressures of symbolic meanings (social legitimacy) and pressures to conform to commonly adopted action-generating properties (efficiency and productivity gains of using EA planning) at the field level. Adoption of IS planning innovations in public organizations therefore needs to be understood in the context of changes at the macro-institutional level.

The analysis also illustrates a constant organizational negotiation going on at the micro level between existing institutional regimes in the 12 agencies and the particular template for IS planning embedded in the EA planning innovation. A number of institutionalized habits and values that reinforce existing administrative and political arrangements were identified, and how pre-existing organizational structures oppose the logics of EA planning. In most of the agencies studied IS planning is still performed as a technical exercise, and decisions about funding of IS-projects are made outside the CIO office with no regard to EA planning. IS planning is perceived as something "technical," and administrative transformation are therefore not driven by EA planning in itself. All Federal agencies in the USA are forced to accept the new EA planning agenda that OMB established with the FEA in 2002, but the EA planning adoption generally has little – or only incremental – effect on executive decisions and resource management, not to mention administrative reforms. Top managers are rarely interested in organizational change, and the EA planning innovation thus gets adopted to underpin the existing organizational structures. Even though EA planning challenges the institutional structures by promoting a new line of thinking for the IS planning routines and values, the analysis illustrates that most of the agencies adopting EA planning struggle to show how IS planning can be a driver for administrative reforms and transformation in government.

When administrative and political change does occur in public agencies, it is likely to be episodic and dramatic. EA planning was used to guide administrative reforms, guide executive decisions, and improve recourse management in the adoption pattern for "Improvers." But, the transformation was a response to institutional change at the macro-level, rather than the particular new template for IS planning that EA prescribes. The majority of the agencies studied ("Improvers" and "Accepters") only make incremental changes to their IS planning efforts because of the "must" statements by FEA. CIOs in the Federal agencies studied rarely have IS-budget control and struggle to get IS planning on the management agenda. Fundamental changes to the IS planning agenda only occurred in two of the agencies because the social arrangements that have buttressed institutional regimes in these organizations suddenly appear problematic. External shocks from Congress pushed administrative reforms in these agencies and the IS-departments successfully exploited the "window of opportunity" by making EA planning a driving force for administrative and political transformation.

The adoption patterns for the EA planning innovation illustrate how difficult it is to introduce new routines, structures and social values in government. The internet and other open standards have greatly improved the technical capabilities for organizational transform. However, as our analysis illustrates, there will be no fundamental changes to the tasks performed in government or the nature of the work itself if the institutional environment resists change. Use of IS has dramatically affected many business organizations and sectors in the past decade (Brynjolfsson and Hitt, 2003). It is however unlikely that the development in the public sectors IS planning will resemble the development in the private sector. Public sector planning is simply qualitatively different from planning in private enterprises or industries; while dramatic higher profits, promotions, stock price increases, and market shares are drivers for planning reforms in the private sector, this can be a showstopper in the public sector where effective IS planning most often will be rewarded with budget cuts, staff reductions and loss of resources (Fountain, 2001). Contrary to the hyperbole about public transformation initiatives driven by IS planning innovations, we found the causal direction reversed from EA planning being transformative and prescriptive in its nature to EA planning being reshaped and adopted in step with the institutional forces in public organizations and their macro environment. As we have seen IS planning innovations can change routines, structures and social values in government, but it must be understood in the context of the institutional forces that often resist dramatic changes. Public sector reforms will always be driven by political determination, while IS planning can be the enabling tool.

Conclusion

The aim of this paper was to understand why, and under which circumstances, EA planning adoption impacts IS planning and supports administrative transformation in government. The neoinstitutional lens applied in this paper offers a broader perspective on the adoption of IS planning innovations in public organizations. The majority of the existing e-government literature typically focuses on prescriptions for strategy formulation at a particular point in time. Our framework helped us understand a series of apparently false dichotomies of various concepts associated

with government EA planning between the cool imagery of formal structure and the warm imagery of human, social processes.

The analysis goes beyond the traditional e-government hyperbole about public reforms driven by IS implementations and offers a contextual understanding of the regulative processes, normative systems, and cultural frameworks that shape the adoption of public IS planning innovations. The basic framework and research approach offered in this paper will be of value to other researchers and senior IS and organizational managers in the public sector responsible for IS planning and its linking to administrative transformation.

The three adoption patterns (accepters, improvers, transformers) identified in the multiple case study illustrate that the adoption of a new IS planning innovation does not create administrative or political reforms in itself. Compliance with the national requirements for EA planning drives the adoption process in all the agencies studied, while fundamental changes to the tasks performed in government may only be achieved if the institutional force at the micro-and macro-level promotes transformation.

All the agencies studied imitate what is perceived as "best practice" in other agencies due to pressures of social legitimacy and pressures to conform to commonly adopted practices at the macro level. IS planning is still perceived as a technical exercise in many Federal agencies in the USA, and it is unlikely that the IS planning development in the public sector will resemble the development in the private sector (Kraemer and King, 2006). Administrative and political changes can only be driven by IS planning innovations if the institutional settings allow it; institutions do not just constrain options – they establish the very criteria by which people discover their preferences.

References

Barrett, M. and Walsham, G. (1999), "Electronic trading and work transformation in the London insurance market", *Information Systems Research*, Vol. 10 No. 1, pp. 1-22.

Bernard, S.A. (2005), *An Introduction to Enterprise Architecture*, Author House, Bloomington, IN.

Brown, S.L. and Eisenhardt, K.M. (1998), *Competing on the Edge: Strategy as Structured Chaos*, Harvard Business School Press, Boston, MA.

Brynjolfsson, E. and Hitt, L.M. (2003), "The catalytic computer: information technology, enterprise transformation, and business performance", paper presented at the First International Conference on the Economic and Social Implications of Information Technology, Washington, DC, January 27.

Crowston, K. and Myers, M. (2004), "Information technology and the transformation of industries: three research perspectives", *Journal of Strategic Information Systems*, Vol. 13 No. 1, pp. 5-28.

Dacin, M.T., Goodstein, J. and Scott, W.R. (2002), "Institutional theory and institutional change: introduction to the special research forum", *The Academy of Management Journal*, Vol. 45, pp. 45-56.

Damanpour, F. and Gopalakrishnan, S. (2001), "The dynamics of the adoption of product and process innovation in organizations", *Journal of Management Studies*, Vol. 38 No. 1, pp. 45-65.

Danziger, J.N. and Andersen, K.V. (2002), "The impacts of information technology on public administration: an analysis of empirical research from the "Golden Age" of transformation", *International Journal of Public Administration*, Vol. 25 No. 5, pp. 591-627.

Datz, T. (2004), "Architecture – what you need to know about service-oriented architecture", *CIO Magazine*, Vol. 17 No. 7, pp. 78-88.

DiMaggio, P.J. and Powell, W.W. (1983), "The iron cage revisited: institutional isomorphism and collective rationality in organizational fields", *American Sociological Review*, Vol. 48 No. 2, pp. 147-60.

DiMaggio, P.J. and Powell, W.W. (1991), "The iron cage revisited: institutional isomorphism and collective rationality in organization fields", in Powell, W.W. and DiMaggio, P.J. (Eds), *The New Institutionalism in Organizational Analysis*, The University of Chicago Press, Chicago, IL, pp. 63-82.

Dobbin, F. (1994), "Cultural models of organization: the social construction of rational organizing principles", in Crane, D. (Ed.), *The Sociology of Culture: Emerging Theoretical Perspectives*, Basil Blackwell, Oxford, pp. 117-41.

Douglas, M. (1986), *How Institutions Think*, Syracuse University Press, Syracuse, NY.

Dyer, W.G. Jr and Wilkins, A.L. (1991), "Better stories, not better constructs, to generate better theory: a rejoinder to Eisenhardt", *Academy of Management Review*, Vol. 16 No. 3, pp. 613-9.

E-Gov (2002), "The E-Government Act of 2002", (H.R. 2458/S. 803), available at: www.whitehouse.gov/omb/egov/g-4-act.html

Eisenhardt, K.M. (1989), "Building theories from case study research", *Academy of Management Review*, Vol. 14 No. 4, pp. 532-50.

Eseryel, U.Y. and Wolff, N. (2005), "Enterprise architecture as a context for ERP implementation", *Journal of Enterprise Architecture*, Vol. 1 No. 2, pp. 7-24.

Evans, P.B., Rueschemeyer, D. and Skocpol, T. (1985), *Bringing the State Back In*, Cambridge University Press, Cambridge.

Fligstein, N. (1991), "The structural transformation on American industry: an institutional account of the causes of diversification in the largest firms 1919-1979", in Powell, W.W. and DiMaggio, P.J. (Eds), *The New Institutionalism in Organizational Analysis*, The University of Chicago Press, Chicago, IL, pp. 311-36.

Fountain, J.E. (2001), *Building the Virtual State: Information Technology and Institutional Change*, Brookings Institution Press, Washington, DC.

Fountain, J.E. (2002), *Information, Institutions and Governance*, John F. Kennedy School of Government, Harvard University, Cambridge, MA.

Garson, G.D. (2004), "The promise of digital government", in Pavlichev, A. and Garson, G.D. (Eds), *Digital Government Principles and Best Practices*, Idea Group Publishing, Hershey, PA, pp. 2-15.

Gasco, M. (2003), "New technologies and institutional change in public administration", *Social Science Computer Review*, Vol. 21 No. 1, pp. 6-14.

Gosain, S. (2004), "Enterprise information systems as objects and carriers of institutional forces: the new iron cage?", *Journal of the Association for Information Systems*, Vol. 5 No. 4, pp. 151-82.

Gronlund, A. (2005), "State of the art in e-gov research: surveying conference publications", *International Journal of Electronic Government Research*, Vol. 1 No. 4, pp. 1-25.

Hai, T.H. (1998), *Organizational Predisposition toward and Information Technology Innovation: The Roles of Three Theoretical Perspectives in the Case of Financial Electronic Data*

Interchange, Department of Computer Science and Information Systems, National University of Singapore, Singapore.

Hirsch, P.M. and Lounsbury, M. (1997), "Ending the family quarrel: toward a reconciliation of 'old' and 'new' institutionalisms", *American Behavioral Scientist*, Vol. 40, pp. 406-18.

Hite, R. (2003), *Information Technology: A framework for Assessing and Improving Enterprise Architecture Management (Version 1.1)*, US General Accounting Office, Washington, DC.

Hjort-Madsen, K. and Burkard, J. (2006), "When enterprise architecture meets government: an institutional case study analysis", *Journal of Enterprise Architecture*, Vol. 2 No. 2, pp. 11-25.

Iyer, B. and Gottlieb, R.M. (2004), "The four-domain architecture: an approach to support enterprise architecture design", *IBM Systems Journal*, Vol. 43 No. 3, pp. 587-97.

King, J.L., Gurbaxani, V., Kraemer, K.L., McFarlan, F.W., Raman, K.S. and Yap, O.S. (1994), "Institutional factors in information technology innovation", *Information Systems Research*, Vol. 5 No. 2, pp. 139-69.

Kling, R. and Iacono, O.S. (1988), "The institutional character of computerized information systems", *Office: Technology and People*, Vol. 5 No. 1, pp. 7-28.

Kraemer, K. and King, J.L. (2006), "Information technology and administrative reform: will e-government be different?", *International Journal of Electronic Government Research*, Vol. 2 No. 1, pp. 1-20.

Lyytinen, K. and Damsgaard, J. (2001), "What's wrong with the diffusion of innovation theory?", *Proceedings of the IFIP TC8 WG8.1 Fourth Working Conference on Diffusing Software Products and Process Innovations*, pp. 173-90.

Magnusson, J. and Nilsson, A. (2006), "Infusing an architectural framework with neo-institutional theory: reports from recent change management initiatives within the Swedish public administration", *Proceedings of the 39th Annual Hawaii International Conference on System Sciences*, p. 67.

March, J.G. and Polsen, J.P. (1989), *Rediscovering Institutions. The Organizational Basis of Politics*, The Free Press, New York, NY.

Mazza, C. and Pedersen, J.S. (2004), "From press to e-media? The transformation of an organizational field", *Organization Studies*, Vol. 25 No. 6, pp. 875-96.

Meyer, J. and Rowan, B. (1977), "Institutional organizations: formal structures as myth and ceremony", *American Journal of Sociology*, Vol. 83, pp. 340-63.

Miles, M.B. and Huberman, A.M. (1994), *Qualitative Data Analysis*, Sage, Thousand Oaks, CA.

Norris, D.F. and Moon, M.J. (2005), "Advancing e-government at the grass roots: tortoise or hare?", *Public Administration Review*, Vol. 65 No. 1, pp. 64-75.

North, D.C. (1990), *Institutional Structures and Institutional Change*, Cambridge University Press, New York, NY.

OMB (2002), "The federal enterprise architecture reference models", available at: www. whitehouse.gov/omb/egov/a-2-EAModelsNEW2.html

Pedersen, J.S. and Dobbin, F. (2006), "In search of identity and legitimating – bridging organizational culture and neoinstitutionalism", *American Behavioral Scientist*, Vol. 49 No. 7, pp. 897-907.

Peristera, V. and Tarabanis, K. (2000), "Towards an enterprise architecture for public administration using a top-down approach", *European Journal of Information Systems*, Vol. 9, pp. 252-60.

Pfeffeer, J. and Salancik, G. (1978), *The External Control of Organizations: A Resource Dependence Perspective*, Harper & Row, New York, NY.

Powell, W.W. (1991), "Expanding the scope of institutional analysis", in Powell, W.W. and DiMaggio, P.J. (Eds), *The New Institutionalism in Organizational Analysis*, The University of Chicago Press, Chicago, IL, pp. 183-203.

Premkumar, G., Ramamurthy, K. and Nilakanta, S. (1994), "Implementation of electronic data interchange: an innovation diffusion perspective", *Journal of Management Information Systems*, Vol. 11 No. 2, pp. 157-86.

Reinermann, H. (1988), "Vor einer 'Verwaltungsreform?' Informationstechnisch motivieerte Ziele und 'Systemkonzepte' der Verwaltungspolitik", in Reinermann, H., Fiedler, H., Grimmer, K., Lenk, K. and Traunmuller, R. (Eds), *Neue Informationstechniken Neue Verwaltungsstruckturen?*, R.V. Decker & C.F. Muller, Heidelberg, pp. 38-50.

Richardson, G.L., Jackson, B.M. and Dickson, G.W. (1990), "A principles-based enterprise architecture: lessons from Texaco and Star enterprise", *MIS Quarterly*, Vol. 14 No. 4, pp. 385-403.

Rogers, E.M. (1995), *Diffusion of Innovations*, The Free Press, New York, NY.

Ross, J. (2003), "Creating a strategic IT architecture competency: learning in stages", *MISQ Executive*, Vol. 2 No. 1.

Scholl, H.J. (2005), "E-government-induced business process change (BPC): an empirical study of current practices", *International Journal of Electronic Government Research*, Vol. 1 No. 2, pp. 27-49.

Scott, W.R. (2001), *Institutions and Organizations*, Sage, Thousand Oaks, CA.

Scott, W.R. and Meyer, J.W. (1994), *Institutional Environments and Organizations: Structural Complexity and Individualism*, Sage, Thousand Oaks, CA.

Scott, W.R., Ruef, M., Mendel, P.J. and Caronna, C.A. (2000), *Institutional Change and Health Care Organizations: From Professional Dominance to Management Care*, University of Chicago Press, Chicago, IL.

Spewak, S.H. (1992), *Enterprise Architecture Planning: Developing a Blueprint for Data, Applications and Technology*, Wiley, New York, NY.

Strauss, A. and Corbin, J. (1998), *Basics of Qualitative Research: Techniques and Procedures for Developing Grounded Theory*, Sage, Thousand Oaks, CA.

Tornatzky, L.G. and Klein, K.J. (1982), "Innovation characteristics and adoption-implementation", *IEEE Transactions on Engineering Management*, Vol. EM-29 No. 1, pp. 28-45.

Weill, P. and Ross, J.W. (2004), *IT Governance – How Top Performers Manage IT Decision Rights for Superior Results*, Harvard Business School Press, Boston, MA.

Weiner, M.E. (1969), *Service: The Objective of Municipal Information Systems*, Institute of Public Service, University of Connecticut, Storrs, CT.

Wildavsky, A. (1987), "Choosing preferences by constructing institutions: a cultural theory of preference formation", *The American Political Science Review*, Vol. 81, pp. 3-22.

Williamson, O.E. (1975), *Markets and Hierarchies: Analysis and Antitrust Implications*, The Free Press, New York, NY.

Yin, R.K. (1994), *Case Study Research*, Sage, Thousand Oaks, CA.

Zucker, L.G. (1983), *Organizations as Institutions. Research in the Sociology of Organizations*, JAI Press, Greenwich, CT, S.B. Bacharach, pp. 1-42.

Further reading

Segars, A.H. and Grover, V. (1998), "Strategic information systems planning success: an investigation of the construct and its measurement", *MIS Quarterly*, Vol. 22 No. 2, pp. 139-63.

Selznick, P. (1957), *Leadership in Administration*, Harper & Row, New York, NY.

About the author

Kristian Hjort-Madsen is the Strategic Enterprise Architect in the Ministry of Finance in Denmark. He is currently writing an industrial PhD in combination with his work in a public-private partnership between the Ministry of Science, the IT-University of Copenhagen, IBM Denmark and KMD. His works and research focus on the implementation and management of enterprise architectures service-oriented architecture in public agencies and he is widely used as a guest lecturer and strategic advisor on EA related matters. A more detailed bio and significant publications can be found on Mr Hjort-Madsen's blog: www.EAGov.org. Kristian Hjort-Madsen can be contacted at: khm@eagov.org

Publication V

Hjort-Madsen K. and Pries-Heje, J. (2009). "Enterprise Architecture in Government: Fad or Future?," Proceedings of the 42nd Hawaii International Conference on System Sciences, Big Island, Hawaii.

Enterprise Architecture in Government: Fad or Future?

Kristian Hjort-Madsen
IT-University of Copenhagen
Rued Langgaards Vej 7
DK-2300 Copenhagen S
Denmark
Tel: + 45 31 61 12 31
khm@eagov.org

Jan Pries-Heje
Roskilde University
Universitetsvej 1
DK-4000 Roskilde
Denmark
Tel: +45 46 74 30 51
janph@ruc.dk

Abstract

Enterprise Architecture (EA) has been promoted as a key tool for transformation and modernization of government. In this paper we study what has driven the use and adoption of the EA concept in the Danish central government. Based on analysis of focus group and 'guru' interviews with government CIO's, enterprise architects, and consultants, as well as extensive document studies, we find that there are two streams in public sector EA programs: a stable element of it-architecture and a fashion driven business architecture element – used in parallel, but with different focus, approach and artifacts. We conclude that EA in government to a large extend is driven by fashion. Finally, we discuss the role of EA in the future and point out that EA can not transform government by itself. Fundamental transformation to the tasks performed in public organizations is only achieved if institutional forces promote transformation.

1. Introduction

Enterprise Architecture (EA) is the new buzz word for information systems (IS) planning in many governments around the world. [1]. Similar to trends in the past such as Management by Objectives, Total Quality Management and Business Process Reengineering, the EA reform agenda in government promises to break down the 'traditional bureaucracy' and create a 'service oriented' public sector with citizens and businesses at the centre. [2; 3; 4].

Traditionally IS planning is conducted by organizations to ensure that IS resources are effectively utilized [5]. EA, however, promises a new line of thinking with the transformation and modernization of government institutions – as a new public management reform tool [6].

John Zachman [7] introduced the first framework of EA in the late 1980's with the purpose of moving away from an isolated IS development focus, and instead moving to an enterprise-wide documentation, analysis and planning approach. Since then several studies have clarified the definition - including [8; 3; 9; 10].

Common across various definitions of EA is the alignment of IS resources with an organization's business strategy. The definition of EA that we will use is based on [3], where EA is the organizing logic for applications, data, and infrastructure technologies, as captured in a set of policies and technical choices that form unifying principles and practice across projects and lines of business in an enterprise. The vision is to create an interoperable infrastructure to guide the integration of government operations and services at all layers of government [11]. Thus, EA is part of a reform paradigm in e-government, where IS is perceived as a central vehicle in administrative reforms and transformation [12].

There is no doubt that the EA rhetoric of transformation and modernization is appealing to many public managers. Announcing reforms, criticizing bureaucracy, praising new management techniques, and promising improved services to citizens and business is popular in government [13]. Adopting EA is 'doing something' and it can attract favorable attention to the politicians and bureaucrats who espouse it. But it might also be exaggerated to ignore powerful forces of path-dependency and self-disequilibration – that is the capacity of management reform initiatives to produce the opposite of their intended results [14].

Very little research can be found that documents the value of EA [3; 15; 16]. Past experiences with administrative reform suggest two possible paths in which a reform initiative like EA can be influential [13]: One is the 'incubated' path where reform ideas do not come into full effect until long after their original instruction. Another path is an 'acute/rapid' innovation pattern, in which reform programs peak early and then breaks up quickly. Topics such as business process engineering and enterprise resource planning have been described as "fads" [17; 18]. And other researchers have noted that waves of "fads and fancies" tend to characterize IS/IT [19

Based on Abrahamson's management fashion theory [20; 21], this paper investigates the formation and adoption of EA in the central government of Denmark. Empirically grounded in focus group interviews and interviews with key informants, we answer the research question:

What is the purpose of EA and what has driven the use and adoption of the EA concept in Danish central government?

The remainder of the paper is organized as follows. First we lay out our theoretical foundation including a neo-institutional perspective focusing on management fashion theory. In section 3 we give a thorough account of our research method and show a detailed example of the analytic induction method we have used. In section 4 our finding are categorized and explained. Section 5 discusses the finding and section 6 concludes and answers our research question. Finally at the end of section 6 we discuss the future of EA.

2. Theoretical Framework

We apply Abrahamson's management fashion theory to answer our research question. Other researchers have used the management fashion theory to compare the strength and duration of selected fashion waves [22]. We look at one specific "fashion" – EA – to see if this particular IS technique is a fundamental improvement to traditional e-government challenges with Information Systems (IS) in public organizations.

Building on neo-institutional theory [23; 24] and theories of innovation and diffusion [25], Abrahamson describes a management fashion, not as simple spontaneous diffusion of guru-driven techniques, but as shaped by culture, society and economics [20].

Abrahamson defines management fashion as: "The process by which management fashion-setters (consulting firms, management gurus, researchers, etc.) continuously redefine both their own and fashion followers´ collective beliefs about management techniques which lead to rational management progress" [21]. He describes the phenomenon as "rapid, bell shaped swings" in management techniques where norms of managerial progress represent societal expectations that managers use as forms of improved management techniques.

Figure 1 below illustrates how Abrahamson's theory first seeks to understand the creation, selection, processing, and diffusion by suppliers of management fashion through certain rhetoric and techniques. The suppliers are represented by consulting firms, business schools, gurus and mass media organizations [21].
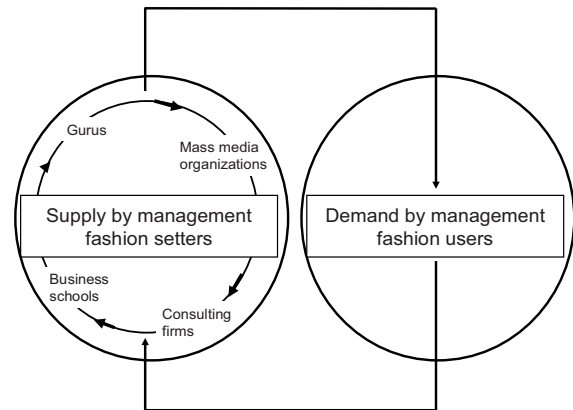

Figure 1: Management fashion setting process [20].

The left side of figure 1 represents the supply for management fashion. The arrow leading out implies that during the processing stage, fashion-setters seek to identify the best-selling rhetoric to carry the selected techniques. This rhetoric is then used in the diffusion stage where the selected techniques are launched into the management fashion market.

The right side of figure 1 represents the demand for management by fashion users. The arrow leading out indicates that during the creation stage fashion-setters, sense the up-coming preferences that will guide the demand and create management techniques to satisfy them. In the next stage, they select those techniques which they perceive as bestsellers.

In the processing phase, the fashion-setters elaborate on different rhetoric to convince the management fashion market and the fashion-followers that their techniques are both rational and at the forefront of management progress. They aim to do so by attempting to create beliefs that there are organizational performance gaps and that the created techniques facilitates the process of reducing these gaps. In many cases, fashion-setters exploit techniques that are being used by a few currently successful companies, and present their success to justify their claims.

According to Abrahamson [21], the techniques chosen in the creation stage do not have to be better, nor more efficient than already existing techniques. Instead, the central issue is that they differ significantly from them. Hence, the major assignment for the fashion-setters is to form collective beliefs that their particular managerial techniques are not only innovative but also constitute a substantial improvement in relation to state-of-the-art in management. This belief, though often based on early adopters' anecdotal success, generates increasing

pressure on every organization to adopt the innovation, because organizational stakeholders expect managers to employ modern and efficient techniques to manage their organizations [23].

In some cases these "fashion beliefs" may be accurate, however in a many situations the techniques represent nothing but old techniques that have been reinvented or rediscovered by the fashion-setters.

The powerful use of neo-institutional theory in Abrahamson's theory asserts that norms of both rationality and management progress influence managers to adopt management techniques perceived as progressive. By arguing that there is a management fashion-setting community which shapes transitory collective beliefs among management fashion-followers that certain techniques are rational and at the forefront of management progress, Abrahamson overcomes what he calls the "pro-innovation" biases in the traditional innovation diffusion literature [21].

Many researchers have argued that IS is an instrument to drive administrative reforms and transformation [26; 27]. Others have, however, found few empirical studies to document the impacts of IS on public administration, and it has been argued that most government mangers want to keep things the way they are [28; 29].

As noted in the introduction, not many public or private organizations have been able to reap the benefits of EA planning [3; 15]. And with few exceptions [e.g. 30] IS research has yet to answer how institutions influence the design, use, and consequences of IS planning initiatives, either within or across organizations.

Abrahamson's theory offers a vantage point for conceptualizing EA formation and adoption as an emergent, evolving, embedded, fragmented, and provisional social production that is shaped as much by cultural and structural forces in the organizational context, in which they are implemented, as rational, technical and economic ones.

3. Research Design

To answer our research question on the purpose and drivers of EA we used two research approaches. In the first part we gathered two focus groups, one with CIOs and one with chief enterprise architects. In the second part we interviewed two experts – or "Gurus" to use the language of Management Fashion Theory – and analyzed official documents, newspapers and official websites. Thus we triangulated sources of evidence and methods for data collection [31].

Focus groups are a qualitative research method where the group of people in focus is asked about their

attitude towards an idea, a concept or a product [32]; here we had EA as the focus. In the group meeting we phrased questions to the group. Participants were free to talk and discuss with other group members. In fact we encouraged as much discussion in the focus groups as possible.

To organize the focus group discussions we had prepared a semi-structured interview guide. In Table 1 we have shown the overall structure and main questions from this interview guide.

Table 1: Excerpt from the semi-structured interview guide

Question	
1	Each Participant. Where from, what role, and daily job
2	Why are you working with Enterprise Architecture EA
3	Advantages from EA; in projects; across organization; across society
4	IS EA better or worse than traditional strategic planning
5	How have you used EA, concrete examples
6	Anything special about EA in the public sector?
7	Will EA exist in three years

Focus group interviews were carried out in March 2008. Respondents were selected based on their official position as CIO's or chef architects and e-mail invitations were sent to CIO's that actively participate in the Danish central government's IT Coordination Forum and chief architects that participate in IT-architecture Committee.

During the focus groups one author concentrated on facilitating a good discussion. The other author took notes, recorded and videotaped the sessions. Each focus group interview lasted between two and three hours. In Table 2 we have shown the participants in the focus groups, their affiliations and role. Furthermore at the bottom of Table 2 we have shown the "Gurus" we interviewed in June 2008 to obtain supplementary interview data.

Table 2: Interviewees in two focus group sessions and two "Guru" interviews

Focus Group #	Organization	Role in relation to EA
1	Directorate for Food, Fisheries and Agriculture	IT Development Manager
1	Ministry of Foreign Affairs	CIO
1	The Danish Prison Service	CIO
2	Ministry of Agriculture, Fisheries and Food	Enterprise architect
2	Ministry of Economic and Business Affairs	Enterprise architect
2	Public Unit responsible for coherent digital healthcare in Denmark	Enterprise architect
"Guru"	Gartner Group, Consulting Director	Experienced Consultant in EA
"Guru"	(Earlier in) Ministry of Science, Technology & Innovation. Main author of [26]	Experienced Consultant in EA

All focus group interviews were tape- and video-recorded and subsequently transcribed in their full length. Interview summaries and quotes were sent to interviewees for clearance.

The interviews were supplemented by examining official documents (strategy papers, white papers, etc), the official web sites of the Ministry of Science, Technology and Innovation as well as the Ministry of Finance, and newspaper clippings about EA in government.

In this way, we made considerable effort creating a historical reconstruction and to try to check the interviewee's views at some historical time against documentation.

For analysis we used analytic induction [33] which can be described as a systematic examination of similarities between various social phenomena in order to develop concepts or ideas.

In Figure 2 we have shown an example of the coding we made of the transcribed interviews. In the middle of the figure an excerpt of the transcribed text is inserted (in Danish). In "bubbles" around the text are shown our coding of the text. After coding the whole text we grouped the codings. This grouping was an iterative process where some codings were grouped in one group, then moved to another group, then back, then copied to both groups and so on. This process continued until we could induce clear findings from each of the group of codings. In the section below we give an account of our findings.

Figure 2: Example of the coding of interview data

4. Analysis

In this section we present the results of our analysis using analytic induction. To preserve the richness of our data we have illustrated every single point of our analysis with excerpts and citations from the interviews.

Following Abrahamson's theory of management fashion, we first investigate the supply for management fashion to understand why and how EA was launched in the central government of Denmark. Grounded in our focus group interviews, we hereafter analyze how EA is actually adopted in the central government of Denmark.

4.1 Launching the EA Fashion

The main vision for Denmark's EA efforts was formulated in a White Paper presented by the Ministry of Science, Technology and Innovation (MSTI) in 2003 [34]. The white paper recommends that the public sector takes more active responsibility for its own EA. A common EA framework was to be established for planning public sector IT systems and ensuring interoperability, and efforts should be concerted to increase knowledge sharing among agencies [34].

MSTI was looking for new approaches to the interoperability challenges that governments in most countries are facing in the struggle to support the exchange of data and the sharing of information and knowledge across IT-systems and business processes. According to a former public servant in The Ministry of Science, Technology and Innovation (and now EA "guru"), "EA was the solution to many of our problems. Meta Group [now Gartner] introduced the EA concept – a concept that has now proven to work in both private and public organizations".

Asking the former public servant in the MSTI why EA was pushed so hard in 2003 he also mentions politics: "EA was also a new platform for our ministry (MSTI) which we could use to steer the e-government development with … we needed a platform to communicate from – and EA was bought by everybody from the top and down".

MSTI is responsible for IT-policy in the Danish central government. But, top-level responsibility for e-government resides with the Danish Ministry of Finance (FM). And EA was therefore also a way to gain political influence for MSTI. FM does not focus on technology and MSTI therefore used EA to push the technical interoperability challenges that information and service sharing and management represents in e-government to create a political platform for the work performed in the MSTI.

In our interviews we also sought to understand why EA is better than previous IS planning techniques like e.g. IS Planning. According to the Gartner director, EA is significantly different from traditional IS planning: "EA is a top-down, business driven approach to IT-management…. We need to tackle the problems of growing IT-investments and inhomogeneous IT-system development with this new approach if we want to be successful in government."

Denmark has been a leading EA reference country [1]. But as noted by [16], EA has not been a driving force in the development of e-government in Denmark. Different common infrastructure elements like common access management and a new infrastructure

for business messages to the government (e.g. electronic invoices) have been initiated outside the EA program in recent years. As a result, there are different perceptions of what NEA is and what it is not.

4.2. Adoption of EA in Denmark

Quite many of our findings concentrated around the adoption process. Thus we sub-divided our findings into groups on organizational demand, the demand for EA, EA work in practice.

4.2.1. Organizational demand for EA. The strategic imperative for the Danish Prison Service to use EA was a vision to integrate everything IT-related. In Denmark all prisoners have an electronic prisoner record (EPR), and all systems are to be integrated with the EPR at the core. Any kind of institution involved in the Danish Prison Service reads and writes in the EPR. The only exception is in cooperation with the Police and the judiciary system which is still paper based.

This new integrated EPR-system for the Danish Prison System was developed as 10 smaller projects. "Nobody dared to start one giant project in 1999" tells the CIO. "Instead we started 10 smaller ones, so if one went wrong, it would not scorch us as much".

The CIO from the Danish Ministry of Foreign Affairs was not overly concerned with EA; "We are extremely centralized and standardized… and we have built our IT organization around this idea of centralization" was his introductory remarks. "Our main problem is that we are so global; we need to have IT all the way to Afghanistan". A second problem "is to comply with the security commitments we have made to European Union and NATO partners" he said.

In the Danish Ministry of Foreign Affairs the very centralized IT function is under some pressure "to fulfill local needs without being too tight-fitting", say the CIO. One way to achieve this is to avoid having an IT specialist as CIO. So the CIO is a career diplomat, who spends 2-4 years as head of the IT function. As an example, the former CIO of the IT function is now working in Berlin as a diplomat at the Danish Embassy. "I think that gives us a focus on the needs that really are there instead of focusing on which IT solutions that are the smartest!", says the CIO.

The Directorate for Food, Fisheries and Agriculture oversees the development and production to the entire Danish food industry. The Directorate was created by merging many institutions in year 2000. "Together with the merger came an incredible number of independent IT systems", tells the IT Development Manager. Thus it was decided to build a totally new EA for the Directorate. This new architecture is based

on the idea of Service Oriented Architecture (SOA). Together with the Ministry of Finance a business case was drafted and the ambitions are high: "We are to harvest 15-25% savings by using SOA" explains the IT Development Manager.

4.2.2. The demand for EA. To the question of why EA was chosen, the CIO from The Danish Prison Service mentions pressure from the Ministry of Science, Technology and Innovation as one reason, but also that the parliamentary climate in Denmark has changed over the last 10 years. Back then it was common practice to take weeks or even months to answer a question raised in parliament. Nowadays the same question requires an answer within one week, and the numbers of questions are tenfold. Thus one integrated system is absolutely necessary to answer many questions fast enough.

In the Directorate for Food, Fisheries and Agriculture it is pressure for savings from the Ministry of Finance that is mentioned as the first and foremost reason for investing in new architecture. "It has been calculated that 17 million DKK can be saved", said the IT development Manager. But also the expectations from government were mentioned as a driver by the directorate's chief architect: The government's constant promises about massive online services, 24-hour case handling and so forth were a driver".

According to the understanding of the CIO from the Ministry of Foreign Affairs there is also a competitive element: "Denmark participates in many international assemblies and organizations; the country that is best informed and has the latest information is the country that obtains the most". Thus there is pressure for new IT systems that can deliver quick and updated information.

Group pressure also takes place at the national level. "If one head of a department takes up a new gadget (here the CIO waves an I-phone in the air to illustrate) during a meeting, then another head may go home and ask: why don't we have that?". And one of the architects noted that "Based on conferences [about EA], white papers, and "gurus" within the [EA] field, we drafted our own EA program."

A common problem was to get the business involved in discussions about IT. The CIO from the Danish Prison Service believes alignment of IT and business is more important than architecture. "It is still not natural for the other managers to think IT". And many of the chief architects were frustrated that they could not get the business people in their organizations interested in EA. As the chief architect from the Directorate for Food, Fisheries and Agriculture phrased it "We need to go back to the business. It is

the business that needs to setup the guidelines for what we [IT] are to do. That is somehow always the same problem."

It seems that to make a new trend successful, a combination of positive and negative incentives – carrot and whip - are needed. "Five years ago the Ministry of Science, Technology and Innovation was without any influence", say the CIO from the Danish Prison Service. "But the Digital Taskforce [in the Ministry of Finance] has made a difference … when the person with the whip takes control then it helps. Before, it was just the carrot". In fact the person with the whip is the Minister of Finance who controls all the financial flows. The view that this Minister made a difference is confirmed by the CIO from the Ministry of Foreign Affairs: "Why architecture is on the agenda? […] I think it is a combination of statements from the Ministry of Science and Ministry of Finance, as well as the result of having consultants who also catch new signals", she says.

Another thing that is pointed out is that the discussion of EA sometimes is a little academic. The CIO from the Foreign Ministry tells it this way: "We don't have the resources for high availability, a high SLA [Service Level Agreement) and the more academic [business architecture] part. So when you hear and read what they say [on Enterprise Architecture] from Gartner and the Ministry of Science you think that it cannot be true; it is just not possible with the resources we have".

4.2.3. EA work in practice. When we asked about EA in the practical management of information systems, the IT Development Manager from the Directorate for Food, Fisheries and Agriculture tells us that she sees it as "kind of old wine on new bottles". "Some new words have come into play. But for many years I have heard that we should centralize and integrate" she said. So in that sense EA brings nothing new to the table. "10 years ago we developed a common interface to four systems. Off course we could do that then. But what may be new is to break down your business into some logical blocks" she said.

An interesting finding in the focus group interviews with the chief architects was the confusion about the EA concept. While we had expected some confusion about the concept with the CIO's, we were surprised how different the architects described and perceived EA - not to mention the way they applied the concept.

Two of the chief architects had mapped all the entities within their domain as a starting point for a better Enterprise Architecture. "It has been our thinking in this architectural work that everybody should be able to take a starting point in the

standardized information architecture and data", told the chief architect from the Ministry of Agriculture, Fisheries and Food. In this ministry they had detailed the entity map more and more all the way down to batch numbers for a single product from a specific producer.

In the Public Unit responsible for coherent digital healthcare in Denmark they were in the middle of the same kind of mapping. They had started trying to cope with registration of medicine in a unified way. The architect told that they aimed for one common medicine card for every citizen. The challenge being that every single system that uses medicine should have an interface to the card.

Another example that was brought up was from the Danish Maritime Authority. Here there was a large and well functioning system which all stakeholders were quite happy with. The chief architect's problem was that "[the IT-systems] was a black box for everybody in our organization – also for the IT-department" The system was running on old technology so it was destined to become obsolete, "So we had to dig it all up again… That is really the driver today that we wanted to have an architectural overview" the chief architect.

The Enterprise architect focus group was in agreement about the importance of different levels of architecture. "You need to have the architecture go from strategy to the operational" as one of the architects expressed it.

However, the group also agreed that interoperability issues were most important for them. All of them spend the majority of their time looking at interrelationships of different applications, modeling and exchanging data. Going "from strategy to the operational" was seen as necessary, but none of the interviewees seemed to have a crystal clear understanding of this link between business and IT.

The business oriented approach that e.g. Garner promotes above was not something that the chief architects – nor the CIO's – were overly concerned with. It was clear that they did not see the major benefits in a business architecture that is more concerned with the business context than the structure of applications and data.

The CIO from Ministry of Foreign Affairs sees EA as "a natural continuation of planning thinking". "But something has changed" he continues. "Today it is much more natural to involve IT from the beginning of a project. It is becoming natural to relate to the enterprise architecture we have".

Another issue that was discussed in the focus group was how to implement EA so that people understand it. "We have tried to visualize our IT strategy. We have a number of small movie sequences [multimedia podcasts] that can show functionality", told the CIO from the Danish Prison Service. "It needs to come from the top" adds the CIO from the DMFA. "When the Director sends the first email, then the head of Department is forced to answer … it doesn't help that an employee starts sending emails to the Head of Department; then nothing happens". Later in the focus group discussion one Enterprise architect from a different organization confessed: "the major challenge is involving top management".

At the end of our focus groups we discussed the how the public sector context influenced EA adoption and return on investment of EA. There was agreement around the table that the public sector was special in some ways. One thing mentioned was that not only profit was the goal. There were many criteria for good performance. Another thing mentioned was the high visibility: "The special thing about the public sector is that any failure gets trumpeted in the press" said one CIO, and all agreed that the private sector could attract better people because they could give higher salaries.

Provoking a discussion with the chief architects about the business case – especially the expected advantages – it was interesting to see that none of the participants would stand up and claim the advantages to be fulfilled. "It may take 10 years to pay back" as one Enterprise architect said. Another one emphasized that cooperation with users of the architectural standard was extremely important. "There is a need for someone testing it and giving you feedback", as it was said.

5. Discussion

Grounded in our empirical data and Abrahamson's theoretical framework, our analysis indicates that EA in government is to a large extend driven by fashion.

Interviews with the former public servant (and now EA "guru") and the Gartner director, indicate that EA was "chosen" as the appropriate tool to strengthen MSTI's influence on the e-government agenda. After publishing the EA white paper in 2003, the concept enjoyed almost instant fame and attracted tremendous managerial attention in the central government of Denmark, which in turn generated a transitory collective belief that EA was efficient, and at the forefront of "best practice" in IS planning.

The MSTI was successful in promoting technical interoperability challenges as so-called "performance gaps" – the difference between the performance level e-government managers aspire to and the level they actually achieve. EA was new and promised improving executive decisions and resource management.

Governments produce White Papers, statements, and booklets that provide "best practice" advice. However, promotional documents do rarely give us a full and balanced picture of what is happening 'on the ground'; like any other public management reform [6]. As our focus group interviews reveal EA is not very well understood in the central government of Denmark, and nothing indicates that it is generating administrative reforms in government that would replace traditional hierarchies with leaner structures.

Our analysis suggests that many of the local EA initiatives are partly initiated because of pressures of symbolic meanings (social legitimacy) and pressures to conform to commonly adopted target objectives such as efficiency and productivity gains of using EA planning. Backed by the promises of private and public success stories, we could say that MSTI supplied the EA "fashion" to the agencies in the Danish central government.

The CIO's and chief architects in our focus groups performed EA as a technical exercise that focuses on the interrelationships of different applications, modeling and exchanging data – and not so much the linking of business and IT. EA is perceived as something "technical" and administrative transformation is therefore not driven by EA planning in itself.

Our findings thus suggest an interesting distinction between two elements to EA in government: a stable element of IT-architecture and a fashion driven business architecture element. The two concepts are used in parallel, but they also have distinct differences in their focus, approach and use of artifacts. Table 3 describes these two seemingly different aspects of EA.

Our focus group participants were all comfortable when we discussed application integration, modeling and data exchange – the IT-architecture. But, when we talked about the more high-level issues of applications and data in a business architecture context they were more skeptical. The external view of software that business architecture takes - focusing on business efficiencies and process transformation and not so much on the internal workings of applications - was not perused explicitly by any of our respondents. As one chief architect put it "business architecture is something that we need to have to do EA, but we don't really do it today…".

Table 3: IT-architecture and business architecture

	IT-Architecture	Business architecture
Focus	Application interaction and systems development	Business efficiencies and process transformation
Approach	Documentation and analysis	Business process management and change management
Artifacts	Logical and physical data models, Technical standards, etc.	Business process diagrams, investment business cases, etc.

IT-architecture has its roots in the established software engineering discipline [35]. While business architecture is a more recent phenomena [3; 8]. Both streams take a top-down approach to design interested in the interplay between different parts that form a whole. But, their artifacts and general purpose is different. IT-architecture can be viewed as the technical documentation and description necessary for traditional IS planning. While business architecture hosts the transformative element in EA – the focus on business process management and change management that promises the modernization of government institutions.

Thus, EA has not been able to substitute the pre-existing organizational IS-governance structures in the public agencies we studied. Institutionalized habits and values reinforce existing administrative and political arrangements, and pre-existing organizational structures for 'traditional' IS planning seem to oppose the logics of EA planning.

As noted by [12] top managers in government agencies are rarely interested in organizational change, and the EA planning innovation thus gets adopted to underpin the existing organizational structures. Thus, our findings suggest, that it is unlikely that the development in the public sector IS planning will resemble the development in the private sector. Public sector planning is simply qualitatively different from planning in private enterprises or industries. As noted by [26], planning reforms can be driven by dramatic higher profits, promotions, stock price increases, and market shares in the private sector, while this can be a showstopper in the public sector where effective IS planning most often will be rewarded with budget cuts, staff reductions and loss of resources.

Finally, an interesting finding was also the confusing mandate of EA in the Danish government. The governance setup gives the MSTI no power to force EA use. What really changes the way IS planning is performed in government is institutional change at the macro-level. The MSTI push for EA only caused

incremental changes to the IS planning efforts in government entities. It was the "External shocks" created by the Ministry of Financed that catalyzed the diffusion process (cf. section 4.2). EA in the Danish central government was supposed to guide administrative reforms, guide executive decisions, and improve recourse management. But, the transformation was a response to institutional change at the macro-level, rather than the particular new template for IS planning in the organizations that we studied.

6. Conclusion

Summing up our analysis and discussion, we found the causal direction reversed from EA being transformative and prescriptive in its nature to EA being reshaped and adopted in step with the institutional forces in public organizations and their macro environment.

As we have seen, IS planning innovations can change routines, structures and social values in government, but it must be understood in the context of the institutional forces that often resist dramatic changes. Public sector reforms will always be driven by political determination, while IS planning can be the enabling tool.

As for our research question on the purpose of EA and what has driven the use and adoption, our analysis indeed suggests that EA in government to a large extend is characterized by fashions. The EA concept is ambiguous and lacks commonly accepted definitions. Our focus group interviews revealed two elements to EA in government: a stable element of it-architecture and a fashion driven business architecture element. As we have seen it seems that the formation and adoption of EA in government is driven by compliance with central guidelines and imitation of "best practice".

The hyperbole surrounding government modernization and transformation thought the adoption of EA planning seem to be epochal. An epochal schema of old style bureaucratic IS planning and the new EA planning agenda has considerable intuitive appeal. But our findings illustrate how individual circumstances cannot just be considered invisible or rendered insignificant. Organizational context, imitation and compliance explain adoption patterns better than a universal and invariable recipe of management procedures and techniques like EA. Thus our conclusion is that EA can not transform government by itself. Fundamental transformation to the tasks performed in organizations is only achieved if the institutional force promotes transformation.

6.1. The future of EA in government

The limitation of fashion theory is its weak explanatory power. Using Abrahamson's theory [20; 21] we can not say how long a fashion like EA will stay fashionable in government or even how long it will take to become unfashionable again.

However, by emphasizing how EA adoption and use is not produced solely by the aggregation of individual and organizational reform agendas but by institutions that structure action, the institutional perspective offers a vantage point for understanding EA planning in government. Our findings points out how EA is not a clear-cut cure that can be adopted by any public organization with similar results. EA implementation must be understood in the organizational context it is implemented in.

Working with many different stakeholders, both leadership and subject matter experts, to build a holistic view of the organization's strategy, processes, information, and technology assets must not be underestimated in government EA programs. Public servants and their consultants must understand the business of government – and the business of their own organizations – before they engage in EA.

To be more than just another fashion fad, future EA programs in government must provide a comprehensive and coherent view across business, information, and technology; not just to guide the design of IT systems – but to deliver business change supported and enabled by IT.

References

[1] OECD (2005). "OECD Peer Review of e-Government in Denmark". [www.oecd.org, last accessed June 2008].

[2] Hite, R. (2003). "Information Technology: A framework for assessing and improving enterprise architecture management" (Version 1.1). Washington D.C.: U.S. General Accounting Office.

[3] Ross, J. (2003). "Creating a strategic IT architecture competency: Learning in stages". MISQ Executive, 2 (1).

[4] Peristera V., Tarabanis K. (2000). "Towards an enterprise architecture for public administration using a top-down approach". European Journal of Information Systems, 9 (4): 252-260.

[5] Segars, A.H., Grover, V. (1999). "Profiles of Strategic Information Systems Planning". In: Information Systems Research, 10 (3): 199-232.

[6] Pollitt, C. & Bouckaert, G. (2004). "Public Management Reform". Oxford University Press.

[7] Zachman, J. A. (1987). "A Framework for Information Systems Architecture". IBM Systems Journal, 26 83): 276-292.

[8] Bernard, S.B. (2005). "An introduction to Enterprise Architecture". Authorhouse.

[9] Spewak, Steven H. (1992). "Enterprise Architecture Planning". John Wiley & Sons, Inc, New York.

[10] Sowa, J.F. & Zachman, J.A. (1992). "Extending and formalizing the framework for information systems architecture". IBM Systems Journal, 31 (3): 590-616.

[11] Kaisler, S.H., Armour, F. & Valivullah, M. "Enterprise Architecting: Critical problems", Proceedings of the 38th Hawaii International Conference on System sciences.

[12] Hjort-Madsen, K. (2007). "Institutional Patterns of Enterprise Architecture Adoption in Government" Transforming Government: People, Process and Policy (1: 4).

[13] Dunleavy, P. & Hood, C. (1994). "From Old Public Administration to New Public Management". Public Money & Management.

[14] Hood, C. (1998). "The Art of the State". Clarendon Press, Oxford.

[15] Hjort-Madsen, K. (2006). "Enterprise Architecture Implementation and Management: A Case Study On Interoperability". Proceedings of the 39th Annual Hawaii International Conference on System Sciences, 2006.

[16] Janssen, M. & Hjort-Madsen, K. (2007). "Analyzing Enterprise Architecture in National Governments: The Case of Denmark and The Netherlands". 40th Annual Hawaii International Conference on System Sciences.

[17] Jones, M.R. (1994) "Don't Emancipate, Exaggerate: Rhetoric, Reality and Reengineering," in: Transforming Organizations with Information Technology, North-Holland, Amsterdam.

[18] Westrup, C. (2003). "Discourse, management fashions, and ERP systems," in: Global and Organizational Discourse about Information Technology, Kluwer Academic Publishers, Norwell, Mass.

[19] Gregor, S., and Jones, D. (2007). "The Anatomy of a Design Theory," Journal of the Association for Information Systems, Vol. 8 (2007): 19.

[20] Abrahamson, E. (1991). "Managerial fads and fashions: The diffusion and rejection of innovations". Academy of Management Review (16:3).

[21] Abrahamson, E. (1996). "Management fashion". The Academy of Management Review (21:1).

[22] Miller, D. & Hartwick, J. (2002). "Spotting Management Fads". Harvard Business Review (80:10).

[23] Meyer, J.W. & Rowan, B. (1977). "Institutionalized Organizations: Formal Structure as Myth and Ceremony". American Journal of Sociology, 83 (1977), 340-363.

[24] DiMaggio, P. & Powel (1991). "The New Institutionalism in Organizational Analysis". University of Chicago Press.

[25] Rogers, E. M. (1995). "Diffusion of Innovations". 4thed. New York: Free Press.

[26] Fountain, J. E. (2002). "Information, Institutions and Governance". Cambridge, John F. Kennedy School of Government: Harvard University.

[27] Scholl, H.J. (2005). "E-Government-Induced Business Process Change (BPC): An Empirical Study of Current Practices". International Journal of Electronic Government Research, 1(2).

[28] Kraemer, K. & King,l J. L. (2006). "Information Technology and Administrative Reform: Will E-Government Be Different?". International Journal of Electronic Government Research, Vol. 2(1).

[29] Grönlund, A. (2005). "State of the Art in E-Gov Research: Surveying Conference Publications". International Journal of Electronic Government Research, 1(4).

[30] Kling, R., & Iacono, 0. S. (1988). "The Institutional Character of Computerized Information Systems". Office: Technology and People 5(1).

[31] Yin, R. K. (1994). "Case Study Research". Thousand Oaks, CA: Sage.

[32] Fern, E. (2001). "Advanced Focus Group Research". Sage Publications.

[33] Miles, M. B. and A. M. Huberman (1994). "Qualitative Data Analysis: An Expanded Sourcebook". 2nd Edition. Newbury Park, CA, Sage.

[34] Ministry of Science, Technology and Innovation (2003). "Whitepaper on Enterprise Architecture". [Web (In Danish: http://www.itst.dk/arkitektur-og-standarder/publikationer/arkitekturpublikationer/hvidbo g-om-it-arkitektur, last accessed September 2008].

[35] Plfeeger, S.L. (2001). "Software Engineering: Theory and Practice". Prentice-Hall, Upper Saddle River, New Jersey.