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MANAGING THE IT ARCHITECTURE: A MULTIPLE CASE STUDY

PhD dissertation

Peter Andersen

Aarhus BSS
Aarhus University
Department of Management
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As I began my work as a PhD student, I was told, on a couple of occasions, that writing a dissertation is a long and tedious process, filled with frustrations and despair. However, looking back on the three years that have now passed, I must say I have generally enjoyed my time as a PhD student. I largely attribute this to the people who have surrounded me, who all in their own way contributed in making my journey as enjoyable as it was.

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Peter Andersen, November 2016

A handwritten signature in black ink, appearing to read 'Peter Andersen', with a long, sweeping flourish extending to the right.

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DANSK RESUMÉ

Ledelse af den samlede IT-arkitektur i organisationer begyndte at modtage øget opmærksomhed som emne fra omkring slutningen af 1980'erne til starten af 1990'erne. Før det lå opmærksomheden blandt forskere på, hvordan man kunne skabe og designe individuelle IT-systemer. Som følge af, at flere og flere IT-systemer blev implementeret fra 1980'erne og ind i 1990'erne begynder forretnings- og IT-ledere at erkende at ledelse og planlægning var nødvendigt for at kunne designe og implementere en sammenhængende IT-arkitektur. Disse dage kan en veludviklet IT-arkitektur udgøre en væsentlig konkurrencemæssig fordel for organisationer. Den strategiske vigtighed af IT-arkitekturen understreges af en række potentielle gevinster såsom omkostningsbesparelser gennem effektiviseringer og forbedret ledelsesinformation. Uanset branche udgør en veludviklet IT-arkitektur fundamentet for at kunne drive en lønsom forretning i dag. Imidlertid er det ofte en udfordring for specielt større virksomheder at sikre, at de mange IT-systemer hænger sammen på tværs af forretningsområder, og at IT-systemerne bliver tilpasset den enkelte organisations skiftende struktur og strategiske behov. Ligeledes kan forskellige forretningsområder introducere overlappende eller redundante IT-systemer. Dette kan ligeledes forårsages af manglende planlægning, fusioner eller opkøb. Således udhules IT-arkitekturen over tid. I forbindelse med den øgede vigtighed af IT-arkitektur for forretninger, er virksomhedsarkitektur således blevet stadig vigtigere disciplin, da den sikrer strategisk og holistisk planlægning og implementering af IT-systemer gennem et indgående kendskab til forretningsstrategier, forretningsprocesser og det eksisterende IT-systemlandskab. På trods af en udbredt forståelse for vigtigheden af virksomhedsarkitektur, slår mange IT-arkitekturprojekter fejl alt imens, at flere organisationer befinder sig i en krisesituation på grund af manglende ledelse (governance) af IT-arkitekturen. Ultimativt kan dette resultere i, at ledelsen ikke kan træffe informerede beslutninger, da data om for eksempel salgstal og indtægter er upålidelige. Ligeledes risikeres det, at værdikæden for produktionsvirksomheder undermineres, da salg og produktion ikke kan afstemmes.

Nærværende afhandling undersøger hvordan store organisationer leder deres IT-arkitektur gennem de to discipliner: virksomhedsarkitektur og IT-governance. Ved at indsamle læring fra disse organisationer, og sammenholde denne læring med eksisterende forskning, var ambitionen at bidrage med ny viden i forhold til, hvordan IT-arkitektur kan ledes ud fra et praktisk og teoretisk perspektiv. Alt imens at den gængse litteratur anskuer IT-arkitekturledelse fra en hovedsagelig teknologisk, rationel vinkel, var formålet med nærværende afhandling at skabe bedre forståelse for, hvordan de ledelsesmæssige og strategiske udfordringer bedre kan håndteres.

Dette ledte frem til følgende overordnede forskningsspørgsmål: *Hvordan kan en socioteknisk forståelse af hvordan IT-arkitekturen ledes berige den teoretiske og praktiske forståelse af fænomenet, der går udover tekniske og rationelle tilgange?*

Det overordnede forskningsspørgsmål blev søgt gennem et tidligt litteraturstudie og et multicasestudie i tre forskellige organisationer.

Et Multicasestudie om IT Arkitekturledelse

Casestudier er velegnede til at forstå komplekse fænomener i deres sociale kontekst. Multicasestudietilgangen gør det muligt at foretage sammenligninger mellem flere cases. Således foretages detaljerede empiriske undersøgelser for at forstå konkrete fænomener gennem anvendelse af flere datakilder såsom interviews og observationer.

Casestudierne blev udført hos tre forskellige organisationer: TDC A/S, LEGO A/S, og Aarhus Universitet. De tre organisationer er udvalgt på baggrund af en række fælles karakteristika såsom størrelse, alder og IT-arkitekturmæssige udfordringer. Således har alle organisationer over 8.000 medarbejdere, og er herved alle større organisationer i en dansk kontekst. Endvidere har disse organisationer alle haft en række udfordringer i forhold til deres IT-arkitektur. Samtidig er der også relevante forskelle imellem de tre organisationer, der gør det interessant at studere, hvordan IT-arkitekturen håndteres på forskellig vis i de tre organisationer. I introduktionen vil der følge en dybere redegørelse og sammenholdelse mellem de tre cases, hvor der også vil blive argumenteret for valget af dem som udgangspunkt for nærværende afhandling. De tre organisationer vil blive beskrevet kort her.

Aarhus Universitet har ca. 8.000 ansatte og over 44.000 studerende. Aarhus Universitet er således det største universitet i Danmark målt på antal studerende. Aarhus Universitet omsatte for ca. 6,2 milliarder kroner i 2014. Studerende og ansatte serviceres i dag af Aarhus Universitets IT-afdeling (AU IT), når det kommer til udvikling og support af IT-systemer, hardware, netværk og infrastruktur. Universitetssammenlægningen i 2007 har betydet, at AU IT fra 2010 har haft en stor udfordring i at lave en samlet, integreret IT-arkitektur for universitetet.

TDC havde i 2014 ca. 8.600 ansatte. I 2014 omsatte TDC for ca. 23,3 milliarder kroner. TDC er det største teleselskab i Danmark og markedsleder inden for eksempel fastnettelefoni, fastnetbredbånd og mobiltjenester. TDC har generelt tilstedeværelse på det skandinaviske telekommunikationsmarked. TDC's IT-afdeling har igennem mange år fokuseret på at rydde op i deres IT-arkitektur, som har været af en anseelig kompleksitet bestående af flere gamle

selvudviklede systemer. Øget digitalisering har dog betydet, at TDC de senere år er begyndt at fokusere på kunderettede tiltag såsom nye integrerede tjenester, produktinnovationer og forbedret kundeoplevelse.

LEGO er en Dansk, familieejet virksomhed med hovedsæde i Billund og ca. 14.800 ansatte. Målt i salgstal er LEGO den største legetøjsfabrikant i verden. I 2014 havde LEGO en omsætning på 28,6 milliarder kroner baseret på salg af legetøj i mere end 140 forskellige lande. LEGOs IT-afdeling servicerer LEGOs mange virksomhedssystemer, der understøtter virksomhedens økonomistyring, lagerstyring, salg med mere. I slutningen af halvfemserne befandt LEGO sig i en krisesituation blandt andet forårsaget af problemer med den underliggende IT-arkitektur. Siden har LEGO fokuseret på integrering af den underliggende IT-arkitektur.

Ved at undersøge hvordan Aarhus Universitet, LEGO og TDC arbejder med deres IT-arkitektur fra et ledelsesmæssigt perspektiv, berører afhandlingen disciplinerne virksomhedsarkitektur og IT-governance. I alt baserer afhandlingen sig på seks videnskabelige artikler. Disse vil der i det følgende blive redegjort for.

Resultater og Implikationer

Artikel 1: Afhandlingens første artikel søger, gennem et litteraturstudie, at afdække eksisterende akademisk og praktisk litteratur, der omhandler evaluering af virksomhedsarkitektur. Organisationers evne til at evaluere den eksisterende og fremtidige arkitektur må siges at være et centralt udgangspunkt for at kunne planlægge og lede arbejdet med virksomhedsarkitekturen. Evaluering i forhold til virksomhedsarkitekturarbejdet gør det muligt for organisationer at identificere eksisterende udfordringer og lave en fremtidig plan for, hvad der bør arbejdes med for at realisere en fremtidig arkitektur gennem IT-projekter. Imidlertid viser litteraturstudiet, at der eksisterer meget få udgivelser vedrørende dette emne. Især fandtes der meget få artikler, der undersøgte emnet fra et induktivt, kvalitativt perspektiv. I artiklen argumenteres der således for, at de deduktive artikler på området mangler empirisk fodfæste. Uden en forståelse for de komplekse sociale sammenhæng som virksomhedsarkitekturarbejdet udfolder sig i, er det svært at argumentere for, at eksisterende metoder og tilgange er velegnede. Litteraturstudiets resultater danner udgangspunkt for de efterfølgende empiriske casestudier, der søger at belyse fænomenet empirisk.

Artikel 2: Afhandlingens anden artikel er baseret på et casestudie ved Aarhus Universitets IT-afdeling. Her blev den praktiske håndtering af arbejdet med evaluering af virksomhedsarkitekturen studeret. Artiklen viser, hvordan evalueringsarbejdet bestod af en kompleks proces, der omfattede ad hoc og uformelle evalueringstilgange. Nogle projekter viste sig at være af en sådan kompleksitet,

at der ikke kunne findes én ideel løsning. I stedet måtte arkitekter og IT-ledere afveje en række suboptimale løsninger gennem forskellige scenarier, der synliggjorde, hvorledes forskellige mål inden for eksempel sikkerhed, brugervenlighed og teknologi ikke kunne opfyldes på samme tid. Dette udfordrer mainstreamlitteratur på området, der anbefaler rationalistisk tænkning og måling som ledelsesredskaber, som ofte ikke tager udgangspunkt i en afbalanceret tilgang.

Artikel 3: Den tredje artikel tager udgangspunkt i, hvorledes virksomhedsarkitekturen evalueres hos TDC, samt hvilken rolle ledelsen af virksomhedsarkitekturen spillede i udarbejdelsen af TDC's IT-arkitektur. *The resource-based view of the firm* anvendes som teoretisk redskab til at tolke casen samt udarbejde en kapabilitetsmodel, der illustrerer, hvilke interne kapabiliteter i IT-organisationen, der understøtter den løbende evaluering af IT-projekter i forhold til den overordnede virksomhedsarkitektur. Disse kapabiliteter er relateret til at skabe IT-mæssig og organisatorisk overblik samt strategisk koordinering med forretningen. De interne kapabiliteter blev hos TDC løbende ændret og forfinet i takt med, at nye strategiske udfordringer opstod. Således viser artiklen, hvordan interne kapabiliteter kan bidrage til at skabe vedvarende konkurrencemæssige fordele, hvilket ikke tidligere har været belyst i litteratur omkring virksomhedsarkitektur.

Artikel 4: Den fjerde artikel tager ligeledes udgangspunkt i TDC som case. Hvor den tredje artikel udforsker, hvilke interne kapabiliteter TDC måtte opbygge i deres IT-organisation, tager denne artikel udgangspunkt i, hvordan det eksterne miljø bidrog til at forme ledelsespraksis i forhold til virksomhedsarkitekturen (architecture governance) ved hjælp af institutionelle logikker som teoretisk redskab. Artiklen bidrager teoretisk ved at vise, hvordan institutionelle logikker kan blive indlejret i governance-redskaber og praksis. Samtidigt bidrager artiklen generelt til IT-governance-litteratur ved at vise, hvordan IT-governance bliver formet på baggrund af en række institutionelle pres. Dette står i modsætning til hovedparten af den eksisterende litteratur inden for IT-governance, der anlægger et rationalistisk perspektiv på, hvordan IT-governance anvendes i organisationer.

Artikel 5: Afhandlingens femte artikel vedrører architecture governance hos LEGO, men bidrager også bredere til IT-governance generelt ved at vise, hvordan LEGO ikke blot ledede deres arkitektur i forhold til gængse tilgange og frameworks, der lægger vægt på formalisering, kontrol og rollefordeling. I stedet beskriver casen, hvordan LEGO leder deres IT-arkitektur gennem samarbejde, der ofte er tværfunktionelt, vedvarende læring og tilpasning. Dette udfordrer den gængse rationalistiske litteratur til at udforske, hvordan organisationer kan drage nytte af den organisatoriske kultur, når IT-governance-tiltag planlægges. På baggrund af analysen af casen, foreslås det, at IT-governance kan nytænkes inden for fire områder: 1) hvad understøtter og

muliggør IT-governance 2) hvordan IT-governance konceptualiseres 3) hvordan IT-governance udvikler sig og modnes over tid, 3) hvad nytteværdien af IT-governance er.

Artikel 6: Den sjette artikel er et multicasestudie på tværs af afhandlingens tre cases. Gennem tværgående analyse af de tre cases, teoretiserer artiklen på sammenhængen mellem IT-governance design, institutionelle logikker, IT-arkitektur og teknologier. Artiklen påviser, hvorledes institutionelle logikker former IT-governance i de tre cases, alt imens at centrale aktører forsøger at adressere den interne IT-arkitektur og eksterne teknologier igennem deres design af IT-governance. Imidlertid påviser den tværgående analyse, at institutionelle logikker medierer organisationernes (og deres aktørers) forståelse og tolkning af muligheder og udfordringer ved henholdsvis IT-arkitekturen og nye teknologier. Således kan institutionelle logikker være en hæmsko såvel som en katalysator for et givent IT-governance design. Teoretisk bidrager artiklen med et framework, der beskriver fundamentale strategier som kan anvendes i forbindelse med implementeringen af et IT-governance design i henhold til eksisterende logikker. Disse strategier omfatter: (a) at *udfordre* den dominerende logik (b) *udnytte* den dominerende logik (c) og *tilpasning* hvis et omskifteligt institutionelt miljø forårsager ændringer i logikker over tid.

Alt i alt bidrager de 6 artikler til den eksisterende teori og viden ved at anskueliggøre den komplekse, sociotekniske kontekst som IT-arkitekturen indgår i. Selvom litteratur ofte italesætter ledelsen af IT-arkitekturen som noget, der bør håndteres gennem tekniske eller finansielle redskaber, har disse redskaber ofte en symbolsk karakter, alt imens at gængse konceptualiseringer og redskaber kan være utilstrækkelige. Ved at benytte institutionelle logikker og *the resource-based view of the firm* belyses det endvidere, hvorledes det eksterne, institutionelle miljø internt kan påvirke, hvordan IT-arkitekturen bliver ledet og kontrolleret, alt imens at interne kapabiliteter kan opbygges, der muliggør, at organisationer kan drage vedvarende konkurrencemæssige fordele af deres IT-arkitektur.

ENGLISH SUMMARY

The management of the collective, organizational IT architecture began to receive attention as a topic from around the late 1980s to the early 1990s. Before that, scholars were interested in architecting individual IT systems. As more and more IT systems were implemented from the 1980s into the 1990s, business and IT managers started to realize that management and planning were necessary for the design and implementation of a coherent IT architecture. Today, a well-developed IT architecture can serve as a major competitive advantage for organizations. The strategic importance of the IT architecture is underlined by a number of potential benefits such as cost-reductions through optimizations and improved information for managerial decision-making. Irrespective of industry, a well-developed IT architecture forms the foundation for running a profitable business today. However, this is often a challenge for larger companies, as they need to ensure that underlying IT systems are connected across business areas and that these IT systems are adapted to the organization's changing structure and strategic needs. In the same manner, different business units can introduce overlapping or redundant IT systems. This can similarly be caused by a lack of planning, mergers, or acquisitions – thus eroding the IT architecture over time. In relation to the increased importance of IT architecture to businesses today, enterprise architecture has thus become an important discipline, as it ensures strategic and holistic planning and design of IT systems through extensive knowledge of business strategies, business processes, and the existing IT system landscape. Despite widespread understanding of the importance of enterprise architecture, many IT architecture projects fail while many organizations find themselves in crisis caused by inadequate governance of the IT architecture. Ultimately, this can make the management incapable of making informed decisions since data regarding sales and revenues become unreliable. Similarly, manufacturing companies' value chain risks being undermined as sales and production cannot be coordinated.

The present dissertation investigates how large organizations manage their IT architecture through the disciplines of enterprise architecture and IT governance. By acquiring knowledge from these organizations and relating it to existing research, the goal was to contribute with new knowledge in relation to how the IT architecture can be managed – both from a practical and theoretical point of view. Whereas prevailing literature views the issue of managing the IT architecture from a primarily technological, rational perspective, the goal of the present dissertation was to create a better understanding regarding how the managerial and strategic challenges can be better handled.

This led to the following main research question: *How can a sociotechnical understanding of how the IT architecture is managed enrich theoretical and practical knowledge of the phenomenon, beyond technical and rational approaches?*

The main research question was sought answered through an early literature review and a multiple case study design with three different organizations.

A Multiple Case Study on IT Architecture Management

Case studies help us understand complex phenomena in their social context. The multiple case study approach makes comparisons between cases possible. Thus, detailed empirical investigations illuminate concrete phenomena through the use of several sources of data such as interviews and observations.

The case studies were carried out in three different organizations: TDC Group, The LEGO Group and Aarhus University. The three organizations were chosen on the basis of a number of common characteristics such as size, age and IT architecture challenges. All three had above 8,000 employees making them large in a Danish context. Furthermore, these organizations have faced a number of challenges in relation to their IT architecture. At the same time, there are also relevant differences between the three organizations, which make it interesting to study how the IT architecture is handled in different ways in these organizations. The introduction will make a deeper account and comparison between the cases, where arguments will also be made for choosing them as a point of departure for the present dissertation. The three organizations will be described shortly here.

Aarhus University has approximately 8,000 employees and more than 44,000 students, making it the largest university in Denmark based on the number of students. In 2014, Aarhus University had revenues of approximately 6.2 billion Danish kroner. Today, students and employees are serviced by the IT department of Aarhus University (AU IT) when it comes to development and maintenance of IT systems, hardware, network and infrastructure. The university merger of 2007 gave AU IT a major challenge, joining and integrating its IT architecture.

In 2014, TDC had approximately 8,600 employees and revenues of approximately 23.3 billion Danish kroner. It is the largest telecommunications company in Denmark and a market leader in fixed-line telephony, broadband and mobile services. It also has a wide presence in the Scandinavian telecommunications market. For many years, its IT department has been focused on cleaning up the company's underlying, considerably complex IT architecture, consisting of several

old, self-developed IT systems. However, in the last couple of years, increased digitization has directed TDC's focus towards customer-oriented initiatives: new, integrated services, product innovations, and improved customer experience.

LEGO is a Danish, family-owned company with headquarters in Billund and approximately 14,800 employees. It is the largest-selling toy company in the world, with 2014 revenues of approximately 28.6 billion Danish kroner based on sales in more than 140 different countries. Its IT department serves the company's many IT systems, which support the company's financial management, inventory management, volume of sales and so forth. By the end of the 1990s, LEGO was entering a crisis caused by, among other things, problems with the underlying IT architecture. Since then, LEGO has focused on integrating the underlying IT architecture.

By investigating how Aarhus University, LEGO and TDC manage their IT architecture, the dissertation touches upon the disciplines of IT governance and enterprise architecture. In total, the dissertation is based on six scientific papers. These will be accounted for in the following.

Results and Implications

Paper 1: The first paper of the dissertation seeks, through a literature review, to uncover existing academic and practical literature on enterprise architecture evaluation. The ability of organizations to evaluate the existing and future architecture is a central point of departure to enable planning and management of the IT architecture. Enterprise architecture evaluation enables organizations to identify existing challenges and make plans for what can be done to realize a future architecture through IT projects. Yet, the literature review shows that very few publications exist on enterprise architecture evaluation. Especially few papers were found investigating the topic from an inductive, qualitative perspective. Consequently, the paper argues that the deductive publications within the area lack empirical grounding. Without an understanding of the complex social context where the enterprise architecture takes place, it is hard to argue that existing methods and approaches are suitable. The results of the literature review forms the foundation for the following empirical case studies trying to elucidate the phenomenon empirically.

Paper 2: The second paper of the dissertation is based on a case study at the IT department of Aarhus University. Here, the practical management of enterprise architecture evaluation was studied. The paper shows how the evaluation consisted of a complex process including ad hoc, informal evaluation approaches. Some projects proved to be of such complexity that one single, ideal solution could not be found. Instead, architects and IT managers had to weigh a number of suboptimal solutions through different scenarios to reveal how different goals within, for example,

security, usability and technology could not be fulfilled at the same time. This goes beyond conventional literature within the field, recommending rational thinking and measurement as management tools that, often, do not take a balanced approach as a point of departure, nor does it consider the difficulties that organizational actors face in practicing EA evaluation.

Paper 3: The third paper takes, as its point of departure, the role that enterprise architecture evaluation played in the development of TDC's IT architecture. *The resource-based view of the firm* is used as a theoretical lens to interpret the case and develop a capability model, illustrating what internal capabilities within the IT organization support the ongoing evaluation of IT projects in relation to the overarching enterprise architecture. These capabilities relate to creating IT and organizational overview and strategic coordination with the business. TDC's internal capabilities continuously changed and refined as new strategic challenges emerged. These capabilities built and mobilized the IT architecture as a firm resource (Wernerfelt 1984). The paper shows how internal capabilities can contribute in creating sustainable competitive advantages by mobilizing and building the IT architecture.

Paper 4: Whereas the third paper investigates what internal capabilities TDC had to build within its IT organization, this paper explores how the external environment contributed in shaping management practice in relation to architecture governance using institutional logics as a theoretical lens. The paper contributes theoretically by showing how institutional logics can become embedded into governance tools and practice. At the same time, the paper contributes in general to IT governance literature by showing how institutional logics shape IT governance. This contrasts with most existing literature on IT governance which employs a rational perspective on how IT governance is used in organizations.

Paper 5: The fifth paper of the dissertation concerns architecture governance at LEGO, but also contributes to IT governance in general by showing how LEGO not just managed its IT architecture in relation to prevailing approaches and frameworks, emphasizing formalization, control and role assignment. Instead, the case describes how LEGO manages its IT architecture through collaboration, ongoing learning and adaptation. This challenges prevailing literature to explore how organizations can exploit the organizational culture when IT governance initiatives are planned. Results suggest IT governance can be rethought within: 1) what IT governance enables and supports 2) How IT governance is conceptualized 3) how IT governance develops and matures over time 4) how IT governance can bring value.

Paper 6: The sixth paper is a multiple case study across the three cases. Through the cross-case analysis, the paper theorizes on the relationship between IT governance design, institutional logics, IT architecture, and technologies. The paper shows how institutional logics shape IT governance while central actors seek to address the internal IT architecture and external technologies through their IT governance design. Further, the cross-case analysis shows that institutional logics facilitate organizations' (and their actors') understanding and interpretation of opportunities and challenges related to the IT architecture and new technologies. In this way, institutional logics can impede as well as support a certain IT governance design. Theoretically, the paper contributes a framework as to strategies that can be employed in connection to designing IT governance in relation to institutional logics. These strategies involve (a) *challenge* the dominant logic, (b) *exploit* the dominant logic, and (c) *adapt* if a volatile institutional environment causes changed in logics over time.

Altogether, the six papers contribute to existing theory and knowledge by demonstrating the complex, sociotechnical context of IT architecture. Although the literature often verbalizes the management of the IT architecture as something to handle through technical or financial tools, these tools often have a symbolic value, while common conceptualizations and tools can be insufficient. By using institutional logics and the *resource-based view of the firm*, the dissertation shows how the external, institutional environment can internally influence how the IT architecture is managed and controlled, while internal capabilities can be built that make it possible for organizations to drive sustainable competitive advantages from their IT architecture.

1 INTRODUCTION

The purpose of this introduction is to justify the research project by providing the reader with the necessary background information regarding the content, structure and outcome of the research project. Overall, the dissertation investigates how the IT architecture is managed in organizations. To this end, the dissertation explores the disciplines of enterprise architecture and IT governance. The outset of the introduction will be a conceptualization of the core concepts of the dissertation. The overall motivation of the dissertation and main research question follows. The subsequent section outlines the individual papers, their research questions, and how each paper contributes to the main research question of the dissertation. Further elaboration on the research process and employed methods follow. Subsequently, it is discussed how the papers of the dissertation individually, and collectively, contributed to answering the main research question of the dissertation. Building on the discussion, implications for practice, guidelines for future research, and a description of the limitations of the dissertation are given. Lastly, a general conclusion of the dissertation is provided together with a description of the general contribution. This is followed by the six papers of the dissertation.

1.1 Conceptualization

Despite a general awareness of the importance of enterprise architecture and IT governance in managing and designing the IT architecture among academics and IT professionals, there is no standard definition of the terms “IT architecture”, “IT governance”, “enterprise architecture,” “architecture” or “enterprise” (Ross 2003; Weill 2004). Thus, to avoid any ambiguity, IT architecture, enterprise architecture, IT governance, and other core concepts will be introduced here.

1.1.1 *IT architecture and enterprise architecture*

The term IT architecture lacks a universally accepted definition (Ross 2003). IT practitioners commonly use the definition of architecture provided by the IEEE standard 1471-2000: “The fundamental organization of a system embodied in its components, their relationships to each other, and to the environment, and the principles guiding its design and evolution” (IEEE 2000). As noted by Ross et al. (2006), the IT organization usually distinguishes between business process architecture, data architecture, application architecture, and technology architecture, while others have made similar distinctions (e.g. Bernard 2012; Spewak and Hill 1993; Zachman 1987). Throughout this dissertation, IT architecture refers to these architectures. These need to be managed coherently as they are interrelated. Business processes are supported by applications that rely on technology (e.g. technology standards and infrastructure). These applications both automate and

integrate existing processes. This integration of processes required a data architecture, defining data standards and which data is to be shared across processes (Ross et al. 2006).

The coherent planning and design of the IT architecture are here referred to as enterprise architecture (EA). The term of *architecture* can be used to describe a design or structure, but also a vision for further design and evolution while the term *enterprise* usually refers to an entire organization (Jonkers et al. 2006). EA can, overall, be said to describe the current IT architecture design in relation to the organization (as-is architecture), its future design (to-be architecture) and a plan for the transition from the current to a future design. A comprehensive working definition encompassing this conceptualization is provided by Ahlemann et al. (2012): “the fundamental organization of an enterprise as a sociotechnical system, along with the principles governing its design and development”. This entails that EA is the purposeful design of organizations in relation to the business process architecture, data architecture, application architecture, and technology architecture. Thus, EA is the discipline through which the IT architecture is planned and designed.

1.1.2 *The emergence of enterprise architecture*

Although the field of information systems (IS) yielded a significant number of publications on the topic of IT architecture since the late 1980s, the initial focus was on architecting individual systems (e.g. Kruchten 1995; Youngs et al. 1999; Zachman 1987) as organizations relied on these to achieve competitive advantages (e.g. King et al. 1989; Rackoff et al. 1985; Segars and Grover 1998). As more and more systems were implemented from the 1980s into the 1990s, organizations and scholars started to realize that the benefits from IS implementations could hardly be achieved without aligning the strategy and architecture of the business with the IS being implemented (Hammer 1990; Spewak and Hill 1993). From a process perspective, organizations were focusing on automating existing processes to facilitate incremental improvements, but failed to realize dramatic improvements such as improved quality, service, innovation and speed. This was because these organizations did not fundamentally reengineer their organizational structures, workflows, or job functions (Hammer 1990; Manganelli and Klein 1995).

The growing realization was that businesses fundamentally needed to transform in order to gain strategic value from their IS investments (Manganelli and Klein 1995; Venkatraman 1994) and that such a transformation would require an architectural plan based on holistic overviews of business processes, data models and application architecture (Bernard 2012; Ross et al. 2006; Spewak and Hill 1993). Later, this realization resulted in a proliferation of EA literature focused on how to

architect and model the important elements of the business to guide the business transformation (e.g. Bernus and Nemes 1996; Rood 1994; Spewak and Hill 1993).

Overall, the early stream of research on EA focused on how to architect and model elements of the business to guide the business transformation. However, most IS investments still came from business unit managers with little knowledge or incentive to think holistically about their investments. As a consequence of this local optimization, many IS implementations grew into isolated silos, redundant systems, or failed projects (Ahlemann et al. 2012; Ross et al. 2006). Ultimately, this led many organizations to suffer from a number of consequences such as unreliable data, increased IS maintenance costs, increased IS implementation costs, and low IT responsiveness (Niemi 2006; Ross and Weill 2005; Ross et al. 2006).

As a result of the complex, unintegrated IT architecture landscapes that began to surface in organizations, EA research and practice started to shift its focus. While the discipline had previously been dedicated to IS engineering and modeling, literature now emerged focusing on how IS investments could be planned, controlled and implemented to guide the business transformation and prevent business managers from eroding the IT architecture (Ahlemann et al. 2012; Fonstad and Robertson 2006; Fonstad and Subramani 2009; Ross et al. 2006). This led to an intensified focus on how the IT architecture could be managed through EA principles, governance, standards and frameworks such as The Open Group Architecture Framework (TOGAF) which emerged during the 1990s (Lankhorst 2005; Weisman 2011; Winter et al. 2013). Thus, EA became increasingly acknowledged as a discipline that goes beyond technical models and the boundaries of the IT organization (Kappelman 2010; Löhe and Legner 2012; Winter et al. 2013).

Despite a recent shift towards EA as a management discipline (Ahlemann et al. 2012), much literature still revolves around research describing and designing IT architecture elements, such as process design (Guzmán et al. 2010; Kosanke and Nell 1999), system landscapes (Buckow et al. 2010; Widjaja et al. 2012) and holistic frameworks (Bernard 2012; Bernus and Nemes 1996; Plessius et al. 2012). Collectively, this research investigates the “what” of EA through designs, documentations and frameworks. Meanwhile, little attention has been paid to the set-up and implementation of EA concepts in organizations (the “how”) (Foorthuis 2012; Löhe and Legner 2012).

1.1.3 IT governance and IT architecture

The implementation of IT architecture in organizations has been largely understudied (Foorthuis 2012; Löhe and Legner 2012) and most IT architecture projects have been known to fail (Roeleven

2010; Ross et al. 2006). Consequently, there is a need to further investigate how organizations ensure that their IT initiatives are implemented successfully and in line with the EA plan. In most companies, this is done through IT governance guiding investments, individual projects, the project portfolio, and the IT architecture (Mueller and Phillipson 2007; Tiwana and Kim 2015; Weill 2004). Niemann describes the relationship between EA and IT governance the following way: “EA is supposed to enable us to answer the often posed questions about the starting point, the nature of the route and the goal of our journey that will lead us through various IT landscapes, with an eye towards increasing efficiency, oriented on the business and its dynamic changes, and keeping an eye out for hidden risks. The task of steering along this route is what we refer to as IT governance” (Niemann 2006 p. 36).

IT governance, like EA, is a somewhat new research phenomenon within IS research and did not receive much attention before the late 1990s (Brown and Grant, 2005). Corporate governance was largely seen as the activities carried out by the senior management and the board of directors. This overall idea of governance changed early in the century after the failure of a number of major American corporations such as Enron, Tyco, and WorldCom (Moeller 2013; Weill and Ross 2004). In 2002, this led U.S. government regulators to establish the Sarbanes-Oxley Act (SOX) in the United States (Moeller 2013). The act imposed increased control, oversight, and standards for public company boards, managements, and accounting firms within the United States (Moeller 2013). SOX had significant implications to IT organizations and their governance as modern financial reporting was driven by IS, budgeting requirements impacted IT investments and the chief information officer became accountable for data accuracy and security (Kaarst-Brown and Kelly 2005). This development impacted mainstream conceptualizations of IT governance and definitions stressing accountability, desirable behavior, and compliance (e.g. Weill 2004; Weill and Ross 2004). Thus, IT governance is often defined as “Specifying the framework for decision rights and accountabilities to encourage desirable behavior in the use of IT” (Weill 2004, p.3). In this way, much IT governance literature departed from the idea that organizations needed to fundamentally decide on which organizational stakeholders should make important IT decisions.

From an IT architecture point of view, organizations began to increasingly integrate data and IT systems while scholars began to explore how the organizational structures could be adapted to IT system integration (Agarwal and Sambamurthy 2002; Ein-Dor and Segev 1982; Power 1983). This led a range of researchers to explore different types of IT governance structures addressing the organizational need for centralization versus decentralization of IT decisions and structures (Malone 1997; Patel 2002; Sambamurthy and Zmud 1999; Weill 2004). These are described as representing

either centralized, decentralized or hybrid (federal) structures (Huang et al. 2010). Studies have shown that IT governance can be designed in relation to a range of contingency factors (Brown & Magill, 1994, 1998; A. E. Brown & Grant, 2005; Sambamurthy & Zmud, 1999) related to organizational structure, business strategy, industry, and firm size (Brown & Grant, 2005). Other studies have explored IT governance as a rational, managerial response to environmental and strategic imperatives that drive new business models and demand IT leadership to position the enterprise to exploit these technologies (Sambamurthy and Zmud 2000; Schwarz and Hirschheim 2003).

Several authors have outlined that further theorizing is needed on the relationship between IT architecture and IT governance (Aziz et al. 2005; Aziz et al. 2006; Schmidt, C. and Buxmann, 2011; Smits & Hillegersberg, 2013; Tiwana & Konsynski, 2010; Winter and Schelp 2008). The dissertation further investigates the relationship between how organizations design IT governance in response to the IT architecture and its sociotechnical context (Paper 6) while also exploring how IT governance of the IT architecture (referred to as architecture governance in Paper 4 and Paper 5) is shaped and influenced by its specific sociotechnical context.

1.1.4 Enterprise architecture evaluation

Although IT governance is important in facilitating company-wide objectives central to EA, it deals with the issue from a top-down research approach, focusing on how management groups can use decision rights and structures to achieve company-wide objectives (Fonstad and Robertson 2006; Mueller and Phillipson 2007). From a bottom-up perspective, IT projects are essentially the way these goals are achieved. Meanwhile, project management literature has largely focused on elements within the traditional project triangle: time, costs and scope (e.g. Engwall 2003; Fonstad and Robertson 2006; Pundir et al. 2007; Svejvig and Andersen 2015). Thus, Fonstad and Robertson (2006) developed the IT Engagement Model to describe the mechanisms that bring together key stakeholders to ensure that projects achieve company-wide and local goals (Figure 1).

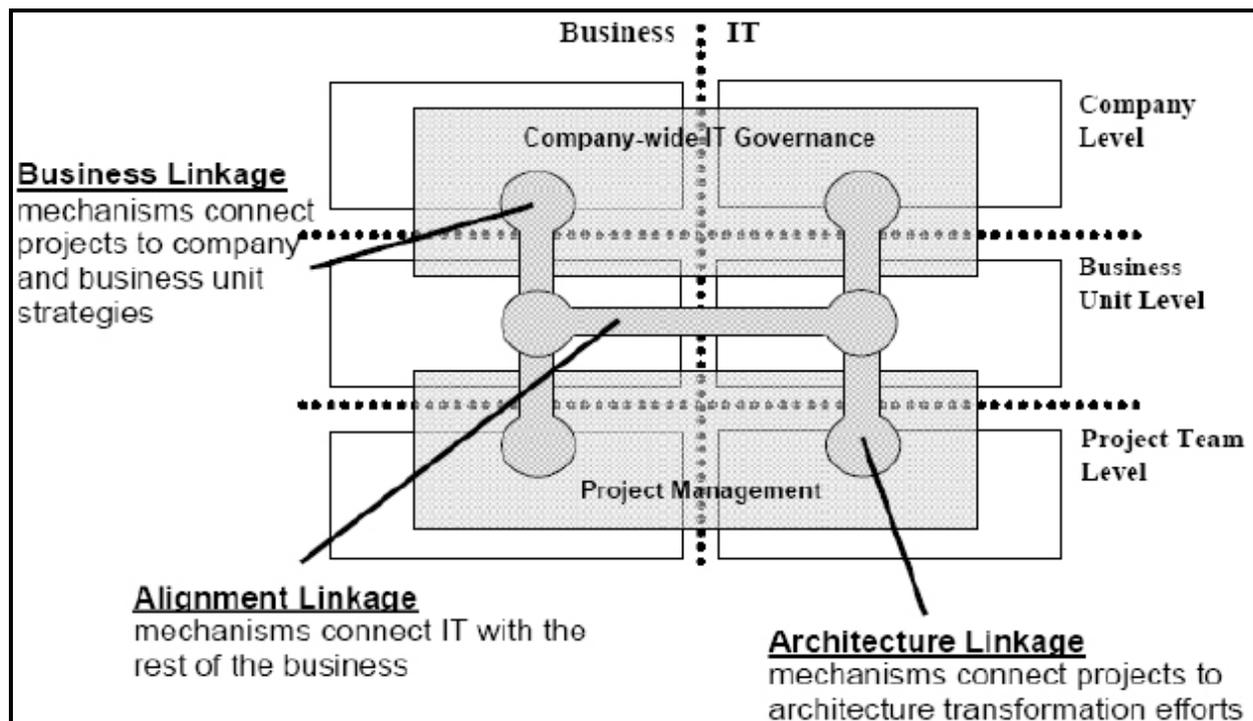


Figure 1. IT Engagement Model with linking mechanisms (Fonstad and Robertson 2006)

Whereas the current dissertation studies the governance structures and mechanisms related to managing EA, it also deals with many of the linkages ensuring that the individual projects are in line with the EA vision and company-wide objectives. This is referred to as *EA evaluation* and encompasses tools and processes targeting at evaluating individual projects, or the entire project portfolio, in relation to the IT architecture. This is, for example, done through ongoing IT architecture compliance reviews, project screenings, checklists, and IT architecture principles (Ahlemann et al. 2012; Fonstad and Robertson 2006).

Overall, the dissertation studies the management of the IT architecture through the two main disciplines of EA and IT governance. While the aim of this section was to provide a general understanding of the core concepts of the dissertation, and the relationship between IT governance, EA and IT architecture section 1.3. provides further details as to the content of each individual paper. The following section provides the motivation for the main research question guiding the dissertation.

1.2 Motivation and Main Research Question

While important work has been carried out outlining how organizations can build a well-functioning IT architecture (e.g. Armour et al. 1999; Fonstad and Robertson 2006a; Löhe and Legner 2014; Ross et al. 2006), the issue of managing the IT architecture has proven a difficult and persistent problem for IT managers and organizations. IT architecture initiatives often fail (Löhe

and Legner 2014; Möller et al. 2011; Roeleven 2010; Ross et al. 2006) and reports have shown that immature IT architectures and legacy systems are causing a lack of innovation and business benefits from IT such as a lack of business efficiency and agility (Evgeniou et al. 2013; Hulme 2015; Savvas 2007; Schmidt, C. and Buxmann 2011). As IT governance and EA have proven essential in managing the IT architecture (Evgeniou et al. 2013; Fonstad and Robertson 2006; Fonstad and Subramani 2008; Ross et al. 2006; Weill 2004), it becomes central to understand how the two disciplines can be further developed.

Although EA has become more recognized as a strategic management discipline (Ahlemann et al. 2012), scholars have pointed to the fact that, EA research is still highly centered on modelling and design of the IT architecture; while less attention has been paid to how the IT architecture can be managed and carried out (Ahlemann et al. 2012; Löhe and Legner 2014). Although several frameworks and methods have been developed (e.g. Aier et al. 2008; Angelov et al. 2012; Aziz et al. 2005; Aziz et al. 2006; Birkmeier et al. 2013; Haki and Legner 2013; Tupper 2011; Wagter et al. 2012), these studies seem to depart from the assumption that we fundamentally understand the relationship between IT architecture, organizations, people, and the organizational environment. Thus, research has primarily contributed to theories for *design* and *action* (Gregor 2006) through prescriptive frameworks and methods rather than, for example, developing theories for *analysis* and *explanation* (Andersen and Carugati 2014).

Similarly, it has been argued that IT governance literature has been highly normative. While useful insights have been provided as to what effective IT governance should be, there is a limited understanding of what really happens as organizations struggle to achieve effective IT governance (Jacobson 2009). This has led some authors to question whether the current conceptualization of IT governance reflects actual practice (e.g. Güney and Cresswell 2010; Jacobson 2009; Jewer and McKay 2012). Much literature has investigated IT governance in relation to objective, organizational contingency factors and IT governance structures (Brown & Magill, 1994, 1998; A. E. Brown & Grant, 2005; Sambamurthy & Zmud, 1999). More recently, research on IT governance has moved towards studying the impact of certain governance structures on the overall effectiveness of IT governance (Ali and Green 2012; Bowen et al. 2007; Bradley et al. 2012; Van Grembergen and De Haes 2009; Huang et al. 2010; Prasad et al. 2010, 2012). Meanwhile, there has been little theorizing on the strategies, difficulties, and tradeoffs that organizations deal with when implementing IT governance in diverse organizations. Also, while much literature has investigated the two disciplines in isolation, several authors have outlined that further theorizing is needed on the relationship between IT governance and EA (Aziz et al. 2005; Aziz et al. 2006; Schmidt, C. and

Buxmann, 2011; Smits & Hillegersberg, 2013; Tiwana & Konsynski, 2010; Winter and Schelp 2008).

By not theorizing on the interplay between the technical IT architecture and the sociotechnical context, many valuable questions have been left untouched. For example, how do the organizational culture, mindset of employees, and logics influence how the IT architecture is managed? What strategic difficulties and opportunities do these elements pose? What organizational capabilities does it take to build an intended IT architecture? How do the fundamental problems that organizations face change as their IT architecture develops? Can our conceptualization of IT governance or EA be expanded in useful ways by investigating how these disciplines are practiced in organizations? Field studies of IT architecture management practice can lead to broader conceptualizations and a richer understanding of how the IT architecture is managed, but also lead to knowledge that can improve how the IT architecture is managed in today’s organizations. Ultimately, this could result in more successful and effective IT architecture initiatives. Thus, the following main research question guided the research process:

How can a sociotechnical understanding of how the IT architecture is managed enrich theoretical and practical knowledge of the phenomenon, beyond technical and rational approaches?

The main research question aimed at providing a deeper understanding of IT architecture management in its sociotechnical context. Overall, the dissertation does so by studying EA and IT governance, as both are essential in managing the IT architecture. The main research question is broken down into separate research questions, answered in six different papers.

1.3 Introduction to the Six Paper of the Dissertation

The first set of research questions were targeted at understanding how EA can be evaluated. These questions were answered in the first paper of the dissertation.

Table 1. The first paper of the dissertation	
Paper title	Research question(s)
Enterprise Architecture Evaluation: A Critical Review, conceptualization, and Research Agenda	<p><i>What is the current knowledge and research on EA evaluation?</i></p> <p><i>What is the nature of EA evaluation as described in the literature?</i></p> <p><i>How can a critical look at existing research be used to guide future research?</i></p>

Paper 1 addresses its three research questions through a structured literature review. Overall, the paper shows that while little research exists in this area, work has been especially sparse in empirical studies of how EA evaluation takes place, while holistic views on EA evaluation are almost nonexistent. Thus, the paper calls for additional studies that could potentially inform how

EA evaluation takes place in organizations. This is important as diverse organizations might employ different approaches to evaluating their architecture or face diverse problems in doing so. Existing generic methods and frameworks do not take this into account. Further theorizing on the topic could thus improve the general success of EA in organizations. The paper also proposes a research agenda based on the shortcomings of the current research. By employing a critical stance and utilizing Gregor’s taxonomy for IS theory (2006), it was argued that much research strives to develop normative models and tools, thus contributing with theories for design and action through action-research (Baskerville 1999) and design science (Hevner 2007; Hevner et al. 2004). While these studies are valuable, less than a handful of papers tried to explain the nature of EA evaluation and how it takes place. Such an understanding might inform more diverse theories for design and action that, for example, take various cultures, norms, and organizational types into consideration. Thus, the next set of research questions aimed to fundamentally understand how EA evaluation takes place in its sociotechnical context:

Table 2. The second paper of the dissertation	
Paper title	Research question(s)
Exploring Enterprise architecture Evaluation Practices: The Case of a Large University	<i>Central question: How does EA evaluation unfold in practice?</i> <i>Sub-question: What are the practical problems of EA evaluation?</i> <i>Sub-question: How are these problems dealt with?</i>

The second paper departs from a case study at Aarhus University (AU). Central to the paper is the investigation of how EA evaluation unfolds in practice. The research questions yielded new insights, elucidating practical problems related to, for example, dilemmas and contradictions within projects, culture, and a lack of strategic direction. Due to these factors, it seemed unlikely that organizations could employ “one size fits all” approaches to EA evaluation. One implication of this study is that practitioners should carefully consider the fit between their own organization and methods for EA evaluation, as organizations with a more democratic culture might have a harder time using centralized and formalized methods of evaluation. From a research perspective, most research has described prescriptive EA evaluation methods and measures based on, for example, mathematical models or technical specifications (e.g. Schütz et al. 2013; Widjaja et al. 2012) as revealed in Paper 1. Thus, the second paper addresses the general gap in literature where scant attention has been paid to how EA evaluation is carried out in organizations.

Subsequently, another study was conducted to investigate what capabilities can be utilized by organizations to conduct EA evaluation. This study was reported on in the third paper.

Table 3. The third paper of the dissertation

Paper title	Research question(s)
The capability model for enterprise architecture evaluation: a case study at a large Scandinavian telecom	<i>How can organizations build internal capabilities to mobilize and build a new architecture resource from scratch?</i>

Overall, this study built on the previous studies, fundamentally exploring the nature of EA evaluation in theory and practice. This study however, sought to more deeply understand the nature of EA evaluation by developing a descriptive model. The model departed from a case study at TDC – referred to in the paper as a large Scandinavian telecommunications company (LST). The *resource-based view of the firm* was utilized as a sensitizing device to discover the main capabilities necessary for evaluating projects in relation to their IT architecture. In this case, these capabilities—*strategic coordination* and *overview*—mobilized the IT architecture as an IT resource for competitive advantage. These fundamental capabilities enhance each other and mutually constitute and enable EA evaluation. The paper thus theorizes on how an evaluation capability can be built and utilized to mobilize an IT architecture resource to gain a competitive advantage. While the competitive advantages of projects are often short-lived (Peppard and Ward 2004), the evaluation capability, and its ongoing adaptation, represents a sustainable competitive advantage as it facilitates value creation through new projects’ improvements to the IT architecture resource. Likewise, the sequential and, to some degree, path dependency of the IT architecture resource makes it valuable, sustainable, imperfectly imitable, and rare (Barney et al. 2001). The evaluation capability created the potential for competitive advantage by implementing strategies to respond to environmental opportunities such as the fast appropriation of new technologies. Meanwhile, it also helped neutralize external threats posed by new technologies and more cost-efficient competitors—while also avoiding internal weaknesses posed by an outdated IT architecture. Further, the project-by-project evaluation of IS investments continually added explicit business value (Peppard and Ward 2004) by increases in IT architecture stability, reducing yearly operational expenses of the IT architecture, reducing time to market, and enabling new product innovations.

Organizations generally want to measure, quantify, and evaluate their ongoing portfolio of projects from an EA perspective, and much literature describes ways of doing this (Andersen and Carugati 2014). However, this paper suggests organizations should first decide whether they have key capabilities for overview and strategic coordination in place, as these two capabilities provide the foundation on which EA evolution can be done. Without first mapping the IT architecture—while having a basic understanding of the strategy of the firm—architects will have a hard time judging the relevance of projects in relation to the organization and its current IT architecture.

As EA evaluation had been explored through several research questions, it was hereafter decided to investigate architecture governance from an institutional perspective. The third paper investigated EA evaluation by studying internal capabilities, shaped by overarching governance structures. Possibly, these were, in turn, influenced from outside the IT organization. This led to the next research question explored in the fourth paper.

Table 4. The fourth paper of the dissertation	
Paper title	Research question(s)
The Role of Institutional Logics In Shaping Architecture Governance: A Case Study	<i>How do institutional logics shape architecture governance practice at TDC?</i>

The fourth paper of the dissertation was also based on a case study at TDC. While the third paper looked at the internal capabilities that constitute EA evaluation, the fourth looked at how architecture governance was shaped through institutional logics externally imposed on TDC. Accordingly, TDC went through a total of three periods dominated by different logics. From 1995 till 2005, TDC was dominated by both a bureaucracy logic and market logic as TDC went from public monopoly to privatization. From 2006 till 2010, the dominant logic shifted into an efficiency logic as private equity funds bought the company and started to drive its internal efficiency. From 2010 till 2015, TDC directed itself towards its customers through a customer logic. The shifting logics of the company affected architecture governance in different ways. While the IT organization during the bureaucracy and market logic focused on making governance standards, the efficiency logic focused on strict cost control, cost transparency, and outsourcing to drive down costs. Thus, both the architecture staff and the IT architecture itself were attempted to be outsourced during this period. As the customer logic began to dominate, architecture governance was done from a more balanced perspective where innovation, customer experience, and costs were balanced through new governance methods. In this sense, while different logics dominated at different times, they also coexisted and formed a constellation of institutional logics that guided the architecture governance efforts (Goodrick and Reay 2011).

IT governance is often described as a management prerogative. However, while mainstream literature on IT governance and EA emphasize linear progression towards increasingly formalized and control-based governance (e.g. Lazic et al. 2011; Simonsson et al. 2007), the longitudinal case study of 25 years of IT governance development at TDC shows that it is shaped through complex, social processes. The paper, thus, makes an important contribution to IT governance literature in general by moving beyond rational models and frameworks that omit the social shaping of IT governance, while existing ideas and frameworks have been primarily developed through a rational choice theory of organizations: utilizing contingency theory, rational choice theory and agency

theory (Jacobson 2009). Additionally, a contribution is made to the current understanding of how competing institutional logics can coexist for a longer duration (Marquis and Lounsbury 2007; Reay and Hinings 2009) by suggesting that their coexistence can be facilitated through their embeddedness in governance practices.

The fourth paper provided some valuable insights into how institutional logics can shape architecture governance. Subsequently, the fifth paper sought to investigate architecture governance in another organization, in order to explore how actual practice relates to the mainstream conceptualization of architecture and IT governance.

Table 5. The fifth paper of the dissertation	
Paper title	Research question(s)
Beyond the Frameworks: Architecture Governance at The LEGO Group	<i>How is architecture governance carried out at LEGO? How do the findings relate to mainstream architecture governance and IT governance thinking?</i>

The literature on IT governance and EA has largely focused on normative frameworks, whereas knowledge regarding how these disciplines are carried out in organizations is scarce (Brown and Grant, 2005; Williams and Karahanna, 2013). Thus, departing from a case study conducted at the LEGO Group (LEGO), the fifth paper sought to empirically investigate how architecture governance is carried out in practice and, subsequently, discusses how the findings relate, and contribute, more broadly to IT governance thinking. A number of findings emerged from the case study that outlined alternative views to the traditional conception of IT governance. These were related to how IT governance is *conceptualized*, what IT governance *supports*, how it *evolves*, and how IT governance creates *value* to the organization.

On one hand, architecture governance at LEGO encompassed traditional governance by allocating decision rights and accountabilities (Weill 2004; Weill and Ross 2004). On the other hand, the analysis also pointed to how architecture governance consisted of cross-functional, collaborative networks to enable the holistic planning of IT investments, while decisions were rarely made in isolation. As such, the case study of architecture governance suggests that IT governance can be viewed as a more holistic discipline than traditionally conceptualized – encompassing cross-functional networks and joint decision-making that goes beyond the boundaries of the IT organization and traditional, top-down control.

Architecture governance at LEGO did not just follow a linear progression towards more formalization of governance mechanisms. While governance was formalized over the years related to IT architecture and portfolio management, there were also indications of rethinking in relation to

the transformation project in 2011. At this point, the internal structure of the IT organization was reconfigured to mirror the three overall business areas. This resulted in new collaborative networks and virtual organizations governing the IT architecture across business areas, such as the EA excellence team, which enabled the architects to become proactive and maximize collaboration with the business. Recently, LEGO again started to question its governance approach as its IT leadership considered building a new IT platform for engagement of consumers, as digitization had become increasingly important. These insights go beyond the traditional, linear view expressed by, for example, governance maturity frameworks (e.g., Simonsson et al., 2007) by indicating that IT governance does not necessarily move towards increased formalization and delegation of responsibilities.

The value proposition of IT governance has traditionally been to enable better investments into IT (Weill and Ross, 2005) and business/IT alignment (De Haes and Van Grembergen, 2009). However, LEGO’s approach emphasized the importance of learning. The CIO stressed that making mistakes was not a problem, but a natural part of learning, while not asking for help was far worse than making a mistake. As employees pointed out, this culture of learning worked because of LEGO’s ability to retain employees for many years, while the IT organization was determined to not to outsource skills essential to the IT platform. This learning culture enabled continuous improvements of governance, employee skills, and the IT platform. While IT governance at LEGO did enable alignment with the business, the focus was equally on facilitating collaboration that would enable new innovations and improvements to the IT platform that could hardly be captured through an investment calculation. These findings suggest that current research might benefit from rethinking the value proposition of IT governance to also emphasize how it can lead to better process and product innovation through learning and collaboration.

While the fifth paper points to an extended view of IT governance, which encompasses elements such as learning, collaboration and adaptation, it does not advocate a replacement of current insights and literature on IT governance, which serve as an important foundation. Rather, the paper attempts to further enrich the current body of knowledge with new insights and perspectives. The final paper of the dissertation similarly contributes to IT governance literature in general through a cross-case analysis based on the three cases of the dissertation.

Table 6. The sixth paper of the dissertation	
Paper title	Research question(s)
Designing IT Governance: Understanding the Interplay Between Institutional Logics, Organizations, and IT Governance	<i>How do institutional logics influence the design of IT governance?</i>

The sixth paper is a multiple case study across the three cases. Through the cross-case analysis of the cases, the paper theorizes on the relationship between IT governance design, institutional logics, IT architecture, and technologies. The paper shows how institutional logics shape IT governance while central actors seek to address the internal IT architecture and external technologies through their IT governance design. Further, the cross-case analysis shows that institutional logics facilitate organizations' (and their actors') understanding and interpretation of opportunities and challenges related to the IT architecture and new technologies. In this way, institutional logics can impede as well as support an IT governance design. Theoretically, the paper contributes a framework as to strategies that can be employed in connection to designing IT governance in relation to institutional logics. These strategies relate to (a) *challenge* the dominant logic, (b) *exploit* the dominant logic, and (c) *adapt* if a volatile institutional environment causes changed in logics over time.

At Arhus University, the dominant autonomy logic – originating from a culture of critical thinking, research freedom and independence – made it difficult to implement centralized IT governance design. Therefore, the IT management pursued a strategy to challenge the existing logic and introduce a new logic within the IT organization. At LEGO, the CIO utilized the existing family logic for the IT governance design. This logic was well-established within LEGO and based on the values of the founding family and emphasized imagination, caring, learning, fun, creativity, and quality. Especially “caring” was emphasized as an important part of the culture that influenced how people worked together, formed networks and collaborated across formal hierarchies. The CIO exploited this family logic to create collaborative IT governance networks across the organization while a new IT architecture was being built that would take collaboration even further. TDC went through several changes to the overall ownership structure as it went from public monopoly to being bought by private equity and later sold off again on the public stock market. As new owners took over the company, changed the corporate management and the strategic direction of the company, TDC went through a change of logics that impacted the IT governance design. TDC went from a bureaucracy logic towards a market logic and, later, an efficiency logic as TDC was acquired by the private equity. In the end, TDC became influenced by a customer logic as the private equity sold their shares in TDC.

In this way, the paper theorizes on the relationship between institutional logics and IT governance design, and contributes a framework as to strategies in dealing with institutional logics. The paper supplements previous studies that have emphasized the relationship between IT governance design, overall organizational characteristics, and strategic objectives, but done little to theorize on how these designs can subsequently be implemented in IT organizations.

1.4 Methodology and Research Approach

In this section, the overall research methods and design will be introduced. This is in order to provide additional explanation regarding how the dissertation was planned, and later discuss its methodological limitations. The first paper of the dissertation employs a structured literature review. The remaining papers consist of four interpretive single case studies and one multiple case study. All case studies employ qualitative methods described in this section.

1.4.1 Structured literature review

Essentially, literature reviews aim at reconstructing accumulated knowledge within a specific domain. Often, they represent an essential first step and foundation when undertaking a research project (vom Brocke et al. 2009; Webster and Watson 2002). As explained by Müller et al. (2014), the structured literature review overcomes the weaknesses of traditional reviews, such as lack of quality assessment of chosen material (Harden et al. 2004) and lack of thoroughness (Tranfield et al. 2003). Further, it follows an explicit methodology using literature as input, rather than interviews and questionnaire data (Harden and Thomas 2004).

The structured review concerned EA evaluation literature—excluding a general review of EA and IT governance. There were several reasons for this. First, a number of recent reviews exist on the topic of IT governance (e.g. Haghjoo 2012; Pereira and Da Silva 2012; Wilkin and Chenhall 2010; Aasi et al. 2014) and EA (e.g. Boucharas et al. 2010; Fernández 2013; Haki and Legner 2012; Mykhashchuk et al. 2011; Simon et al. 2013). Second, as outlined in Paper 1; the review on EA evaluation required an assessment of almost 2,200 papers. Thus, a review of EA in general together with IT governance would have been a substantial undertaking. Thirdly, the review was particularly relevant to the study of EA evaluation as the topic is rather elusive (as detailed in Paper 1). Current research uses different terminology for EA evaluation, conceptualizes EA evaluation differently, and conducts it from multiple perspectives and use multiple methods. To this point, the structured literature review was an important means in conceptualizing and understanding the topic, while discovering potential research gaps.

1.4.2 Interpretive case studies

A number of fields such as computer science and software engineering are concerned with information technology (IT) as an object of study in itself. IS as a discipline, however, investigates the development, use, and impact of IT in organizations (Myers and Avison 2002). While the field at first had a rather technical focus, such as automation in the 1980s, the focus broadened considerably in the 1990s to also investigate the relationship between IS and organizations as a

whole (Myers and Avison 2002). This development has led to an increase in qualitative research contributions seeking to understand the sociotechnical context of IS, although the field has, traditionally, been quite hostile towards non-quantitative and non-positivist research (Markus and Lee 1999). As qualitative studies can be done from different epistemological points of view such as positivist (Yin 2009), critical (Carr and Kemmis 1986), and interpretive (Walsham 1995; Walsham 2006), and can employ a number of research approaches such as action-research, ethnography, and case study research (Myers 1997), further positioning is necessary. Apart from the structured literature review, the case studies reported in this dissertation can be categorized as interpretive case studies (Walsham 1995).

As with qualitative research contributions in general, interpretive research has become increasingly important within the field of IS (Klein and Myers 1999; Walsham 2006). Overall, interpretive research methods depart from the position that knowledge of reality, including human action, is a social construction by human actors while theories are used to make sense of the world. Thus, meanings are created subjectively and intersubjectively (Orlikowski and Baroudi 1991; Walsham 2006) while data represents the researcher's own constructions of other people's constructions (Geertz 1973).

Overall, a case study is a research strategy that focuses on understanding the dynamics within single settings (Eisenhardt 1989). As noted by Benbasat et al., case studies are particularly appropriate for “sticky, practice-based problems where the experiences of the actors are important and the context of action is critical” (1987, p. 369). In this sense, a case study approach was deemed ideal for the current dissertation as it seeks to understand the sociotechnical context where EA takes place. As opposed to the positivist case study research strategy described by Yin (2009), the interpretive case study does not adhere to methodological principles consistent with the conventions of positivism (Klein and Myers 1999). This means that positivistic criteria concerning external and internal validity, reliability, and objectivity (Denzin and Lincoln 1994; Lincoln and Guba 1985) are replaced with another set of principles for justification. For example, Walsham and Sahay propose that authenticity, criticality, and plausibility are useful in judging interpretivist studies (1999). This means that the study should be genuine to the field experience, connect to the experience of the readers, and finally, prod the readers to consider their taken-for-granted ideas and beliefs (Walsham and Sahay 1999). Klein and Myers (1999) suggest a total of seven principles for evaluating and conducting interpretive studies. For example, the principle of multiple interpretations and the principle of contextualization (Klein and Myers 1999). Similarly, Klein and Myers (1999) also acknowledge that their proposed principles are just some among many plausible and useful

principles. The papers of this dissertation can be said to emphasize several principles outlined by Klein and Myers indirectly, such as contextualization by emphasizing social and historic background, reflection on how data is socially constructed, and the principle of abstraction and generalization. I further draw on Guba’s criteria for qualitative research (Guba 1981; Shenton 2004). The remaining part of the section seeks to outline the chosen cases, their characteristics, and the qualitative methods employed as these elements influence the degree of transferability of the findings and conclusions made (Guba 1981; Shenton 2004).

1.4.3 Multiple case studies

The research design encompassed a total of three cases, representing a multiple case study design employing qualitative methods (see 1.4.2). Overall the multiple case study design enables the researcher to explore differences within and between cases. Thus cases should be picked carefully to anticipate similar results, or contrasting based on theory (Yin 2009). Purposive sampling (Kuzel 1992) was used to select the cases based on a number of considerations such as organizational characteristics and theory, primarily related to EA. The selected cases are presented below (Table 7).

Table 7. Characteristics of the three cases as of 2014						
Company	Size employees	Revenues (in DKK)	Founded	Sector	Estimated EA Maturity (Ross et al. 2006)	Headquarters
AU	8,000	6.2 billion DKK	1982	Public	Level 1-2	Denmark
TDC	8.600	23,3 billion DKK	1990	Private, service	Level 2-3	Denmark
LEGO	14,800	28,6 billion DKK	1932	Private, manufacturing	Level 3-4	Denmark

As Table 7 depicts, all three case organizations are Danish and large enterprises as defined by the European Commission, regarding both size and revenues (Commission 2015). Size was an important criterion since the difficulties of managing the IT architecture increases as organizations get bigger, and their IT landscapes more complex (Hinton and Kaye 1996; Möller et al. 2011). This can lead to increases in expenses and IT complexity if one does not manage the IT architecture accordingly (Ross et al. 2006; Schütz et al. 2013; Widjaja et al. 2012).

Equally important, all three organizations were established before 1990, when enterprise systems began to emerge (Brown and Vessey 2003). While TDC was established as a national telecommunications company in Denmark in 1990, its IT architecture has its roots in the old, regional telecoms established in Denmark around the 1950s. (TDC n.d.). Thus, all three cases have

had difficulties with old legacy systems, process standardization, and data integration (Ross et al. 2006).

Further, each of the three cases was, seemingly, in different EA maturity levels (Ross et al. 2006). As the maturity stages represent different archetypes which one organization rarely fully fits, architects from each organization have described their respective organization as between two of the four different maturity levels described by Ross et al. (2006): business silos, standardized technology, optimized core and business modularity. Despite the similarities between the cases, the theory-based diversity between the cases could result in additional findings beyond what each case individually contributes (Stake 2006). Accordingly, the chosen cases have not been selected for *literal replication*—focusing on predicting similar results. Rather, the cases have been chosen for *theoretical replication*—predicting contrasting results for anticipatable reasons (Yin 2009, p. 54). Overall, the anticipation was that an organization in the process of, for example, standardizing its technology would govern and evaluate IT architecture projects differently than an organization moving towards business modularity.

1.4.4 Case descriptions

AU was founded in 1928, has around 8,000 employees and 6.2 billion DKK in revenues as of 2014 (AU 2015). From 2006 to 2007, it went through a number of mergers with formerly independent research and university institutions: Aarhus School of Business, the Herning Institute of Business Administration and Technology, the Danish School of Education, the National Environmental Research Institute, and the Danish Institute of Agricultural Sciences. In 2010, it also went through a substantial restructuring that merged the nine former faculties into four main faculties: Science and Technology, Arts, Health, and School of Business and Social Sciences. It also centralized the once autonomous IT departments of AU into one department. The new IT department (AU IT) then had to create a common IT architecture for the entire university, which had six different and independent IT architectures before the merger. The merger posed significant challenges from an IT architecture perspective and a number of projects were initiated to reduce system complexity, integrate data, and standardize processes.

TDC is the biggest telecommunications company in Denmark and among the biggest in Scandinavia, with approximately 8,600 employees and an extensive history of EA initiatives. It was created in 1990 as a Danish, state-owned monopoly—exclusively covering all of Denmark and encompassing all the old, regional telecoms established in the 1950s. The merger in 1990 aimed to create a powerful company strong enough to thrive on a free, international market (TDC n.d.). In

1997, TDC became fully privatized as the fixed telephony market was fully liberalized. Today, TDC is executing its strategy to become further established within Scandinavia (TDC 2014). TDC is an interesting case of IT architecture management due to its large size, international presence and number of mergers and acquisitions—complicating the integration of its systems, as in the case of AU. Second, TDC is a somewhat old company that went through changes regarding ownership, strategies and size. Thus, due to its size and IT architecture history, a case study at TDC seemed likely to yield new insights to current theory and practice. Lastly, TDC has had problems with its EA due to a failed attempt to outsource its underlying IT architecture around 2008 (Simonsen 2008).

LEGO was founded in Denmark, Billund in 1932. In 1958, it introduced the LEGO brick that transformed the company into a global manufacturer of toys. By September 2014, LEGO had grown to become the largest toy company in the world (Davidson 2014) with more than 10 years of consecutive growth, 14,762 employees and revenues generated from products sold across 140 countries. Turnover reached 28.6 billion DDK by the end of 2014 (LEGO 2014). The IT platform at LEGO is the result of several failed attempts to implement a common enterprise resource planning system across the organization. This journey started in the early 1990s when enterprise systems became increasingly popular. By the end of the decade, LEGO found itself in severe crisis, intensified by a lack of management of the IT architecture, leading to a lack of process and data integration.

1.4.5 Qualitative methods employed

The dissertation is based on a wealth of data that was collected on the three cases. While interviews and observations were the main source of data, the dissertation is also based on both internal and external documents (publicly available documents such as newspapers and annual reports). This section first explains how and why the data was collected. Then, the process of data analysis is elucidated. Although the data collection and analysis in qualitative research are not completely distinct processes, but somewhat overlapping (Myers 2013 p. 165), they are here discussed separately to explain the two activities in a more logical way.

Data collection was carried out in the three organizations from April 2013 to July 2016¹. Data was collected from three sources: interviews, documents, and observations. The accumulated data from

¹ Most of the data collection was finished by April 2015, but some supplementary interviews were held at a later stage to confirm and supplement findings. These were held on October 20 2015, June 26 2016 and July 4 2016. The periods in table 2 display the duration of the primary data collection of each case, not including the supplementary interviews.

the cases amounts to 46 interviews, 21 observations (meetings, briefings, and workshops), and more than 1000 pages of internal documents (Table 8).

Table 8. Data overview					
Data source	#	Description of positions, observations and document examples			
Aarhus University (approximately from May 2013 – May 2014)					
Interviews	15	Chief information officer, project managers, IT developers, vice president of IT, IT architects, head of IT development			
Observations	12	IT architecture coordination meetings, IT project vendor meeting			
Internal documents	+370 pages	Email correspondence between IT architects, architecture principles, reference architecture, project and program descriptions			
External documents	+70 pages	Annual reports, newspaper articles, public statements			
The TDC Group (approximately from March 2014 – February 2015)					
Interviews	10	Enterprise architects, IT architects, project architect, external consultant, senior IT manager, domain architect, senior project manager			
Observations	3	High-level demands of project, project architect workshop (with vendor), role-play session on IT capability tool in project stages			
Internal documents	+500 pages	NPV calculation, business cases, IT rejuvenation document, introduction to business-aligned architecture, business/IT strategy			
External documents	+200 pages	Annual reports, newspaper articles, public statements			
The LEGO Group (approximately from March 2012 – April 2015)					
Interviews	23	chief executive officer, chief information officer, head of IT operations, enterprise architects, IT project architect, head of logistics, corporate IT, senior director of technology, head of project management excellence team, head of change management, change managers, head of project portfolio organization			
Observations	6	IT town hall meeting, IT architecture challenge sessions			
Internal documents	+200 pages	Strategic principles, IT governance documents, IT architecture overviews, guidelines for architecture challenge sessions			
External documents	+300 pages	Annual reports, books, newspaper articles, public statements			
Total (all cases)		Interviews	Observations	Internal documents	External documents
		48	21	+1070 pages	570

Access was gained by contacting people in the role of IT architect, enterprise architect or similar within each of the organizations, as the IT architecture was central to the dissertation. From there, snowball sampling (Blernacki and Waldorf 1981) was used to identify actors with considerable knowledge of the IT architecture, EA, and IT governance practices within each case. This implied asking interviewees if they could provide contact information for somebody knowledgeable within a certain area. For example, retrospective accounts were sought by asking for people who had been in the organization for a longer time. In other cases, informants with technical expertise or people at a higher management level were sought for. One drawback of this method is that it relies on the network of the interviewees (Flick 2009 p. 348). This was addressed by supplementing the snowballing method with specific requests to talk to people in certain areas and by identifying

interviewees in others ways, for example, by requesting interviews with individuals met through observed meetings or taking contact by email or phone. Most interviews were conducted at the headquarters of each organization, while some were conducted via online video and telephone. Interview guides (Kvale 2008) were made for each interview, outlining the interview questions and their sequence. The interview guides were changed either when new perspectives emerged or when the respondent had different knowledge. For example, the CIO interviews focused on strategic intentions, while IT architect interviews focused on understanding the IT architecture and how it was managed. Detailed field notes were recorded for each observation and interview. These were subsequently refined with additional notes and impressions. A distinction was made between what was observed and own interpretations (Flick, 2006, pp. 286-287). The interviews can overall be categorized as semi-structured (Flick 2009; Myers and Newman 2007). In this type of interview, the researcher may have prepared questions beforehand, but leaves room for improvisation. This type of interview is the most common interview type for qualitative research in the field of IS (Myers and Newman 2007). The degree of structure varied for each interview. In some cases, there was very little structure. For example, one interviewee at LEGO had been at the company for 29 years as both a business and IT manager. As he was considered one of the founding fathers of the LEGO IT architecture, he was asked to provide his historical account of how the IT architecture had developed over the years, while a few questions were prepared beforehand to guide the conversation – for example “what were the key challenges?” and “what have you learned from the process?”. In other cases, more structure was required to get specific information on how the IT architecture was managed, what the formal processes were, and so forth. A few interviews were also carried out as focus groups (Flick 2009). The method allows group interaction through which data and insights are produced that would be less accessible without the interaction. The method was, for example, used once to highlight shared and contrasting views between a program manager and an enterprise architect.

All interviews were recorded and all central interviews transcribed. A few audio recordings were either lost or of too poor quality to transcribe. These interviews were used on the basis of the field notes taken or selected excerpts being transcribed. In one instance, after realizing that one interview was not saved on the recording device, field notes were immediately elaborated and sent to the interviewee for confirmation. In this case, the interviewee also agreed to do a follow-up meeting to elaborate on information that might have been lost. Some interviews were retrospective to unveil how the organization, and the management of the IT architecture, had developed over time. In order to address the possible shortcomings of examining the cases through retrospective interviews,

multiple perspectives were sought through comparison with internal documents and by contrasting information with other informants. This enabled cross-checking and triangulation of the retrospective data (Flick 2009) to ensure credibility of the studies (Guba 1981).

Another way to ensure credibility was to interview stakeholders with different roles and within different management layers in each organization – thus ranging from the most senior executives such as Chief Executive Officer (CEO), and Chief Information officer (CIO) (at TDC it was not possible to access senior executives) to project managers and system developers. In this way, individual viewpoints and experiences could be verified against each other, providing a rich picture of the attitudes and practices (Shenton 2004). During the roughly three years of data collection between the three cases, debriefing sessions were held to discuss alternative approaches and changes to the course of action. This helped test ideas and interpretations and identify possible biases and preferences (Shenton 2004). This was done through workshop discussions with research peers and discussions with key informants within each case (Figure 2).

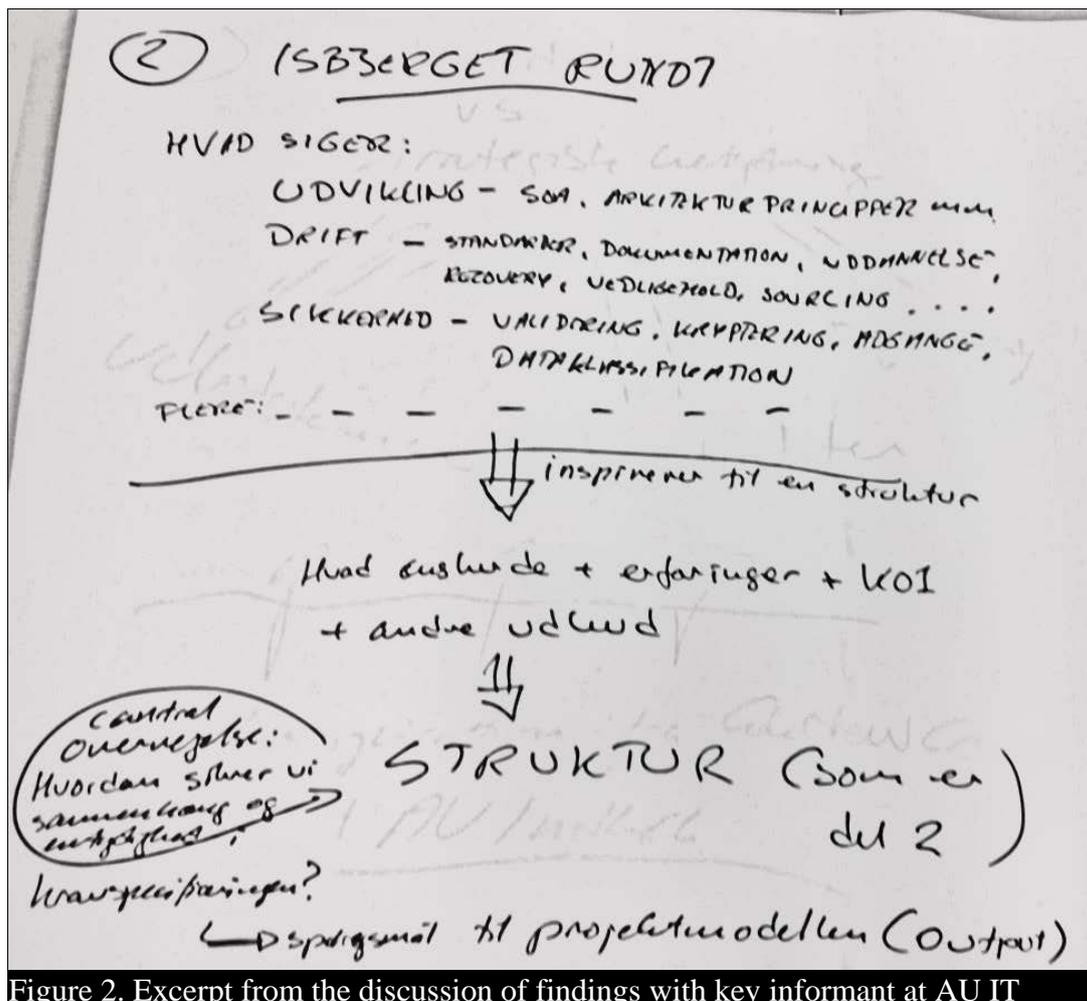


Figure 2. Excerpt from the discussion of findings with key informant at AU IT

In all three cases, key informants were asked to read and comment on central quotes, case reports (Stake, 2006), or parts of the analysis to further confirm credibility. Figure 2 is an excerpt from a discussion on different views on the IT architecture between areas such as development, maintenance, and security. Sessions were held with an IT manager at AU IT, a senior IT manager at LEGO, and an IT architect and manager at TDC.

Whereas the interviews were the primary data source, they were also supplemented with observations during which descriptive and reflective field notes were taken about what was seen, heard, and experienced in each observation. Observations can be used to supplement interviews, as interviews can comprise a mix of how something is and how it should be (Flick 2009). In this way, observations further add to the credibility of the interview data. These observations included IT architecture meetings, workshops, and IT project meetings that were all central to the daily work with the IT architecture. All observations were overt as all participants were informed of my presence and the overall aim of my research – to study how the IT architecture was managed in organizations. These observations were exploratory and unsystematic (Flick 2009), as they were conducted early in the data collection of each case and prior to having chosen a theoretical lens.

The more than 1,000 pages of internal documents were accessed through key informants and interviewees, often given as supplementary material to support, contextualize, or elaborate interview statements. These documents ranged from overall business strategies to IT strategies, IT architecture principles, EA checklists, project models, business cases, and email correspondence. These documents provided background information on the business and IT organization. They were further helpful in interpreting and making sense of the interview and observational data.

For the purpose of analyzing the qualitative data, the software tool NVivo was used. Qualitative coding was used for the data analysis in all papers except the literature review (Paper 2-6). Although the coding process was slightly different for each case, the overall approach will be explained here. Initially, the case recordings would be listened to and interview transcripts read. Any field notes were uploaded to Nvivo. While doing so, descriptive codes (Miles et al., 2014 p. 74) were used to summarize passages of data. Descriptive codes assign a label summarizing data in a word or short phrase (Miles et al. 2014 p. 74). The coding did not initially depart from a conceptual framework and were, in this way, inductive. In all the single case studies, the initial coding was, however, guided by the research question(s) of each paper.² In this sense, some codes

² The single case studies are reported in Paper 2-5. In the multiple case study reported in Paper 6, the research question was informed by initial coding.

can also have been said to emerge deductively. The initial descriptive coding served as a way to make sense of, and structure the data. By not having a complete framework to guide the initial coding, it was sought to keep a level of openness to the data, rather than forcing data into preexisting codes (Miles et al. 2014). This process was iterative and followed several rounds of coding as rivaling perspectives emerged, or ideas were discarded as a result of subsequent triangulation. Then, codes were grouped into a smaller number of themes – thus pulling codes together into more meaningful and parsimonious units of analysis (Miles et al. 2014 p. 86). These themes helped understand the cases separately, but also laid the groundwork for cross-case analysis by surfacing common themes (see Paper 6). The themes were identified by looking for commonalities between bits of data. Through the initial understanding of the cases shaped by the emerging themes, possible theoretical lenses were discussed with coauthors and colleagues. In Paper 3, this process resulted in the choice of the resource-based view of the firm (Barney 1991; Wernerfelt 1984) as theoretical lens, while institutional logics (Friedland and Alford 1991; Thornton and Ocasio 2008) were chosen as a lens for Paper 4 and 6. The analysis of the cases would subsequently follow a more deductive coding process around the emerging themes or theoretical lenses (Paper 3, 4, 6), although induction still took place to some extent. For example, some emerging codes were found not to match preliminary themes. These were in some cases merged into new themes while others were discarded due to too little support from the data. While collecting data and performing the analysis, ideas, insights, and interpretations were recorded in different ways for each paper. These were kept in documents separate from the actual data in the form of case reports³ (Stake 2006), memos⁴ (Flick 2009), or summaries of insights.

³ See Paper 6, Appendix B for examples of case reports

⁴ See Paper 3, Table 2 for example of use of memos to describe themes

2 DISCUSSION AND CONCLUSION

Through six papers, this dissertation sought to answer the following main research question: *How can a sociotechnical understanding of how the IT architecture is managed enrich theoretical and practical knowledge of the phenomenon, beyond technical and rational approaches?* This section first discusses how this research question was addressed through each individual paper. This is followed by the practical implications, limitations, and directions for future research. Lastly, concluding remarks are provided on the dissertation.

2.1 Contribution of the Individual Papers to the Main Research Question

The first paper of the dissertation was a literature review on EA evaluation. The paper indicated that research on EA primarily employs deductive and quantitative methods for EA evaluation and only to a lesser extent empirical field studies. As a result, research has been developed through existing methods and measurements without departing from the sociotechnical context EA is embedded in. Furthermore, most evaluation methods described did not provide a balanced approach. Instead, they would base their evaluation on purely financial or technical criteria rather than taking into account that EA, in essence, is about a holistic consideration from a strategy, business and technology perspective (Bernard 2012). Departing from these findings, a research agenda was proposed for EA evaluation. The research agenda emphasizes the need for further theory development, especially theory corresponding to type 1 and type 2 in Gregor's (2006) taxonomy. Type 1 theories are concerned with describing "what is" while type 2 theories are for understanding how and why some phenomena occur. These theories are less concerned with making predictive generalizations (Gregor 2006). In itself, the literature review represents a type 1 theory by creating a conceptual foundation and understanding of EA evaluation, while another type 1 theory could create a fundamental understanding of EA evaluation practice in its the sociotechnical context (the second paper). Overall, the first paper of the dissertation, thus, contributes to the main research question by suggesting a gap between the mainstream literature on EA evaluation and practice since few studies depart from field studies investigating the sociotechnical context of EA. Moreover, the first paper provides an initial, conceptual understanding of EA evaluation (Table 9).

Table 9. Main contributions of the individual papers	
Paper 1	<p>Provides an initial, conceptual understanding of EA evaluation</p> <p>Outlines research gaps</p> <ul style="list-style-type: none"> • Few EA evaluation methods are based on empirical field studies • Limited understanding of the sociotechnical context of EA evaluation • Few holistic approaches • Prescriptive models and approaches lack grounding in both theory and practice
Paper 2	<p>How EA evaluation unfolds in practice</p> <ul style="list-style-type: none"> • Informal and ad hoc evaluation • Coordination • Practical problems of EA evaluation • Dilemmas and contradictions: wicket problems • Evaluation from multiple perspectives • Indicates a mismatch between literature and practice
Paper 3	<p>Capability model for EA evaluation</p> <ul style="list-style-type: none"> • Overview and strategic coordination as main capabilities • How capabilities mutually constitute and enhance each other • How capabilities contribute in mobilizing the IT architecture resource • How to build internal capabilities from scratch
Paper 4	<p>Shows how architecture governance is influenced by shifting institutional logics</p> <ul style="list-style-type: none"> • Shows how governance is shaped socially by the external environment • Shows how governance is shaped through a process that is not fully rational • Shows how institutional logics can co-exist over longer duration by being embedded into governance practices
Paper 5	<p>Provides an extended view on IT governance</p> <ul style="list-style-type: none"> • What IT governance enables and supports • How IT governance is conceptualized • How IT governance develops over time • How IT governance brings value
Paper 6	<p>Theorizes on the relationship between IT governance design, institutional logics, the IT architecture, and technologies</p> <ul style="list-style-type: none"> • A framework as to strategies for IT governance design in dealing with institutional logics. • A greater understanding of IT governance design and the central role institutional logics play when designing IT governance according to the organization, technologies and the IT architecture.

Working from the findings and research agenda of the first paper, the second paper sought to explore how EA evaluation unfolds in practice—thus contributing to current research and addressing the main research question of the dissertation, by elucidating some of the practical problems of EA evaluation (Table 9). Seemingly, there is a mismatch between prescriptive approaches and how EA and IS evaluation is actually practiced as some authors have indicated that both IS and EA evaluation is done unsystematically in practice (Hochstrasser 1990; Klein and Gagliardi 2010). Similarly, the findings of the second paper show that while few formal procedures were in place for evaluation, different ad hoc procedures and informal processes enabled EA

evaluation as there was no formal EA group in the organization. Due to an anarchistic culture and a flat hierarchy, architects would often have to deal with emerging problems, as different managers and project managers initiated new projects, sometimes out of line with the IT architecture principles. Furthermore, some projects could represent wicket problems (Rittel and Webber 1973) and thus required complex discussions involving multiple perspectives, for which no formal tools or methods existed. Based on this, the paper shows a need for more balanced view on EA evaluation and that informal coordination, in some cases, could supplement standardized approaches that are often used (Ballantine and Stray 1999). Although the importance of senior management backing (Kabai 2013), and formal EA processes (Fonstad and Robertson 2006; Ross et al. 2006) have been outlined, there is little knowledge as to how organizations can improvise EA based on a lack of support, cultural problems, and informal practices. By theorizing on the practical problems of EA in an organization with low IT architecture maturity (Ross et al. 2006) and few formalized EA approaches, the second paper contributes current EA literature by emphasizing how the sociotechnical context, in which EA evaluation takes place, influences how EA evaluation is carried out. The findings indicate that a low IT architecture maturity organization with few formalized approaches will improvise ad hoc evaluation and deal with the issue of EA in more informal ways.

Collectively, the first two papers of the dissertation contribute to current EA literature by showing that there is a mismatch between most EA evaluation literature and how EA can unfold in practice. This might be due to the historical development of both EA and the field of IS in general. In both cases, research did not go beyond technical perspectives before the 1990s (e.g. Ahlemann et al. 2012; Bernus and Nemes 1996; Foorthuis 2012; Myers and Avison 2002; Rood 1994; Spewak and Hill 1993). While interpretivist studies have become more accepted within the field of IS (Klein and Myers 1999), the literature review did not reveal interpretivist papers on the topic. In this sense, the second paper represents an important step in further understanding the context of EA evaluation by providing a deeper understanding into the practical problems of EA evaluation (Table 9) and how the issue of IT architecture is embedded into, and influenced by, the specific social setting of each organization.

The third paper sought to provide a deeper understanding of what constitutes EA evaluation and how it takes place in practice. In this paper, the *resource-based view of the firm* was used as a theoretical lens to form the analysis and enable generalization through abstraction (Klein and Myers 1999). This resulted in an EA capability model that described the capabilities for EA evaluation as they emerged from the data analysis. The IT organization built these capabilities within the IT organization from 2008 after the organization had failed to outsource its IT architecture. The two

capabilities were strategic coordination and overview. The overview capability included application mapping, capability mapping, IT roadmaps, and domain blueprints. The strategic coordination capability supplemented the overview capability and covered, among others, IT architecture principles, business drivers, business visions, scenarios, and IT strategies. Collectively, the two capabilities were essential by enabling EA evaluation through checklists, formalized approval processes, design authorities and an application strategy. In this sense, the case contributes to current research by providing a detailed example of how to build internal capabilities for EA evaluation over time. The two capabilities built upon each other to create an increasingly refined evaluation capability over the years. While the early EA evaluation capability enabled technical and financial evaluation, the strategic coordination capability enabled evaluation from a more holistic perspective—taking business requirements into perspective and coordinating with the business in various ways. On the one hand, the paper provides a detailed picture of how the evaluation capability was built through firm-specific processes and resources over time (Amit and Schoemaker 1993). On the other hand, the paper also shows how the IT architecture in the organization was mobilized through the evaluation capability to gain a sustainable competitive advantage as the capability facilitated ongoing improvements to the IT architecture in accordance with strategic needs. Likewise, the path dependency of the IT architecture resource makes it valuable, sustainable, imperfectly imitable and rare (Barney 1991). Though other authors have already explored the resource-based view in relation to the field of IS (e.g. Kearns and Lederer 2003; Wade and Hulland 2004), no previous studies have explored the resource-based view, and the attainment of sustained competitive advantage, in the context of EA evaluation. By emphasizing fundamental capabilities, rather than specific methods and approaches, the third paper theorizes, at an abstract level, what overall capacities actually constitute EA evaluation—thus contributing by further conceptualizing EA evaluation from a theoretical perspective and outlining what internal capabilities can be used for EA evaluation (Table 9).

Collectively, the three first papers provide a general understanding of the gap between theory and practice regarding EA evaluation as the sociotechnical context of EA makes it difficult to use standardized approaches. Consequently, the third paper sought to provide a useful model for both theory and practice that did not focus on specific approaches or frameworks to employ. Instead, the capability model outlines the fundamental capabilities necessary for EA evaluation. A range of different processes, structures, and roles unique to the individual organization can constitute these capabilities. However, while the third paper explored the internal capabilities that can be built within the organization, it was also evident that the IT organization was governed by shifting

strategies and circumstances. Due to this fact, it was decided to subsequently explore how the architecture governance—guiding the evaluation effort—was shaped by external factors.

While EA evaluation largely represents how IT projects are evaluated in relation to the IT architecture, these practices are governed by overarching processes, roles, and structures (Van Grembergen 2013; Weill and Ross 2004). Therefore, to fully answer the main research question of the dissertation, the fourth paper takes a broader perspective by investigating architecture governance and how the external environment shapes it. While the previous papers investigated how EA evaluation takes place and what constitutes EA evaluation, the fourth paper looks at how the overall architecture governance structures are influenced by the external environment through institutional logics (Thornton and Ocasio 2008).

The fourth paper reports on a longitudinal case study investigating the past 25 years of architecture governance at TDC and shows how the organization went through four different logics generated by changing institutional pressures and ownership structure. These logics were bureaucracy, market, efficiency and customer logic. The logics impacted the way the IT architecture was governed. In general, the paper contributes to IT governance literature by showing how institutional logics, influenced by different institutional pressures, shape IT governance. This contrasts with the majority of existing literature on IT governance, which employs a rational perspective on how IT governance is used in organizations and is largely based on contingency theory, rational-choice theory, and agency theory (Jacobson 2009). While existing literature and IT governance thinking are valuable, both neglect how IT governance is carried out in its social setting, how it changes over time, and how it interacts with the external environment of the organization. The paper also contributes to the understanding of how competing institutional logics can coexist for a longer duration within the IT organization by suggesting that their coexistence can be facilitated through embeddedness in governance practices (Table 9).

Both the third and the fourth paper depart from an analysis of TDC, but arrive at somewhat different conclusions. This begs the question as to whether both can be right at the same time. While the third paper outlines how actors build the capability for EA evaluation at TDC, the fourth paper, argues that the governance of the IT architecture was influenced by shifting logics. By studying the same organization through two different theoretical lenses (the resource-based view and institutional logics), different elements were highlighted and different understandings emerged, but this does not entail that one is right, while the other is wrong. Instead, the two papers show that the IT architecture is managed in a dialectical manner involving reciprocal causation (Orlikowski 1992).

While actors do have a say in how they manage the IT architecture, and plan in accordance to strategic objectives, and goals of the organizations, these actors are similarly influenced by institutional pressures and norms, as are the goals and strategies of organizations (DiMaggio and Powell 1983). Collectively, paper 3 and 4 thus shows how IT managers and architects can build essential capabilities for EA evaluation, but at the same time, they are also influenced, constrained, and enabled by the norms, logics, and culture that exist as part of the sociotechnical context of the IT architecture.

Similar to Paper 4, the fifth paper departs from an investigation of architecture governance and contributes to IT governance literature in general. By investigating architecture governance at LEGO, the paper shows how LEGO did not just manage its IT architecture in relation to prevailing approaches and frameworks emphasizing formalization, control and role assignment (e.g. Radovanović et al. 2010; Rau 2004; Van Grembergen 2013; Van Grembergen et al. 2004; Weill and Ross 2005; Weill and Ross 2004). Instead, the case describes how LEGO manages its IT architecture through collaboration, ongoing learning and adaptation. This challenges prevailing literature to explore how organizations can exploit their culture when IT governance initiatives are planned. On the basis of the analysis of the case, it is suggested that IT governance can be extended and supplemented by alternative views on IT governance within four areas: 1) what IT governance enables and supports 2) how IT governance is conceptualized 3) how IT governance develops and matures over time 4) how IT governance can bring value. Thus, while IT governance literature and practice emphasizes normative, formalized frameworks and approaches to IT governance, the case study of architecture governance at LEGO shows that IT governance also goes beyond mainstream architecture governance thinking and frameworks (Table 9). As the paper shows, this alternative governance approach employed by LEGO was largely driven by increased digitization. In this way, the alternative governance approaches, and alternative views identified in the paper, might be helpful for organizations in dealing with an increasing demand to address digitization of products and processes.

The single case studies at AU, TDC, and LEGO showed diverse approaches to managing the IT architecture, but each organization was also different in relation to their IT architecture, culture and sector. Elements that could influence the way each organization managed their IT architecture. This observation led to the sixth paper involving a multiple case study design of the three cases. The sixth paper theorizes on the relationship between IT governance design, institutional logics, IT architecture, and technologies. The paper shows how institutional logics shape IT governance in each of the cases while central actors seek to address the internal IT architecture and external

technologies through their IT governance design. Further, the cross-case analysis shows that institutional logics facilitate organizational actors' understanding and interpretation of opportunities and challenges related to the IT architecture and new technologies. In this way, institutional logics can impede as well as support a certain IT governance design. Theoretically, the paper contributes a framework as to strategies that can be employed in connection to designing IT governance in relation to institutional logics. These strategies relate to (a) *challenge* the dominant logic, (b) *exploit* the dominant logic, and (c) *adapt* if a volatile institutional environment causes changed in logics over time. Thus, the findings contribute with a theoretical framework as to strategies for IT governance design in dealing with institutional logics. The analysis indicated that institutional logics can go against a certain IT governance design, shift over time, or complement an IT governance design. Likely, IT governance designs are more successfully implemented if the existing organizational logic(s) are considered, and the organization in question devises a strategy in dealing with the logic(s). Without such a strategy, a given IT governance design is likely to fail due to a mismatch between the organizational logic(s) and the governance design. The sixth paper further investigates how institutional properties (Orlikowski 1992) such as strategies, technologies, and IT architecture maturity (Ross et al. 2006) are central elements that influence the interplay between IT governance designs and logics. While technologies are increasingly impacting organizations, industries and the global economy itself (Brynjolfsson and McAfee 2011, 2014; Hansen and Sia 2015; Hendrix 2014; Matt et al. 2015), there is little knowledge on how emerging technologies influence IT governance designs. The cross-case analysis shows that each organization became increasingly attuned to new technologies such as cloud computing (Iyer and Henderson 2010), business analytics (Chen et al. 2012), and omnichannel retailing (Brynjolfsson et al. 2013) that made actors reassess the adequateness of their IT governance design. Thus, the analysis suggests that organizations design IT governance to address the internal IT architecture while dealing with the challenges and opportunities of new, external technologies. These can be seen as two institutional pressures, each having the power to influence institutional logics and drive the IT governance design in a certain direction. While much institutional literature views institutional pressures as constraints to which organizations must respond (e.g. Greenwood et al., 2011), this view overlooks the available strategic opportunities and choices that organizations have in acting upon them (McPherson and Sauder 2013; Oliver 1991). Similarly, the cases illustrate that organizations strategically adapt to these pressures and shift their focus between addressing technological changes and managing the IT architecture. Both elements were important to all three organizations, but not equally important at all times. Thus, as the existing IT architecture matures, new technologies emerge, and the institutional logics of organizations change, it is unlikely that

one, unique IT governance design can, or should, persist over time. This implies a more dynamic view on IT governance design than traditionally employed. While current literature has outlined how organizational characteristics and objectives determine an appropriate IT governance design (e.g. Weill, 2004), Paper 6 takes a step further to theorize that organizations should strategically implement and adapt their IT governance design in accordance with the prevailing logic(s) and institutional properties. However, at the same time, the prevailing logics within organizations frame how actors think about the challenges and opportunities posed by external technologies and the internal IT architecture. This means that institutional logics both limit and enable strategies in dealing with the issues of IT architecture and technologies.

2.2 Practical Implications

Practical implications are detailed in each of the six papers of the dissertation. Thus, this section seeks to provide implications that were either not detailed in the papers, or draw new implications across the papers.

EA is still in the midst of defining itself as an emerging profession (Bernard 2012; Lane 2010). EA professionals typically have a background within IT or engineering (Chuang and Van Loggerenberg 2010), however, the field is now moving beyond the boundaries of the IT organization, as IT is becoming increasingly important to organizations (Weill and Woerner 2014; Weill and Woerner 2015). While this fact is recognized within literature (Kappelman 2010; Löhe and Legner 2012; Winter et al. 2013), much of the current conceptual foundation of EA seems to still revolve around the same problems organizations were facing one or two decades ago: data modeling, standardization, effectiveness and system integration. Meanwhile, as argued for in the introduction, IT governance is largely conceptualized according to the demands that were enforced by the SOX in the United States (Moeller 2013) stressing accountability, desirable behavior and compliance (e.g. Weill 2004; Weill and Ross 2004). The existing conceptualizations and knowledge base of EA and IT governance has proven a valuable foundation for realizing a number of benefits such as increased effectiveness (e.g. Kamogawa and Okada 2005; Van Der Raadt et al. 2007), reduced IT costs, and increased IT responsiveness (Ross et al. 2006). As companies mature their IT architecture, the IT architecture becomes increasingly important for realizing strategic business benefits through, for example, customer intimacy, product leadership, and strategic agility (Ross and Weill 2005; Ross et al. 2006). Thus, as more and more companies overcome the fundamental problems of process integration and standardization (Ross et al. 2006), it is likely that the IT architecture needs to be managed differently. In relation to this, some lessons can be drawn from the

cases reported in this dissertation. While some of these implications are in line with extant literature (e.g. Ross and Weill 2005; Ross et al. 2006), they provide some additional details and perspectives for practitioners.

2.2.1 Implications for Low IT architecture maturity organizations

As illustrated in the section “Methodology and Research Approach” (Table 7), the three cases represent different maturity levels (Ross et al. 2006) regarding their underlying IT architecture, while all cases found themselves at the lowest IT architecture maturity level (business silos) at some point. Accounts from all three cases suggest that gaining an initial overview of the IT architecture is essential. This entails (cf. the definition of IT architecture in section 1.1.1) an overview of business processes, data, applications, and supporting technologies. Each case brings different arguments as to why this is an important start for managing the IT architecture. At LEGO, a lack of data overview and standards had resulted in unreliable information across the business regarding revenues and sales. At TDC, an overview of the application landscape was essential in reducing the operational expenses within the IT organization. Overlapping and redundant IT applications were expensive to run, but without an overview, the IT application landscape could not be consolidated. After the university merger, AU needed to standardize central processes across the entire university. Some of these needed to be optimized or supported by applications while there was also a need for data integration. Therefore, AU needed to build an overview of central processes to be standardized, while gaining an overview of existing applications and data. All three cases suggest that organizations at lower maturity levels fundamentally need to create an overview of the IT architecture. Paper 3 similarly stressed overview as a central capability for EA evaluation. In all case studies, backing from the senior management was essential in getting anything done from an IT architecture point of view. As outlined in Paper 6, a middle-out process can be used if there is not sufficient backing and understanding from the senior business management. In this way, IT managers and architects seek to work more closely with the middle management of the business, who in turn can influence the senior business management. As described in Paper 6, both TDC and AU strived to build a more mature project and portfolio organization and improve the EA knowledge within their organization early on. Overall, low maturity organizations benefit from focusing on building an overview of their IT architecture, seeking backing from the senior management, and developing skills for EA, project management and IT governance.

2.2.2 Implications for high IT architecture maturity organizations

As the IT architecture of TDC matured, the architects started to build an overview of the IT capabilities needed by the business, build strategic IT roadmaps, and identify industry drivers such

as new technologies. A similar process took place at LEGO. This implies that senior IT managers need to be aware of when enterprise architects need to turn their attention from optimizing the IT architecture towards proactively investigating how the IT architecture can support the business. TDC did this by positioning enterprise architects outside of the IT organization and by allocating more money for strategic IT investments. Senior IT managers can also consider how to potentially restructure the IT organization itself as the IT architecture matures. To this end, Paper 5 specifies how the IT organization can reorganize to increase business proximity and become more proactive through overarching excellence teams, cross-functional collaborative teams, and by restructuring the IT organization around the lines of the business. It is important to note that the IT architecture should still be a priority – even at high maturity levels. TDC continuously work to further consolidate their IT architecture by removing redundant IT applications, while the IT management at LEGO utilizes the EA challenge sessions to prevent new projects from potentially compromising the mature IT architecture. The mature IT architecture at LEGO serves as an important backbone for the global supply chain of the company.

2.2.3 Implications of technologies

Despite the cases operating in different industries – research and education, telecommunications, and toy manufacturing – they all perceived a need to address emerging technologies that potentially impacted their IT architecture and business in new ways (see Paper 6). Regardless of IT architecture maturity level, this means that business and IT managers might need to reconsider their IT governance design and EA priorities. Even though all three cases needed to manage their IT architecture centrally, new technologies challenged a centralized IT governance approach. At LEGO, this resulted in the IT management deciding to build a second IT architecture for digitally engaging consumers, while maintaining their existing IT architecture to support enterprise IT systems and processes. Resultantly, IT managers and academics should be mindful of whether new technologies could challenge the monolithic view on IT architecture and how it is managed.

2.2.4 Implications of the sociotechnical context

The papers of the dissertation point towards a need for further attention to the sociotechnical context. Each individual paper provides answers as to what this implies for business and IT managers. In particular, Paper 6 discusses how strategies can be applied in dealing with the socially constructed institutional logics (Thornton and Ocasio 2008). While the dissertation emphasizes the sociotechnical context of the IT architecture, each of the cases also shows how organizations can make pragmatic choices based on the sociotechnical context of the IT architecture. In this way, the case studies reported in the current dissertation can act as useful examples providing concrete,

context-dependent knowledge for practitioners and academics (Flyvbjerg 2013). These insights will hopefully lead to more successful management and implementations of IT architectures in organizations.

2.3 Limitations and Future Research

Despite the theoretical contributions of the current dissertation to IT governance literature, EA, and how the IT architecture can be managed in general, the dissertation has certain limitations. Although each individual paper discusses its particular limitations, this section will address the general limitations of the dissertation, while proposing some directions for future research.

First, a possible limitation is the number of cases included in the dissertation. Whereas a larger number of cases could have potentially yielded more insights, in-depth studies and in-depth analysis of few cases were prioritized in order to be able to thoroughly understand the sociotechnical context of each case (Myers 1997), and how it influenced the management of the IT architecture.

Second, the cases were chosen because they all represent large and long-standing organizations. For this reason, the findings can only to some extent be transferred to organizations that are either smaller or more recently established. All three cases reported here had old legacy IT systems, or were struggling with an unintegrated IT architecture as the result of several mergers. While the issue of IT architecture is important to small and medium-sized companies (e.g. Bernaert, Poels, Snoeck, & De Backer, 2014), these face different challenges in relation to their IT architecture and will approach the issue somewhat differently (Bidan et al. 2012). Therefore, while small and medium-sized organizations are influenced by the issue of IT architecture, it is likely that the IT architecture would play a different, or less significant, role compared to organizations struggling with complex IT architectures or old legacy IT systems. In this way, further theorizing on how smaller companies, or startups, manage their IT architecture, and build capabilities for doing so over time, could prove a promising research avenue.

Third, all cases were chosen to be Danish companies. On the one hand, this makes it possible to rule out country-specific practices and country-specific culture as causes of variations in how the three cases manage their IT architecture. On the other, one could therefore argue that Scandinavian culture and values influence how the IT architecture was managed in the three cases. Still, as Paper 6 highlights, the IT architecture was managed differently across the three cases, while different logics also existed. As institutional logics have been known to transcend national boundaries (Thornton et al. 2012), it is likely that similar logics to those identified in Paper 4 and Paper 6 can be found in organizations outside of Scandinavia. Indeed, Paper 4 shows how TDC was influenced

by logics coming from owners outside of Denmark. Additionally, both LEGO and TDC operate outside of Denmark. In this way, the fact that all cases were sampled to be Danish should not be regarded as a limitation as it does not invalidate the theoretical findings, such as the relationship between IT governance and institutional logics and capabilities for EA evaluation.

A fourth possible limitation is related to the use of retrospective analysis of interviews and documents (Paper 4, 5, 6). While drawbacks of retrospective analysis were addressed through data triangulation, some of the analysis goes back more than twenty years. Therefore, emphasis was put on the more recent years in each of the cases.

In general, much can still be learned from interpretivist case studies of how organizations manage their IT architecture. Such studies could provide even richer longitudinal insights as to how IT governance design and institutional logics develop and influence each other over time. They could also work to build further on capabilities for EA evaluation. Further in-depth qualitative studies of IT and architecture governance could clarify how governance is socially, temporally and contextually shaped. Such theorizing could provide insights for practitioners trying to build their IT architecture and could help expand current models and frameworks employed by practitioners.

2.4 Conclusion and General Contribution

Overall, the dissertation aimed to further clarify how the IT architecture is managed by studying the IT architecture in its sociotechnical context. By doing so, the dissertation shows how the social context of the IT architecture is instrumental in how the IT architecture should be managed. The dissertation has a number of implications for both research and practice. The first paper conceptualized and took a critical look at existing literature on EA evaluation. While conceptualizing and contributing to the general understanding of EA evaluation, the first paper fundamentally showed that few studies emphasize the relationship between EA evaluation and its sociotechnical context. Thus, a need for further theorization on the relationship between evaluation practices and the organizational context was identified. This led to the subsequent case studies seeking to understand how the IT architecture as a technical phenomenon is determined, not just by choices related to deliberate strategies and structure, but also socially shaped through culture, individuals, past history, and the organizational environment. Figure 3 below shows the overall areas that were touched upon within the dissertation and how the management of the IT architecture takes place in a complex, sociotechnical context.

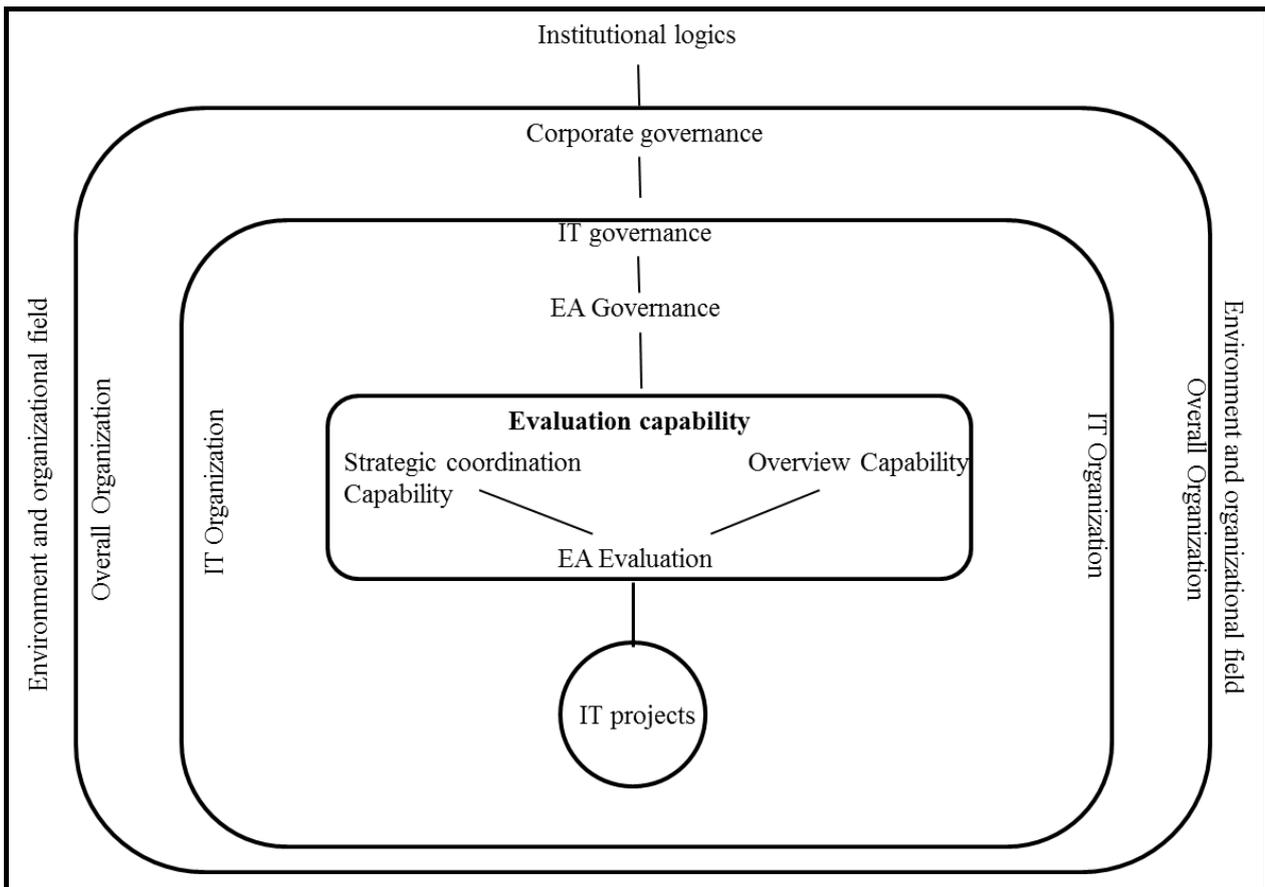


Figure 3. How the dissertation studies the sociotechnical context of managing the IT architecture

As Figure 3 shows, the dissertation investigates how the IT architecture is managed through IT governance and EA. IT projects and initiatives related to the IT architecture undergo EA evaluation to assess their appropriateness in relation to the planned IT architecture. As described in Paper 2, this evaluation can take various forms and goes beyond technical and formalized approaches. It relies on certain capabilities in the IT organization that enable the overview and coordination necessary to evaluate the projects' contribution to the IT architecture (Paper 3). The evaluation of the individual projects and the project portfolio is further governed by IT governance. Even though IT governance is largely viewed as a rational discipline concerned with decision rights, accountability and formal procedures, it is not employed in a fully rational way, but influenced by logics existing in the organization (Paper 4, 6). Furthermore, it is also shown that architecture governance relies on learning, adaptation and collaboration and, thus, could benefit from alternative views beyond existing conceptualizations (Paper 5).

Existing tools and methods are indeed valuable, but many also abstract from a social, holistic understanding of how the IT architecture is managed. In recent years, considerable rethinking has taken place within the field of project management, beyond traditional project management tools and rational approaches. This implies, for example, broader conceptualizations of projects,

emphasis on the social and political aspects of projects, and viewing projects in a broader context (e.g. Andersen 2016; Berggren and Söderlund 2008; Cicmil et al. 2006; Crawford et al. 2006; Kreiner 2012; Svejvig and Andersen 2015). While a similar movement has not caught on within EA or IT governance literature, IT architecture implementations have been reported to have a high failure rate, between 50% and 66% (Roeleven 2010; Ross et al. 2006). The hope is that the more contextual understanding of IT architecture difficulties, institutional shaping, capabilities for EA evaluation, alternative views on how the IT architecture is governed, and strategies for IT governance design in dealing with institutional logics will contribute to more successful implementations and management of the IT architecture in organizations. While institutional logics in particular have been used to illustrate how IT governance of the IT architecture is shaped by the sociotechnical context that each organization finds itself in, the analysis of the cases also show that standardized approaches, rational planning, and strategies are applied in all organizations. Although these are certainly valuable, practitioners and academics need to be mindful of the fact that the IT architecture cannot just be managed by applying “off-the-shelf” strategies or best practice frameworks. Neither is it sufficient to adapt the management of the IT architecture to contingency factors such as current strategy, sector, or size. These could certainly all be valuable factors to take into consideration, but the current dissertation suggests that organizations need to more deeply recognize the role of the sociotechnical context when managing the IT architecture. Therefore, the findings of the dissertation are valuable extensions to existing knowledge within IT governance and EA literature.

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PAPER 1

ENTERPRISE ARCHITECTURE EVALUATION: A CRITICAL REVIEW, CONCEPTUALIZATION, AND RESEARCH AGENDA⁵

Author(s): Peter Andersen

ABSTRACT

Enterprise architecture (EA) is a holistic discipline concerned with achieving coherency among organizational elements such as organizational strategy, business needs, and how information systems (IS) can best support the business. Though EA is a maturing research area, little has been done to understand how projects, and investments into IS or other elements, can be evaluated in relation to building an architecture. The current paper presents a literature review on EA evaluation in general. Various types of evaluation are necessary to ensure that EA demands are being met by different IS initiatives. Meanwhile, many different methods can be applied to evaluate IS initiatives in relation to, for instance, EA compliance and EA benefits. Still, EA evaluation has attracted little attention within the literature. The aim of the current review is to attain an overview of the topic, which can serve as a foundation for further development of the field. Overall, the study shows that while little research has been carried out in this area, work has been especially sparse when it comes to empirical studies of how EA evaluation unfolds in practice, while holistic views on EA evaluation are almost non-existing. Thus, the paper calls for additional inductive studies of how EA evaluation unfolds in practice. It also proposes a research agenda based on the shortcomings of the current research.

Keywords: enterprise architecture, evaluation, literature review

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1 INTRODUCTION

In a world increasingly driven by information technologies, enterprise architecture (EA) has become more important than ever (Schekkerman 2006). New technologies such as data analytics and cloud computing have become central to obtaining and sustaining competitive advantages. However, without a sufficient architecture, these technologies are not easily adoptable (Weill and Ross 2009). At its core, EA facilitates: “The analysis and documentation of an enterprise in its current and future states from an integrated strategy, business, and technology perspective” (Bernard 2012, p. 31).

Traditionally, EA has focused on understanding and representing the fundamental components of an enterprise through modelling methods and notations. However, little attention has been paid to the set-up and implementation of EA concepts in organizations (Löhe and Legner 2012). Thus, while EA research and practice have mainly paid attention to the overall analysis and documentation of the enterprise, knowledge is limited when it comes to how the ideas and architectural plans are realized through everyday projects and IS investments that collectively build the architecture over time. As a result of the failure to operationalize EA, architecture teams in organizations and in the field in general have been criticized for acting like ivory towers disconnected from the practical concerns of the business (Koch 2005). In this regard, EA evaluation plays a key role in ensuring that EA does not function or is not perceived to function like an organizational ivory tower but, rather, adds clear value to the organization.

By changing from a predominantly technical discipline to a business discipline, EA now needs to be able to provide clearer indications that IS initiatives are moving the business in the right direction (Fonstad and Subramani 2009). However, extant research remains unclear regarding how project and IT investments contribute to building the overall architecture. This issue is what motivated the research reported in the current paper. The following research questions were used to guide the research process: “*What is the current knowledge and research on EA evaluation?*”, “*What is the nature of EA evaluation as described in the literature?*” and “*How can a critical look at existing research be used to guide future research?*”

The next section further conceptualizes EA and EA evaluation in order to give the reader an overview of the field. This conceptualization of EA was intended to guide the further analysis of the reviewed literature—by setting the limits and boundaries for EA evaluation. The conceptualization is followed by an elaboration of the methodology of the review, after which follows the analysis of the contributions identified through the search process. Hereafter, current research on EA evaluation

is discussed and directions for further research will be given. Based on the analysis and discussion, an overall conclusion will be made.

2 CONCEPTUALIZING ENTERPRISE ARCHITECTURE EVALUATION

Since EA emerged as a field at the beginning of the 1980s with IBM’s business system planning method (Ahlemann et al 2012; Zachman 1987) and the later development of the Zachman framework (Zachman 1987), EA has developed both within academia and practice. Still, EA as a concept is associated with a great deal of ambiguity (Kappelman 2010, p. 1). Thus, a clear conceptualization of the topic is an important prerequisite for this review. The following definitions of EA are used in this paper as the basis for further conceptualization.

Author	Definition	Main Concepts
Ross et al (2006, p. 47)	“The organizing logic for business process and IT infrastructure reflecting the integration and standardization requirements of the firm’s operating model.”	Integration and standardization of core processes
Lankhorst (2005, p. 3)	“a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise’s organizational structure, business processes, information systems, and infrastructure”	Design and realization of organizational structure, business processes, information systems, and infrastructure.
Bernard (2012, p. 31)	“The analysis and documentation of an enterprise in its current and future states from an integrated strategy, business, and technology perspective”	Integrated view of strategy, business, and technology.

It is clear from the above definitions that EA is a broad concept – covering systems, processes, organizational structures, strategies, data and infrastructure that are realized through models, documentation, principles and methods. Resultantly, a number of frameworks exist describing the key elements of EA. These frameworks are often divided into different subdomains, which, in some cases, can be further subdivided (Kappelman 2010, p. 247). For example: business architecture, information architecture, and technical architecture (Kappelman 2010, p. 247), or data architecture, application architecture, and technology architecture (Spewak and Hill 1993). For architects, this provides a level of abstraction. However, the definitions above (Table 1) also stress that EA is concerned with not only the different technical levels of the organization but also the tactical and strategic levels of the organization, which are not easily quantifiable. Instead of financial evaluation, other methods are used such as realized benefits (Plessius et al 2012b). Such benefits can include reduced risk, improved integration, stability, improved business processes, and increased responsiveness and guidance to change (Tamm et al 2011). The difficulties related to quantifying EA were similarly expressed by a CIO of a top 10 Danish company (top 10 measured

by profits) during an interview in relation to the review. As stated by the CIO, EA evaluation is a multidimensional beast.

“It [EA evaluation] is so complicated. Often, the platform services throughout the whole organization, and not only delivers process support, but also numbers and data of high quality, consistent with your data model and other advantages. It also translates into high quality data so you can do analytics and what not. So it suddenly becomes a multidimensional beast. Can you really chop that down?”

Like the CIO, we conceptualize EA evaluation as being multidimensional and encompassing the technical, business, and strategic elements that are necessary for building the architecture. On the one hand, EA focuses on technological solutions and how technology can help support the standardizing of existing processes. Thus, EA is seen as a driver for enhanced business execution by digitizing routine processes and capabilities (Ross et al 2006, p. 3-4; Weill and Ross 2009, p. 1-20). However, in order to drive not only the efficiency of current processes but also their ongoing effectiveness, EA needs to consider both organizational strategy and the organization’s future state. For this reason, EA is as much concerned with the enterprise’s future architecture as it is with its existing architecture and can hardly be understood only from a technical point of view.

To get an overview of both the current state of an organization’s EA and the envisioned future state, enterprise architects often describe and view their architecture as going through a number of different architectural stages or maturity levels (Open-Group 2009; Ross et al 2006; Weill and Ross 2009). As they shift from one maturity stage to another, enterprises also shift their investments in IT and business process redesign (Ross et al 2006, p. 71-72). With this, they also shift their architectural goals and priorities.

Types of EA evaluation: In this study, evaluation is understood as it is defined in the Oxford Dictionary of English: to *“form an idea of the amount, number or value of”* (Stevenson 2012). This implies that this study considers both qualitative and quantitative evaluations. Additionally, evaluations of EA can have either a technology focus or a focus on strategic or business aspects. All these aspects are, according to the above conceptualization, included within the holistic view of EA applied here. On the one hand, the technology focused evaluations are mainly concerned with the properties of systems, for example, data accuracy (Närman et al 2011), modifiability (Lagerström et al 2010), and usage (Närman et al 2012). These evaluations are usually performed using tangible, quantitative measurements. On the other hand, strategically focused evaluations are mainly concerned with the achievements level of, for example, different strategic/business goals (Doumi et

al 2013; Quartel et al 2012), benefits (Niemi and Pekkola 2009), and more qualitative aspects. Furthermore, EA evaluations can be considered at a number of different levels. Interoperability, for example, can be viewed from a business, process, service, or data level (Elmir et al 2011). Evidently, one cannot evaluate this concept in the same way for different levels: data interoperability, for instance, is concerned with semantic properties, while service interoperability relate to other aspects. The same holds true for concepts such as agility. While this is often considered a strategic goal, it can also arise from a number of different providers such as technology, people, and innovation while covering a number of different capabilities such as responsiveness, competency, flexibility, and speed (Sharifi and Zhang 1999; Sherehiy et al 2007).

This becomes more complex if one starts to consider dissimilarities between different organizations and how these can affect the elements that should be evaluated and how the evaluations should be made. Evaluating enterprise agility is less relevant to a low EA maturity (Ross et al. 2006) enterprise, trying to build up its fundamental capabilities, than it is to a high maturity level enterprise that's already sufficiently standardized its technology, integrated their processes and achieved operational efficiency (Ross et al 2006). At the same time, other factors, such as the size of the enterprise, the current sector, and the strategy, additionally influence which types of evaluation are relevant and how they should be performed. Moreover, evaluations that are performed in relation to EA are often not intended to measure the architecture itself but the elements related to EA. For example, services (Närman et al 2013b), applications (Närman et al 2012), processes, enterprise systems (Lagerström et al 2010), architectural candidates (Razavi et al 2010; Razavi et al 2009), or projects (Quartel et al 2012). By covering so many aspects of the business, it is possible that the literature that relates to the evaluation of EA elements, such as process modelling (vom Brocke et al 2010), might not be explicitly linked to the concept of EA in the written contribution.

Another important distinction is whether the evaluation refers to the current situation—through, for example, service performance (Närman et al 2013a) or existing processes (Setiawan 2013)—or to project business cases or scenarios that represent a future architecture (Gammelgård et al. 2007; Lange and Mendling 2011). It seems that the types of evaluation used to assess the current situation can be quite different from the ones used to evaluate a future state. The following methodology provides a transparent overview of how literature was selected and analyzed.

3 METHODOLOGY FOR THE REVIEW PROCESS

Overall, this study followed a process similar to the one outlined in the framework by vom Brocke et al. (2009)—intended to guide the process of searching for and reviewing the literature within IS. The review was designed to be systematic. Tranfield et al. define a systematic review as: “a replicable, scientific and transparent process ... that aims to minimize bias ... by providing an audit trail of the reviewers’ decisions, procedures and conclusions” (Tranfield et al. 2003). The actual process (Figure 1) was somewhat less ideal than this description, especially in the early stages, which were less structured and more exploratory. However, we would argue that the less structured process was a necessary step because it allowed us to acquire the fundamental knowledge that would guide the more structured process.

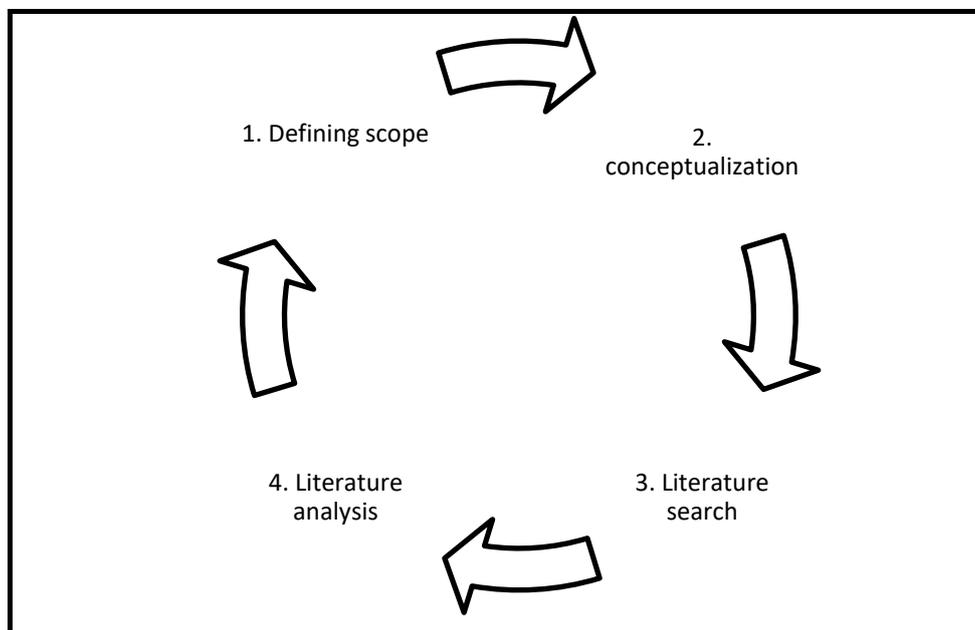


Figure 1. The research process adapted from (Svejvig and Andersen 2014)

The process occurred in an iterative manner where search and analysis, in some cases, revealed insights that resulted in changes to the initial decisions about the review scope and the conceptualization of the topic.

3.1 Defining Scope and Conceptualizing

At the outset of the study, the scope of the review was defined (vom Brocke et al. 2009). It was decided to search for contributions concerned with evaluating elements in relation to EA in general. For example, relevant contributions could be attempts to identify measurements or methods for evaluation or could feature descriptions of EA evaluation practices within organizations. Also, it was decided that the scope should not be limited to contributions within highly regarded academic journals but should also include practical journals and conferences. This is because the goal of the

review was to find existing knowledge on the topic, summarize that knowledge, and come up with potential ways to develop the field. We believed that such an agenda required a complete view of developments within both theory and practice. The initial goal was not to do a critical review. However, as our findings began to emerge, we saw a need for a critical stance. While one can easily fall into the trap of being overly critical when conducting literature reviews (Webster and Watson 2002), we believed that a somewhat critical stance in this case was necessary in order to point out some of the shortcomings within what we consider an emerging area of research that is highly influenced by practice.

The definition of scope was followed by a conceptualization of the topic, as described in the previous paragraph. Although the conceptualization of the topic changed as new insights were gained (Figure 1), the initial conceptualization served as an important overall direction and structure throughout the process.

3.2 Literature Search

The outset of the literature search featured an exploratory analysis and review process focused on EA evaluation. During the first part of this phase, literature was sought by consulting experts within the field (Papaioannou et al. 2010), including other scholars and practitioners, and by exploring different keyword searches on Google Scholar and the eLibrary of the Association for Information Systems.⁶

We considered, in particular, journals within the field of IS that the Association for Information Systems' Senior Scholar's Basket of Journals identified as important (Consortium 2011). However, since the goal was to do an exhaustive and selective coverage of relevant literature (vom Brocke et al. 2009)—not only limited to top journals or the field of IS—the search was not limited to these journals. Instead, they were consulted as a way of selecting which databases to use for the structured search.

The exploratory study was followed by a second phase where literature was sought in a structured manner in selected databases: Scopus, Business Source Complete, ScienceDirect, and the Association of Information Systems library. The chosen databases covered a wide range of journals within the field of IS, computer science, engineering etc. The motivation for this broad review scope was that EA as a field is driven by practitioners as well as academics (Langenberg and Wegmann 2004). Thus, only looking at peer reviewed journals within the field of IS might result in

⁶ <http://aisel.aisnet.org/>

the exclusion of relevant insights either from practice-oriented or non-peer reviewed literature. Also, high quality publications reside outside of the more popular outlets.

First, EA was used as a keyword in a broad search within the AIS eLibrary and ScienceDirect (Table 3). Since this resulted in an extensive amount of literature – 1399 contributions in total – a search string (Table 2) was developed based on the exploratory search process and literature identified here. This search string was used for subsequent searches within Business Source Complete and Scopus.

Table 2. Logical search string		
Author	Definition	Main Concepts
Ross et al (2006, p. 47)	“The organizing logic for business process and IT infrastructure reflecting the integration and standardization requirements of the firm’s operating model.”	Integration and standardization of core processes
Lankhorst (2005, p. 3)	“a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise’s organizational structure, business processes, information systems, and infrastructure”	Design and realization of organizational structure, business processes, information systems, and infrastructure.
Bernard (2012, p. 31)	“The analysis and documentation of an enterprise in its current and future states from an integrated strategy, business, and technology perspective”	Integrated view of strategy, business, and technology.

In total, 2192 contributions were found (not excluding duplications) through this second phase distributed across the different databases (Table 3).

Table 3. Database overview				
Databases	Science Direct	AIS Library	Scopus	Business source Complete
Total contributions	856	543	606	187

Afterwards, a forward and backward search was conducted (Webster and Watson 2002) on selected contributions, based on the degree to which they were related to the concept of EA and the general quality of the paper.

3.3 Conducting the Literature Analysis

In order to determine the individual paper’s relevance to the study, each paper was analyzed by first looking at the title of each paper. If in doubt, the papers were analyzed further by looking at keywords and abstracts. In some cases, it was necessary to analyze the body text. Each paper was assessed in terms of whether it contributed to knowledge of EA evaluation. Generally, papers with evaluation of EA as their main area of concern were deemed relevant—regardless of methods,

findings etc. Also, more conceptual and exploratory papers were sought. As noted by Papaioannou et al (2010): “Terms within social sciences are often ambiguous, poorly defined and constantly changing.” Therefore, the study did not limit itself to papers using the term EA due to its broad definition and the fact that the term is not necessarily used by the authors. Instead, relevance was judged according to the earlier conceptualization of EA. In total a net list of 45 contributions were deemed relevant in relation to the evaluation of EA.

The 45 contributions identified through the search process were subsequently put through a deeper analysis. The focus of the analysis was on identifying how each contribution was concerned with evaluating EA or related concepts, what was being evaluated, and how. Also, the research approach (whether inductive or deductive) was identified for each paper, together with an analysis of whether the approach would be applicable to an evaluation of both the current situation and a future state. Lastly, Gregor’s (2006) taxonomy was applied to all papers to gain additional insights regarding the papers’ main theoretical focus. The taxonomy divides literature within the field of IS into five overarching types: *analysis*, *explanation*, *prediction*, *explanation and prediction*, and *design and action* (Table 4).

Theories for analysis and description are concerned with describing *what is* rather than explaining causality or making predictive generalizations. However, they are not only limited to pure description since they also analyze or summarize attributes of phenomena and relationships among phenomena (Gregor 2006, p. 623). While these relationships are classificatory, compositional, or associative, they are not explicitly causal. This type of theory is used when little is known about the phenomenon.

Table 4. Gregor’s taxonomy of theory types in IS research (Gregor 2006)	
Theory type	Distinguishing attributes
I. Analysis	Says what is. The theory does not extend beyond analysis and description. No causal relationships among phenomena are specified and no predictions are made.
II. Explanation	Says what is and what will be. The theory provides explanations but does not aim to predict with any precision. There are no testable propositions.
III. Prediction	Says what is and what will be. The theory provides predictions and has testable propositions but does not have well-developed justificatory causal explanations.
IV. Explanation and prediction	Says what is, how, why, when, where, and what will be. Provides predictions and has both testable propositions and causal explanations.
V. Design and Action	Says how to do something. The theory gives explicit prescriptions (e.g. methods, techniques, principles of form and function) for constructing an artifact.

Theories for *explanation* seek to explain how, why, and when something occurred—without being concerned with making testable predictions. Instead, theories for explanation might result in process theory that shows how and why things are in a certain way. These theories can be either at a high or low level. An example of a high level theory could be actor-network theory (Latour 1991). At the lower level, explanations are given for how and why things happened in a particular situation—typically through case studies (Gregor 2006).

The theories for *prediction* say what is and what will be through predictions and testable propositions. However, these theories lack causal explanations and cannot, therefore, explain why something is the case. The fourth type of theory provides both *explanation and prediction*. It implies understanding of underlying causes, prediction, and descriptions of theoretical constructs and their relationships. Such theories include general system theory (Gregor 2006). The fifth type of theory for *design and action* shows how to do something and is concerned with principles, methods, and justificatory knowledge used in the development of IS (Gregor 2006).

4 ANALYSIS

As a first step in the analysis, we investigated which elements were being evaluated in the different papers (Figure 2).

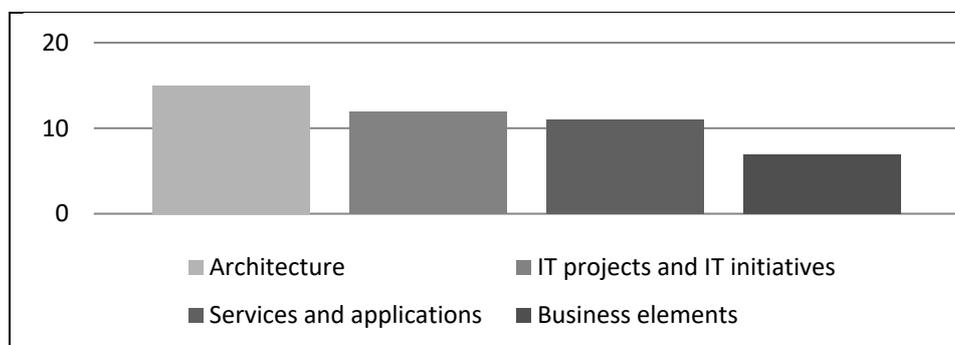
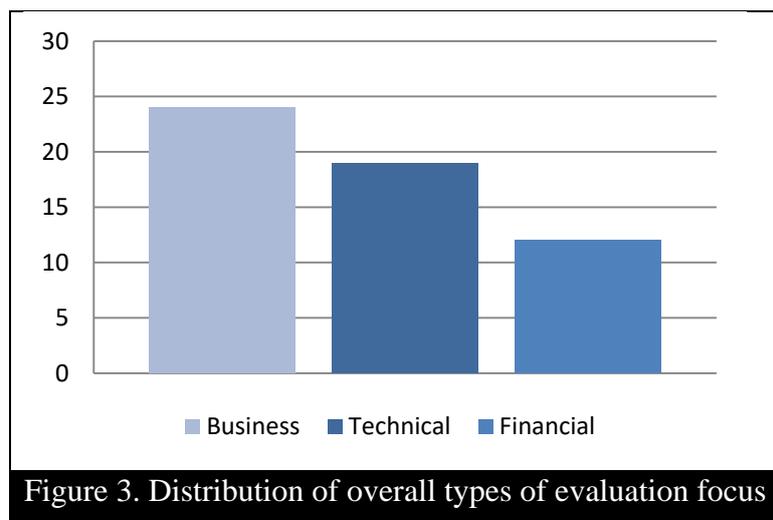


Figure 2. Different elements being evaluated

Evaluation of EA is often performed either by examining the architecture itself or by examining the projects, IT initiatives, and investments related to it. Since projects and individual solutions are often the units of delivery within the larger realization of a particular EA (Klein and Gagliardi 2010), it makes sense that this has received some research attention. Meanwhile, the evaluation of services and running applications has received less attention. Seven contributions were concerned with business elements such as process integration, and this was the least touched-upon category.

This suggests that EA is still regarded mostly as a technical discipline, even though the discipline is closely linked to organizational and strategic issues (CISR 2014).

Subsequently, each contribution was analyzed according to what the different EA elements were being evaluated against. While the different types of focuses for evaluation varied greatly—for example, granularity, flexibility, response-time, value, usage, and financial issues—some overall types of evaluation focuses did emerge. Overall, these can be categorized as financial focus, business contribution focus, and technical focus (Figure 3).



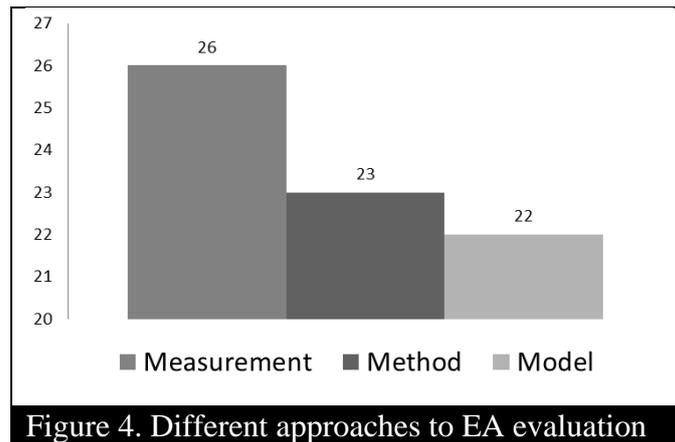
While the business centric evaluation was identified as the largest category with a total of 24 contributions, this was also a broad category encompassing elements related to, for example, EA goals (Lange and Mendling 2011), strategic alignment (Doumi et al. 2013), benefits (Niemi and Pekkola 2009; Plessius et al. 2012a), and key performance indicators (Ganesan and Paturi 2009). Also, many of the papers were concerned with technical properties relevant to the concept of EA. These concerned, among others, the evaluation of service granularity and its relation to reuse (Krammer et al. 2011), measurement of architecture complexity (Schütz et al. 2013), and interoperability of services to improve integration (Elmir et al. 2011). Finally—and to a lesser degree—some papers were concerned with evaluation in relation to financial properties. For example, Rico (2006) described different methods and models for measuring return on investment (ROI) in relation to EA, while Kuiper et al. (2011) described different methods for IS and IT valuation. It must also be noted that some contributions were attributed to more than one category since some contributions were concerned with, for example, evaluating financial contribution and business contribution at the same time. However, only one paper focused on all three focus areas.

In summary, one could say that the current literature is generally focused on evaluating technical elements in relation to, for example, achievement of business goals and business benefits. This is not surprising since EA is often conducted from the IT side of the business in an attempt to align technical systems and applications with the strategy and business—which are represented in the business category. As stated, the category is also broad and encompasses both business and strategic elements. If we look only at the number of papers concerned with evaluating the strategic contribution of the architecture, IT initiatives etc., only two papers are found. Another interesting finding is that only one paper considered evaluation in relation to all three focus areas, although EA is generally regarded as a holistic discipline engaged with the elements of business, strategy, and technology (Bernard 2012).

Overall, the different papers contributed to EA evaluation in three different ways: measurements, methods, and models. Of these three, measurements for EA evaluation were the most represented. Some papers identified existing measurements for EA evaluation or developed their own measurements. These quantitative approaches have been applied broadly to different EA concepts and are related to all of the three different evaluation focuses: business, technical, and financial. Some examples of contributions concerned with quantitative measurement approaches are depicted in Table 4.

Table 5. Examples of measurements	
Measurements	Contribution
Financial value of EA	(Rico 2006)
Granularity of services	(Krammer et al. 2011)
Flexibility and efficiency	(Kim et al. 2000)
Response time of services	(Närman et al. 2013b)
Usage of applications	(Närman et al. 2012)
Data accuracy	(Narman et al. 2011)
Modifiability of systems	(Lagerström et al. 2010)
Interoperability of services	(Elmir et al. 2011)
Valuation of IS/IT	(Kuiper et al. 2011)
Complexity of EA	(Schütz et al. 2013)

Apart from papers focusing on measurements, the contributions either focused on methods for evaluation or models. Here, both methods and models are understood broadly. This is partly due to the inconsistencies that exist between the ways different papers define their work as, for example, frameworks, models, theories, and approaches. The distribution of the papers among the three different ways they contribute to EA evaluation is shown below.



As the categories (Figure 4) were somewhat overlapping, some papers were counted multiple times. Naturally, the scientific contribution of a paper is not reducible to any of the three categories. Some contributions identified, for example, tangible measurements as well as methods for EA evaluation within the same paper.

Whereas a larger number of papers employed a quantitative approach to evaluation, a smaller number of contributions—a total of five papers—employed a qualitative, empirical research approach to EA evaluation. Out of these five contributions, only one paper was identified as having an inductive, qualitative research approach that studied how EA evaluation unfolds in practice rather than, for example, employing predefined measurements to a social context. The one paper with an inductive approach studies how IS/IT evaluation is performed in different ways using a single case study (Kuiper et al. 2011). This approach is different from the deductive approaches employed in the quantitative and technically focused papers, wherein methods derived from, for instance, mathematical formulas might be empirically tested at a later stage. While inductive case studies were not used—apart from (Kuiper et al. 2011)—many of the contributions used a deductive research approach and a theoretical point of view that, in some cases, was applied to an empirical setting at a later stage. These contributions included a case as a minor portion of the research design for illustrational purposes or for arguing for validity (e.g. De Vries and Van Rensburg 2008; Franke et al. 2012; Widjaja et al. 2012; Zellner and Laumann 2013).

As a next step, each contribution was analyzed to identify whether they were concerned with assessing the current or a future situation. A total of 20 contributions developed measurements, methods, or models applicable to the evaluation of a future state. For example, EA management benefits (Lange et al. 2012), the value of process redesign projects (vom Brocke et al. 2010), and the future value of IT investments (Cumps et al. 2006). Some papers were concerned with the evaluation of both a current and a future state.

Finally, the papers were analyzed using Gregor’s taxonomy for IS theory classification (Gregor 2006). The papers were distributed according to what type of theory the individual paper sought to contribute to (Figure 5). Interestingly, the analysis showed that research within EA evaluation primarily revolves around the fifth theory type: design and action.

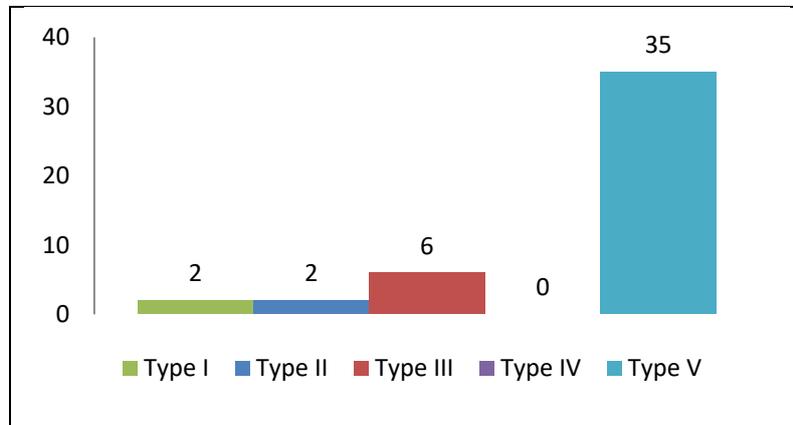


Figure 5. Outcomes of the different papers

There could be a number of reasons for this bias toward theory. First, the EA field is highly practical, and contributions come from both academia and consultancy (Langenberg and Wegmann 2004). Since theories within the design and action category are developed on a pragmatic basis and focus on problem solving or making useful solutions, this category is in line with EA’s practical origins. Second, the act of evaluating something is, in itself, a highly practical problem. Third, more of the contributions were related to fields such as computer science and software engineering (e.g. Krammer et al. 2011; Lagerström et al. 2010). These fields have a traditional focus on designing useful artifacts. Thus, a number of papers positioned themselves within the design science tradition (Barclay and Osei-Bryson 2010; Foorthuis et al. 2012; Fuerstenau 2012; Närman et al. 2013b). However, the contributions based on the fifth category primarily employed a deductive research approach where the suggested solution or design’s usefulness is afterwards illustrated through an example. Based on the analysis, a classification of EA evaluation literature was made (Table 5).

Table 6. A classification of EA evaluation literature

#	Category	Distribution
1	Element being evaluated	Architecture (15), IT projects and initiatives (12), services and applications (11), business elements (7)
2	Evaluated against (evaluation focus)	Business (24), technical (19), financial (12), all three (1)
3	Future state	Current (14), future (20), both (11)
4	Outcome/contribution	Measurement (26), method (23), model (22)
5	Empirical vs non-empirical	Qualitative and empirical (5)
6	Theory type (Gregor, 2006)	Type I (2), Type II (2), Type III (6), Type IV (0), Type V (35)
7	Type of research	Qualitative and inductive (5), deductive (38)

Note that the numbers do not necessarily add up to 45 within each category. For example, the category type of research did not apply to all papers because practical papers without an actual research approach were included in the review. As also described earlier, some papers were counted more than once when relevant. The classification is used as a point of departure for further discussion of current research.

5 DISCUSSION

Regarding the research methods employed (Table 5, category 5 and 7), the review showed that while a lot of research on EA employs deductive and quantitative methods for EA evaluation, pure empirical studies are almost non-existent. This means that prescriptive research has been developed through existing methods and measurements without departing from the sociotechnical context EA is embedded in. This might be due to underlying objectivistic philosophical assumptions within EA research. EA has traditionally had a strong connection to the field of engineering and computer science. However, from a utilitarian point of view, much can be learned from practical studies of EA. Unfortunately, research is uninformed with regard to how EA evaluation is practiced.

Another finding from this study is that most research on EA evaluation takes a monolithic rather than a holistic approach to the subject (Table 5, category 2). This contradicts the very nature of EA as shown in the earlier conceptualization, which suggested that EA can only be understood holistically—in other words, from a perspective that integrates strategy, business, and technology (Bernard 2012). As pointed out by the CIO quoted earlier, EA evaluation is indeed a multidimensional beast that cannot be evaluated in only one dimension. Thus, evaluating delimited elements such as system heterogeneity is not sufficient to determine whether an architecture is

adequate or is moving in the right direction. Another important finding is that evaluation was only conducted in relation to strategic achievement in two cases.

By looking critically at current EA evaluation research and identifying the shortcomings of current research, the following research agenda was developed. The agenda is used by the research team and has guided subsequent research in EA evaluation, but the aim is also that the research agenda will guide, enrich, and extend the field in general beyond its current foundations and limitations.

5.1 Research Agenda for Enterprise Architecture Evaluation

While we believe there is a general need for additional research within the subject, there seems to be a critical need for research with a focus on theory. This will allow analysis to form a deeper understanding of the phenomenon in its context. Like Gregor (2006), we believe that these studies form an important foundation for further inquiries. The validity and relevance of theories for design and action depend on a solid understanding of practice. Based on this review, the following research agenda outlines some fundamental research questions that need to be addressed (Table 6).

Table 7. Proposed research agenda	
Proposed research question	Rationale
What is the nature of EA evaluation?	Creating a conceptual foundation and understanding. Theory type I.
How does EA evaluation unfold in practice?	Creating a fundamental understanding of practice and the sociotechnical context of EA evaluation. Theory type I.
What are the practical problems of EA evaluation?	Creating a fundamental understanding of practice and the sociotechnical context of EA evaluation. Theory type I.
How do EA evaluation practices, in relation to building an architecture, unfold in different contexts and over time?	Provide an explanation of how EA evaluation unfolds in different contexts and why. Does not predict with precision. Theory type II.

Existing papers that departed from the fifth level of Gregor’s taxonomy were not grounded in research on the first level, which is concerned with explaining, describing, and analyzing the phenomenon. First, only two papers within this first category were identified through the review. Second, since most of the papers employed a deductive research approach, they did not depart from a previous, empirical research study. Rather, the designed prescription was, as stated earlier, tested within a social context after being developed. Without any preceding theory for analysis, it is hard to judge the usefulness of the many design and action theories within the field. Evidently, a clearer understanding of its sociotechnical context forms better grounds for research within all the

remaining levels (2-5). Therefore, a better understanding of the area of concern is needed, especially since EA is a field that extends far beyond technical domains. This could be achieved through qualitative case studies to understand the phenomenon in its complex social context. Also, this current review serves as a type I theory and addresses the first research question by classifying and conceptualizing EA evaluation. In subsequent studies, the focus can shift into theory for the purpose of explanation. This is after sufficient knowledge has been gathered on *how EA evaluation does unfolds in practice and what the practical problems of EA evaluation are?*

Building upon these two research questions, it is possible to investigate *how do EA evaluation practices, in relation to building an architecture, unfold in different contexts and over time?* This could also include investigations of how EA initiatives are evaluated from a strategic perspective. Such studies could then develop theories for explanation by indicating how EA evaluation works in different contexts.

Subsequently, it is possible to engage in any of the remaining four types of theory generation. However, we believe that the third and fourth types of theories, through their use of testable propositions, will yield less insights of relevance until sufficient knowledge and theories of analysis and explanation have been developed. For example, while type three theories for prediction could show the relationship between certain evaluation elements and positive gains from IT investments, a thorough understanding of EA evaluation through theories for analysis and explanation would better inform studies seeking theoretical prediction and explanation. It would do this by providing indications of which methods are used in different contexts and how. Thus, our research agenda focuses on building the foundation for further inquiries and theory building within the remaining categories of Gregor's taxonomy.

In this way, methods and measures can emerge from the practical context inductively and can, at a later stage, be developed into theories for design and action through, for example, action research (Baskerville 1999) or design science (Hevner et al. 2004). Although one does not have to disregard existing knowledge, we would argue that more empirical grounding is beneficial.

We believe that this current review serves as a necessary Type I theory for analysis in itself by providing an overview and conceptualization of EA evaluation through the provided classification. Our hope is that more fundamental research on the topic will follow.

6 CONCLUDING REMARKS

By dissecting EA evaluation, the current study shows that EA evaluation is a complex research area that can be viewed from many angles. Taking the many different perspectives and ways to evaluate into consideration, one must say that surprisingly little literature exists on the topic.

Hopefully, the provided insights and proposed research agenda on EA evaluation can serve as stimulation for further research into the area in general and also guide future research. By providing an overview of the current knowledge and research on EA evaluation, identifying the relevant research gaps, and outlining a research agenda, this study will hopefully motivate and guide further research into the more unexplored areas of EA evaluation. Through our critical stance, our main point is that without a fundamental understanding of the research phenomenon at hand, we risk performing research that is decoupled from the problems of practice by being concerned with answers and solutions to empirical problems that are not fully understood in the empirical context.

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PAPER 2

EXPLORING ENTERPRISE ARCHITECTURE EVALUATION PRACTICES: THE CASE OF A LARGE UNIVERSITY⁷

Author(s): Peter Andersen, Andrea Carugati, Morten Grue Sørensen

ABSTRACT

EA evaluation has received very little attention in academic publications on EA. While EA evaluation to some extent has been described in the literature, the different ways of evaluating architecture have mainly used a top-down approach deriving measures from theory rather than a bottom-up approach using empirical and practical studies. This paper presents the findings from a case study exploring how enterprise architecture (EA) evaluation takes place in practice. The aim of the case study is to explore EA evaluation from the practical view of primarily enterprise architects and project managers. The findings show that while few formal approaches for EA evaluation were in place, the organization succeeded in evaluating complex projects using informal ad hoc evaluation and by viewing the project from different perspectives.

Keywords: case study, enterprise architecture, evaluation

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1 INTRODUCTION

EA is the discipline concerned with the management and strategic planning of information systems (IS) within the organizational context. As described by Lankhorst (2005, p. 3), EA can be seen as: “a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise’s organizational structure, business processes, Information systems, and infrastructure.” In relation to this, an important aspect of EA is to continuously evaluate different IT initiatives with respect to their fitness with the EA since companies are realizing that conducting EA is an ongoing effort that also involves operational activities and projects.

Implementations of large enterprise systems, as parts of large scale EA efforts, often fail due to the complexity, cost, size and business obstruction that follows (Ross et al. 2006). Thus, pursuing a specific EA “in one go” is a risky process. As an alternative, it has been suggested to build the EA incrementally, project by project (Fonstad and Robertson 2006; Ross et al. 2006). In this way, the EA is slowly developed without any significantly increased expenses (Ross et al. 2006). The drawback of such an approach to EA is that it takes time and discipline and thus it makes it likely, by mistake or by design, to stray away from the path. Through this realization, evaluation in relation to EA has grown into an important topic for large and complex organizations that need to coordinate a large portfolio of projects over time. For these organizations, evaluating the ‘fitness’ of the individual IT projects that collectively constitute and support the entire EA is becoming a key strategic challenge and competency. However, in many aspects, scientific knowledge is lacking within this area. As noted by Foorthuis and Brinkkemper (2008, p. 4) regarding EA compliance of projects: “[...]very few scientific publications seem to discuss the topic, and those that we found only scratch the surface”. Also, as noted by Lange et al. (2012) there is currently no comprehensive instrument that deals with how to measure or explain the benefits one can gain from EA initiatives. While the work of these authors represents important steps in providing ways to evaluate EA, they do not address the fundamental problem that knowledge is generally lacking regarding how EA evaluation unfolds in practice and why. Arguably, research shows that the evaluation of IS in practice to a large extent is done unsystematically (Hochstrasser and Griffiths 1991), which has similarly been suggested in relation to EA evaluation (Klein and Gagliardi 2010). But rich empirical studies are needed in order to thoroughly understand if a structured approach is really needed, and if so; when and why this might be the case. As shown by Hochstrasser (1990), evaluation of IS investments by traditional financial means does not always make sense. Additionally, Hochstrasser found no single generic procedure to be adequate for measuring the variety of functions and benefits in relation to IT projects. Thus, there might be good reasons why structured approaches are

lacking within practice, but the underlying reasons for this are not well understood. Meanwhile, literature on EA evaluation has been primarily preoccupied with top-down approaches e.g. deriving measures from existing theories developed within other fields (e.g. Brown 2006; Walther et al. 2013; Widjaja et al. 2012) rather than a bottom-up approach using empirical studies of EA practices. The studies deriving measures and approaches from theory may either encounter contextual difficulties, problems with different types of projects (Hochstrasser 1990) or may be rendered obsolete by the complexity and changing nature of practice.

This study aims to explore EA evaluation as it unfolds in its practical context through an empirical case study, and thus addresses the following central research question: “How does EA evaluation unfold in practice?” This central research question is further refined into the following sub questions: “what are the practical problems of EA evaluation?” and “how are these problems dealt with?”

The remainder of this paper is structured in the following way: First, literature on IS and EA evaluation will be presented. Afterwards, the research design and methods of this research project are outlined. Next, the findings of this research project are provided. The findings are then discussed in relation to existing knowledge followed by an elaboration on the implications for both practice and research. Hereafter, the research limitations will be accounted for followed by concluding remarks.

2 THEORY

2.1 Approaches to IS Evaluation

Since evaluation is a key concept to this study, we will use a formal definition for the concept. Thus, in this study, evaluation is generally understood as it has been defined in the Oxford Dictionary of English which is: “to form an idea of the amount, number or value of” (Stevenson 2012). In a similar line, Smithson and Hirschheim (1998) define IS evaluation as the assessment or appraisal of the value, worth or usefulness of an information system. In an organizational perspective, one can presume that an IS investment or project is done to generate some form of additional value for the organization. Hence, evaluating the usefulness of an IS investment is an important activity to many organizations.

A quantitative investigation of IS evaluation in practice was done by Ballantine and Stray (1999). They found out that many organizations tend to use financial quantitative assessments before doing

an IS investment, such as cost-benefit analysis, return on investment or net present value (Ballantine and Stray 1999; Umar and Zordan 2009). While these purely financial evaluations can certainly be seen as valuable in determining the direct gain of an IS investment, they fail to deliver any insights into the indirect, intangible and qualitative value that might be gained from IS investments. These alternatives to pure financial evaluation have become increasingly important since; “many organizations use IT to improve customer service and product delivery, increase flexibility and facilitate innovation” (Serafeimidis and Smithson 1999, p. 94). In some cases IT constitutes the product itself and, in many firms, especially within in the finance and services sector, IS is regarded as a strategic part of the organizational infrastructure (1999). Thus, it makes sense to consider not only the immediate financial returns when evaluating IS.

2.2 Approaches to EA Evaluation

In relation to EA evaluation specifically, a structured review on the topic was conducted by some of the authors (Andersen and Andrea Forthcoming 2014). Analyzing almost 2200 papers, this review identified a total of 45 papers reporting on EA evaluation. The review generally showed that most literature dealt with EA evaluation through technical and quantitative measures. Some of these are exhibited in Table 1.

Table 1. Examples of measures for EA evaluation	
Measures	Ref.
Financial value of EA	(Rico 2006)
Granularity of services	(Krammer et al. 2011)
Flexibility and efficiency	(Kim et al. 2000)
Response time of services	(Närman et al. 2013)
Usage of applications	(Närman et al. 2012)
Data accuracy	(Narman et al. 2011)
Modifiability of systems	(Lagerström et al. 2010)
Interoperability of services	(Elmir et al. 2011)
Valuation of IS/IT	(Kuiper et al. 2011)
Complexity of EA	(Schütz et al. 2013)

As shown in Table 1, the technical measures concern for example the evaluation of service granularity and its relation to reuse (Krammer et al. 2011), measurement of architecture complexity (Schütz et al. 2013), and interoperability of services to improve integration (Elmir et al. 2011). Additionally, some papers were concerned with evaluating financial properties. For example Rico (2006) describes different methods and models for measuring return on investment (ROI) in relation to EA, while Kuiper et al. (2011) describe different methods for IS and IT valuation. Out of the 45 contributions concerned with EA evaluation only five were empirical studies. However, only one of

these five papers used an inductive research approach, studying how organizations work with EA evaluation (Kuiper et al. 2011). While this study did show that limited coordination existed between the different evaluation methods employed within the organization, it leaves much untouched and is, in itself, not enough to reveal how EA evaluation unfolds in practice. This gap in the literature sparked our interest in uncovering how EA evaluation is actually done in organizations.

3 RESEARCH DESIGN AND METHODS

Following the research question, this study departs from an empirical case study (Yin 2009) using qualitative methods. While the typical approach for evaluating EA thus far has been deductive, literature shows that EA is context dependent (e.g. Ross et al. 2006; Weill and Ross 2009). Although the original work of e.g. Zachman (1987) had a predominantly technological focus, EA – like the field of IS in general – has seen a shift from a technology focus to strategic, managerial, and organizational issues. For this reason, an examination of the phenomenon in its real-life context seems appropriate. As noted by Benbasat et al. (Benbasat et al. 1987), case studies are particularly suitable for problems that are: “sticky, practice-based problems where the experiences of the actors are important and the context of action is critical” (1987, p. 369). This made a case study particularly fitting for this research since the goal was to gain insights into how IT organizations conduct EA evaluations, which practical problems they are dealing with and to potentially identify ways they overcome difficulties of EA evaluation.

3.1 Data Collection

The case study was conducted within the IT organization of a large Scandinavian university, and involved different forms of qualitative data collection. Data was gathered from April 2013 to May 2014. The data collection carried out initially involved exploratory interviews and observations. The aim of this initial phase was to gain insights into the IT organization regarding its culture, main challenges and focus areas.

The data collection was initiated during a meeting and unstructured interview with the head of IT development – who also led weekly architectural meetings. During this meeting, the researchers were introduced to the IT organization and some of its fundamental problems regarding EA evaluation. Here, it was decided that further knowledge into the organization was necessary and hence, a number of observational studies were planned. These were conducted during in the early stages of the research from the beginning of May 2013 till early December 2013. The meetings were followed by one of the authors as a participant observer (Flick 2006 pp. 219-227). This was

done in order to gain additional basic insights about the IT organization and its main areas of focus and challenges. A total of 11 observations of the meetings were conducted. Although the meetings were scheduled for one and a half hours, they lasted anywhere between half an hour and one and a half hours, depending on the length of the meeting agenda. The meetings were scheduled weekly, with typically 10-12 members participating. The observations were supplemented with a couple of ad hoc meetings and questions often conducted after the observations of the meetings.

The exploratory phase was followed by a more focused process, consisting primarily of semi-structured interviews (Flick 2006). At this point, the fundamental knowledge about the organization had been established, which enabled the researchers to seek out more specific details through interviews – using the knowledge from the unstructured process as a foundation for structuring the interviews. Interviews were conducted with project managers, the chief information officer (CIO), employees at IT operations, project participants and the head of IT development. Furthermore, several documents such as project initiation documents, drafts for architectural principles, architectural documentation etc. have been analyzed. The observation notes were analyzed using the Nvivo© software and coded using descriptive codes (Miles et al. 2014). In the coding process, the authors were looking for concepts related to the central research question and the underlying sub questions. In this way, the emerging concepts pointed both at the ways evaluation was carried out and at some of the practical problems concerning evaluation, such as dilemmas. The emerging concepts were further used to guide the subsequent data collection. The main concepts that emerged are shown in Table 2.

Table 2. Main concepts from coding of observations	
Concepts	#
In touch with management and business	17
Communication	14
Evaluation	13
Dilemma	11
In touch with operations	8
Democratic/distributed evaluation	8
Anarchistic culture	7
Technical insight	6

While the concepts depicted in Table 2 were used to make sense of the many hours of observational notes and guide the subsequent interview selection and questions, concepts were not used as part of the further analysis.

The primary data collected through interviews and observations was additionally compared with secondary data such as internal documents, emails, and newsletters for data triangulation (Bogdan and Biklen 2006), by looking for contradictions or conflicts between the data. An overview of the primary data collected is shown in Table 3.

Table 3. Overview of data collection		
Primary data	Period	#
Observations	May 2013 - Dec 2013	12
Interviews	April 2013 - May 2014	13

Since EA is very much linked to the business, one could argue that interviews with stakeholders from the business side would have been beneficial. In this regard, EA research is not easily delimited, but it is in many ways linked to the rest of the business through e.g. business strategies. However, in this organization all the EA work and the evaluations of IT projects are handled by the IT department. Because of this, we would argue that data collected at the IT organization is sufficient for the scope of our research, and that the data collected through the higher levels of the IT management – including interviews with the Chief Information Officer and CIO – is sufficient to support our findings.

4 BACKGROUND OF THE CASE: LU

The case was conducted at a large university (LU) in Denmark. LU is one of the largest public organizations in Denmark, with approximately 11.000 employees. Measured by the number of students, the organization is the largest educational institution in Denmark with more than 43.000 students currently enrolled. Like most public organizations in Denmark, LU has historically been decentralized with autonomous divisions and a democratic culture. However, with the beginning of 2012, LU went through a centralization and consolidation of its administration. This was necessary due to a large merger that grew the organizational size by 40 %. Ten formerly autonomously functioning faculties were hereby centralized. Before this, IT was spread out, with an independent IT department within each of the faculties. Now, the IT department is centralized and counts around 250 employees (full-time equivalent). These are distributed across 21 different support areas with back office provided at four different locations. The IT organization is structured according to the plan, build, run logic with an annual budget of 35 million U.S. dollars. Currently, it has 160 different systems in operation, while the project portfolio consists of more than 100 IT projects. The large landscape of different systems after the merger posed a number of problems, for example, lacking interoperability of the many different systems and data inconsistencies. These overlapping and redundant systems and processes had now become critical problems that, if not addressed in

time, could pose a significant threat to the organization. Therefore, as a first step, the CIO stressed that gaining an overview of the different IT organizations had become a key issue for the IT organization. In order to address these problems, a program was initiated at the end of 2012. The goal of this program was to address some of the problems that arose when all the former autonomous IT divisions were merged by e.g. creating an overview of the organizational roles, their associated rights in the different systems and correct access to the systems. This posed a tremendous task due to the large number of overlapping systems and lack of integration. As pointed out by the CIO, the university currently had 27 different systems for emails that needed to be merged into one system for each functional department.

5 FINDINGS FROM THE CASE

During the first meeting and interview with the head of IT development, it was made clear that the organization had a number of problems that made any form of architectural evaluation difficult. The head of IT development pointed to the fact that, while they were in the process of developing EA principles, there was no formal EA evaluation process in place within the organization: “In our situation I did not dare to bring up the issue of EA to the management. This did not preclude us from establishing principles and trying to follow them though.”

It was additionally brought up that the IT organization did not have a formal EA group. Instead, EA and IT architecture decisions were discussed during architecture meetings. Secondly, the people who were involved in EA decisions did not have all the required EA knowledge and expertise. Hence, several employees were now sent to participate in courses on The Open Group Architecture Framework (TOGAF), which is widely used by EA practitioners (Open-Group 2009). It was also made clear that the organization architecturally was at a very immature stage. The formerly ten different IT departments had each created their own business silos (Ross et al. 2006) that now needed to be integrated with one another as pointed out by the CIO: “The university is the result of a huge merger of nine different faculties and one administration. Each with its own way of doing things, with ten different ways of conducting IT – ten different ways of doing everything!” Correspondingly, it was pointed out by a project manager that similar systems were previously implemented within the different faculties without thinking about overlap or integration with systems in other faculties: “The old faculties had enough money that they could just make their own solutions, and if there was disagreement, you would just make your own.” From talking to different people at LU, it became evident that the organization was immature regarding both its EA practice

and EA maturity level which to a large extent seemed to resemble the business silos stage (Ross et al. 2006).

To gain a deeper knowledge into the work done at the architecture meetings, a series of observational studies were carried out. These observational studies were followed by interviews and generally showed, that while few formal procedures were in place for evaluation, different ad hoc procedures and informal processes enabled EA evaluation.

5.1 Navigating Through Informal Evaluation

In her paper, Luch Suchman (Suchman 1986) uses the analogy of the European and Trukese navigator. She argues that: “While the objective of the Trukese navigator is clear from the outset, his actual course is contingent on unique circumstances that he cannot anticipate in advance. The plan of the European navigator, in contrast, is derived from universal principles of navigation, and is essentially independent of the exigencies of his particular situation.” Similarly, we will show how ad hoc EA evaluation was used at LU without a detailed plan for evaluation, but rather by using overall goals and by an appreciation of the current situation.

The months of observational studies of the architectural meetings gave some additional perspectives to the knowledge gained from the initial meeting with the head of IT development. While one could argue that the participants of the meetings lacked EA knowledge and business insights, they each possessed deep technical knowledge and overview of the system landscape. This knowledge was important to the board in order to understand the people sitting in IT development and maintenance. Still, different participants from the board were often referring to various ad hoc meetings that they had with people from operations who gave their view on the architectural decisions. For example, one meeting participant pointed out that: “People in operations are very unsatisfied with the way the new email addresses are handled. They are used to using another script against the exchange. They would prefer to do things as they usually do.” Similarly, other ad hoc meetings also happened between architects and people from portfolio management in order to make sure that the prioritizations made within the projects were aligned with the EA vision. For example, this happened in relation to the procurement of outsourced systems that also needed to fit the EA plans e.g. regarding consolidation, where the non-functional requirements were evaluated against the EA. This was especially important since there were no formal EA group in place. As pointed out by the head of IT development, this resulted in many EA decisions being made by the portfolio management, which required ad hoc meetings and coordination in order to evaluate the different projects from an EA perspective. Additionally, the informal culture and flat hierarchy within the IT

organization resulted in autonomous decisions being made by developers and project managers. According to a project manager, one important project would never have been done in time if they were to wait for a mandate from the management. Instead, the project was done in time due to civil disobedience. This more anarchistic way of managing the portfolio required additional coordination done ad hoc in order to make sure that emerging projects did not only fulfill a business need, but that they also made sense from a technical and strategic perspective. In this sense, the architecture development did not follow a completely linear path. However, the architecture meetings themselves were flexible enough to allow deviations from the agenda as new issues were brought forth by the meeting participants.

Interestingly, no detailed strategic direction was given from the management, as there had not been any formal IT strategy in place since 2011. According to the CIO, the IT strategy had been replaced: “It has been replaced by other action plans and other initiatives since. That is, replaced by more portfolio management.” While this lack of strategic guidance by many would have been deemed potentially disastrous, the ad hoc evaluation and informal interaction between portfolio management, architects and developers seemed to provide enough guidance for directing the development of the IT projects. One project manager argued that he did not need long strategies. He understood that the most important objective for the IT organization at that point was consolidation, and for all that he was concerned, this was all he needed to know. In collaboration, the architects, IT management and portfolio management even managed to evaluate and reduce the overwhelming portfolio of more than 100 IT projects to a top 12 of the most important projects that were most critical to the business and had the highest priority in the IT organization.

Conducting EA evaluation ad hoc between the different stakeholders required, as it has already been shown, broad knowledge from the side of the architects who needed to evaluate the technical solutions’ relevance to the business. Overall, the architects evaluated solutions from three different perspectives: strategy, business and technology. These three perspectives were not used as the result of a deliberate design choice, but emerged in different ways through for example discussions or workshops held between architects, portfolio management and the IT management. This enabled the participants of the architecture meetings to deal with projects of complex character with multiple possible solutions described by Rittel & Webber as wicked problems (Pries-Heje and Baskerville 2008; 1973). As it will be shown in the following, choosing the optimum solution required a deep understanding of the dilemmas inherited in these projects and switching between the three perspectives.

5.1 Dealing with Dilemmas and Contradictions

During the architecture meetings, the participants dealt with complex projects through ad hoc evaluation from the different perspectives. Interestingly, the interviews with the head of IT development, and the following observations, indicated that these practices were not thought of as actual EA evaluation practices.

Nevertheless, how the participants in the architecture meetings did evaluation through the different perspectives was seen in various ways. For example, in relation to a new email system implementation project, the participants were confronted with a number of difficult dilemmas. These dilemmas concerned five different areas: legislation, administration, organization, user-orientation and technology that contradicted each other in different ways. One important principle was to make the administration more user-oriented. This made a single sign-on solution an important business requirement for the email implementation, and from a business perspective, the architects saw this as the most reasonable solution. However, a single sign-on solution posed a number of problems in relation to legislations. For example, with students having roles as both ordinary students, but also being employed at the institution. According to security legislations, students could not have access to the same systems and data as for example researchers. This made it difficult to avoid having to give students with double roles two sign-on accounts. Though a combination of single sign-on and same sign-on was proposed as a possible solution – allowing users to switch between roles after validation – this was quickly identified as not being technically feasible due to current architecture and technical solutions. After evaluating the project by identifying and weighting the different dilemmas, a total of nine different solutions were identified. Lastly, the upper IT management was involved to strategically evaluate the different proposed solutions.

Since there was no formal EA group in the organization, many decisions of a more strategic character were made outside of the architecture meetings e.g. through the portfolio management who made the strategic prioritization of projects, or by the higher management levels. Here, the technical knowledge of the participants of the architecture meetings came into play since the management and IT management generally did not possess the required technical knowledge to understand the developers. In the case with the email implementation, the management had chosen an alternative technology that employees at IT operations did not want to use. As one participant of the architecture meetings put it: “The people in operations say the solution is not maintainable, and that we should not interfere in their maintenance, and that we do not have the competencies to know

what to put into operations.” While the participants of the architecture meetings did seem to understand the problems suggested by IT operations, they also understood the dilemma between what the operations on the one side saw as the best solution, and what the management and business on the other side saw as most optimal. In this case, it was decided to try and arrange a meeting between the management and critical voices from the IT operations – evaluating the different options together: “We have to involve both operations and the management and let the people from operations tell the management why they think it cannot be done.”

Interestingly, while no formal procedure for evaluation was in place, each project was continuously, and informally, evaluated through discussions between the participants. These discussions revolved around business, technical and strategic evaluation perspectives, where multiple solutions were weighted against each other – often requiring expertise input from IT specialists or the business. In the end, it was acknowledged that tradeoffs had to be made, and that the inherited dilemmas made it impossible to find one optimal solution. When presented with different evaluation measures from academic literature such as measures for heterogeneity (Widjaja et al. 2012), complexity of architectures (Schütz et al. 2013) or granularity of services (Krammer et al. 2011), the head of IT operations said that found the mathematical approaches interesting, but she could not see much value in using them and generally found the approaches hard to apply.

Table 4. Key findings from case	
Practical problem	Evaluation practice
Dilemmas and contradictions within projects	Multiple perspectives
Contradicting view between mgmt. and operations	Joint evaluation, multiple perspectives
Lack of strategic direction	Evaluation against goals ad hoc
Anarchistic culture	Ad hoc meetings
No formal EA group	Informal evaluation

Table 4 sums up the key findings of this case study regarding the evaluation practices employed at LU and the practical problems that the evaluation practices were addressing. These findings emerge from both the observational data and interviews. LU was confronted with a number of problems such as lack of strategic direction, no formal EA group, dilemmas etc. while the EA evaluation practices to a large extent was found to be unstructured and conducted ad hoc as issues arose. The practices and problems of EA evaluation at LU will be further discussed in the following.

6 DISCUSSION

Through our analysis of the case presented in this paper, it has been shown how EA evaluation unfolds in practice. The findings show that even organizations considering their EA evaluation capabilities to be low, and having no formal EA group, constantly evaluate projects and IT investments against their EA through informal and ad hoc work processes. While formal evaluation procedures and measures were not employed in this case organization, it is unclear from this study whether the organization would actually benefit from such formalized approaches – given the heterogeneous nature of IT projects today (Hochstrasser 1990). On the contrary, one could argue that more informal and ad hoc evaluation – rather than predefined methods and measures – is more fitting when dealing with varied types of projects. As shown through this case, one of the main difficulties of evaluation was dealing with the inherited dilemmas and contradictions between the many different requirements through legislation, business goals and what is technically feasible. Navigating this landscape, caused by the complex nature of today's organizations, requires thoughtful reflection on the different possible solutions, and employing a holistic evaluation, using the perspectives of strategy, business and technology as shown through this case. While EA is generally conceptualized holistically (e.g. Bernard 2012), literature on EA evaluation has almost entirely overlooked the need for holistically evaluating solutions from multiple perspectives (Andersen and Andrea Forthcoming 2014), and has instead employed monolithic views on evaluation by e.g. only considering financial or technical evaluation. As pointed out by Rittel and Webber (1973), social problems are inherently different from the problems of engineering, and herein might lie the drawback of much EA literature since it still views EA as an engineering discipline. While EA has strong roots within the field of engineering, few would today contest that EA is also much more than just engineering. Though practice seems to reflect this fact, research appears to be still caught in the past regarding its view on EA evaluation.

As shown by Espinosa et al. (Espinosa et al. 2013), coordination is an important aspect of EA practice. In relation to EA evaluation, we have shown that coordination similarly played a significant role in successful evaluation for this particular organization. However, we would not go so far as to say that informal and ad hoc evaluation poses an advantage over more formalized evaluation. Rather, our findings indicate that the situation at LU called for this particular approach to evaluation. Given the democratic and almost anarchistic culture at LU, and the lack of elaborate strategic direction, the architects and portfolio management constantly had to assess emerging projects and coordinate with e.g. management or developers in ad hoc evaluation practice. As the

EA and IT function matures, it is likely that the ad hoc evaluation will be less relevant and replaced by other practices.

7 IMPLICATIONS

Regarding directions for practice, our suggestion is that practitioners should first carefully consider their own organizational setting before deciding on specific methods of evaluation. More democratic public organizations, as they are often seen in Denmark, might have a hard time directing the IT development through centralized and formal evaluation. Additionally, the complex dilemmas, posed by some projects, underline the need for practitioners to apply different perspectives to their evaluation practices. In today's organizations, EA evaluation, and IS evaluation in general, is mostly done through financial and quantitative approaches (Ballantine and Stray 1999), but as Einstein supposedly once said: "Not everything that can be counted counts, and not everything that counts can be counted." Likewise, organizations should not be too caught up in evaluating EA from financial or technical perspectives just because these are easily quantifiable. EA is a holistic business discipline (Bernard 2012), and if organizations do not evaluate projects through multiple perspectives, it defeats the purpose of doing EA altogether.

From a research perspective, while some work has been done on EA evaluation, research on the topic has generally overlooked how EA evaluation unfolds in practice. In this regard, current research has mainly been trying to answer the "how" of EA evaluation by coming up with different approaches and measures for evaluation. In this paper, we were instead concerned with the "what" and "why" of EA evaluation, which we see as prerequisites for suggesting how EA evaluation should be done. By having a limited knowledge of the actuality and dynamics of practice, it is hard to argue for the applicability of theoretically derived methods and measures to practice. As mentioned, some studies indicate that the variety of benefits in relation to IT projects cannot be measured through a single, generic procedure (Hochstrasser 1990). Similarly, this study shows that inherited project contradictions and dilemmas pose problems that can be characterized as wicked (Rittel and Webber 1973). By identifying this type of problems as part of the EA evaluation, it is clear that predefined measures or for example architectural checklists might not be the optimal way to work with EA evaluation, like much extant theory suggest. The danger is that these approaches might only provide a partial view on complex and dynamic problems.

Thus, by problematizing what we see as essentially an engineering perspective to EA evaluation, we hope that our research – apart from enriching current knowledge on EA evaluation practices – will also stimulate further research and discussion on how alternative perspectives and approaches might

supplement the predominating logic. For example, employing a systems perspective to EA evaluation might prove to be beneficial in relation to evaluating complex projects with inherent dilemmas and contradictions. This perspective has already been applied in relation to understanding complex projects (Sheffield et al. 2012), and also to the topic of EA in general (Gøtze and Jensen-Waud 2013). Nevertheless, to our knowledge, it has not been used in relation to understanding EA evaluation practices.

8 LIMITATIONS

Our research has a number of limitations. While the case study makes some important steps towards understanding how EA evaluation unfolds in practice, it does not provide a complete picture of the phenomenon. Though the study does show how informal ad hoc evaluation is used to for example deal with complex projects with inherited dilemmas, there is still a need for a deeper understanding and conceptualization of informal evaluation practices. For example, although this study shows how architects employ the three different perspectives of strategy, business and technology to evaluate projects and deal with dilemmas, it is possible that more relevant perspectives exist and are employed in other EA evaluation practices. Looking into the dilemmas of evaluation in general might also prove to be a valuable avenue of research.

As our findings show, LU is in a typical example of a low EA maturity organization with little formal governance in place. While the study does show that this particular type of organization successfully used informal ad hoc evaluation practices to evaluate individual projects and the portfolio in general, such approaches might not be successful or even used in other organizations that, for example, operate at a higher EA maturity level with more centralized governance in place. An important next step is thus to investigate how EA evaluation unfolds in these more architecturally mature organizations. While quantitative measures for EA evaluation were not employed at this organization, studies of organizations actually employing more quantitative and formal approaches might reveal whether these approaches are relevant to various IT projects. As this study indicates, some projects consist of dilemmas and contradictions, which would probably make pure mathematical or quantitative evaluations impractical for these projects, and at least a combination of qualitative and quantitative evaluation would have to be employed. In line with Hochstrasser (Hochstrasser 1990), we find it difficult to believe that the exact same type of evaluation can be used for all types of IT projects.

Another direction for future research could be to empirically test many of the theoretically derived measures for EA evaluation (e.g. Schütz et al. 2013; Widjaja et al. 2012) through for example action

research studies (Baskerville 1999). As described in our findings, the architects at LU were not convinced that for example a measure of their current heterogeneity (Widjaja et al. 2012), as a measure for evaluating projects, would be beneficial.

When an adequate understanding of the practices of EA evaluation and the practical problems posed by IT projects and project portfolios has been gained, attempts can be made at developing and refining useful evaluation methods based inductively on knowledge of practice, rather than the deductively developed evaluation methods presented in extant literature, with little empirical backing.

9 CONCLUDING REMARKS

With this research project, we investigated how EA evaluation unfolds in practice, the associated problems of EA evaluation and how they are dealt with in practice through the three research questions. Through the findings, it was shown that the organization indeed had a number of difficulties in relation to EA evaluation. These concern the dilemmas and contradictions associated with more complex projects, which was exemplified through the implementation of an email system. This problem was dealt with by viewing the project from different perspectives, and informal, ad hoc, qualitative evaluation together with e.g. the IT management. In addition it was shown that the lack of strategic direction and anarchistic culture at LU made informal and ad hoc evaluation an important technique by which the people in charge of the EA effort evaluated the different projects and dealt with problems as they arose.

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PAPER 3

THE CAPABILITY MODEL FOR ENTERPRISE ARCHITECTURE EVALUATION: A CASE STUDY AT A LARGE SCANDINAVIAN TELECOM⁸

Author(s): Peter Andersen, Andrea Carugati, Per Svejvig

ABSTRACT

Enterprise Architecture (EA) links Information Systems (IS) to the strategy and needs of the business, but knowledge is lacking on how evaluation of IS projects can be carried out successfully from an EA perspective. Departing from a case study, we seek to understand how LST managed to build their IT architecture by evaluating their IS projects one at a time. The resource-based view of the firm (RBV) is used as a sensitizing device to analyze and develop an EA capability model from the case. The model provides a detailed understanding of what underlying capabilities constitute successful EA evaluation.

Keywords: enterprise architecture, case study, information systems, project, resource-based view, capability

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1 INTRODUCTION

Evaluating how Information System (IS) projects contribute to organizational performance has become an important matter. With competitive and dynamic markets, enterprise transformation needs to be not only reactive, but also proactive to adapt to external opportunities and threats such as those posed by increased digitization and cloud computing (Weill and Woerner, 2014). For practitioners and researchers, Enterprise Architecture (EA) has been seen as the discipline that would align IS initiatives with the organizational needs through “the analysis and documentation of an enterprise in its current and future states from an integrated strategy, business, and technology perspective” (Bernard, 2012, p. 31). Meanwhile, EA has proven to be an asset that can bring a number of business benefits such as reduced IT costs, increased IT responsiveness, reduced business risk, greater data sharing, strategic agility and operational excellence (Ross and Weill, 2005). Although the benefits of EA have been well documented (Lange and Mendling, 2011; Lange et al., 2012; Niemi, 2006; Niemi and Pekkola, 2009; Ross and Weill, 2005), achieving these benefits has proven to be a difficult, and often unsuccessful, endeavor (Ross et al., 2006). Thus, EA literature advises that EA transformation programs should be avoided in favor of incremental, project-by-project, transformations (Fonstad and Robertson, 2006; Ross et al., 2006).

However, the process of guiding such a project-by-project transformation by choosing and evaluating the right IS projects is still unclear (Shollo et al., 2015). EA-based evaluation can provide a competitive advantage for organizations capable of conducting effective evaluation while others are less successful in their effort: “Experience suggests that some firms are much more skilled in how they implement otherwise common governance devices” (Barney, 2002, p. 216-218). While most large organizations attempt to implement EA as an IT governance practice, there is a gap in understanding how EA skills and practices can be leveraged in an effectual way to evaluate and facilitate a business transformation to create a competitive advantage (Barney et al., 2001; Fonstad and Robertson, 2006; Short et al., 1999).

In an attempt to understand how to achieve the benefits of successful EA evaluation, we conducted a case study at a large Scandinavian telecom (LST). The study shows how the organization managed to build internal capabilities to mobilize and build an architecture resource years after a failed EA transformation program. By building the underlying capabilities to conduct effective EA evaluation, the company is in the process of building their architecture in a project-by-project manner (Fonstad and Robertson, 2006) where the individual projects’ contribution to the

architecture plan is continuously being evaluated. The following research question was used to guide the case study:

RQ: How can organizations build internal capabilities to mobilize and build a new architecture resource from scratch?

By using the resource-based view as a theoretical lens, a model was made from coding and analysis of the qualitative data. The model shows how the EA evaluation capability is constituted by both a strategic coordination and an overview capability that mutually support and enhance each other. We believe that our work is useful in showing how IS investments can go from being a liability to becoming a strategic asset, and a sustainable competitive advantage through EA evaluation capabilities.

The paper is structured as follows: Firstly, we will describe the theoretical outset of the study – which is focused on EA theory and the resource-based view. Secondly, the overall methodology of our research approach – including research design and methods – will be accounted for. Hereafter, the case study will be described and analyzed followed by a discussion of the findings, future research, implications and concluding remarks.

2 THEORY

The outset of the case study was to study EA evaluation practices. Thus, EA theory was a natural point of departure. Later, as data were collected and discussed, the resource-based view emerged as the theoretical lens most suitable for addressing the research question (Urquhart and Fernández, 2013). While the resource-based view was used to inform the data analysis and construct a model to explain how LST built the capabilities to revamp its architecture, EA theory was used to set the stage and explain much of the practical work that was done by, for example, enterprise architects at LST.

2.1 Enterprise Architecture and IS Evaluation

EA is a discipline concerned with the management and strategic planning of IS within organizations. As described by Lankhorst (2005, p. 3), EA can be seen as: “a coherent whole of principles, methods, and models that are used in the design and realization of an enterprise’s organizational structure, business processes, information systems, and infrastructure.” In relation to this, an important aspect of EA is the continuous evaluation of different IS initiatives with respect to their alignment with the EA plan, which typically takes into account the overall business strategy

and business objectives. Throughout this paper, evaluation of IS systems in relation to the EA plan is referred to as EA evaluation.

Implementations of large EA programs often fail due to the complexity, cost, size and business obstruction that follows (Ross et al., 2006). Thus, these large architecture implementations are associated with a great deal of risk. As an alternative, building the architecture incrementally, project by project, has been suggested (Fonstad and Robertson, 2006; Ross et al., 2006). In this way, the architecture is slowly developed without the risks involved with one big implementation (Ross et al., 2006). The drawback of such an approach is that without ongoing EA evaluation, it is likely that IS projects will be implemented that are not aligned with the envisioned architecture. Through this realization, EA evaluation has grown into an important topic for complex organizations that need to coordinate and oversee a large portfolio of projects over time. Many different ways to evaluate the architecture, and EA initiatives, have been suggested within academic literature. For example, the evaluation of service granularity and its relation to reuse (Krammer et al., 2011), the measurement of architecture complexity (Schütz et al., 2013) and the interoperability of services to improve integration (Elmir et al., 2011). Additionally, some papers have been concerned with evaluating financial properties (Kuiper et al., 2011; Rico, 2006). In general, these approaches to EA evaluation reflect – through their focus on quantification and rationalization – that EA as a discipline emerged as a technical discipline. However, as pointed out by Ross, this view is problematic since: “The value of these initiatives rests in their contribution to a firm’s strategic objectives, which is often non-quantifiable and uncertain” (Ross et al., 1996). Instead, EA evaluation needs to be studied from an empirical and holistic perspective that takes into account the complexity and interrelatedness of EA evaluation practices due to its embeddedness in a social and organizational setting (Serafeimidis and Smithson, 2000). EA evaluation can potentially lead to the achievement of many associated EA benefits and, thus, successful EA-based evaluation can provide a major competitive advantage for organizations capable of conducting effective evaluation while others either fail, or are less successful in their effort: “Experience suggests that some firms are much more skilled in how they implement otherwise common governance devices” (Barney, 2002, p. 216-218). While most large organizations have implemented EA and IT governance practices, there is a significant gap in understanding how these skills and practices can be developed in an efficient and effective way to create competitive advantages (Barney et al., 2001; Short et al., 1999).

2.2 Theoretical Lens: The Resource-Based View and its Use in IS Research

The resource-based view (RBV) seeks to explain how organizations outperform their competitors by analyzing how these organizations utilize internal resources for competitive advantages (Amit and Schoemaker, 1993; Wernerfelt, 1984). This can best be achieved if the resources are rare, valuable, imperfectly imitable and sustainable as this prevents imitation, transfer or substitution (Barney, 1991). Capabilities represent a firm's ability to deploy and mobilize resources using organizational processes to generate a competitive advantage (Amit and Schoemaker, 1993; Grant, 1991). Thus, capabilities transform resource assets into something of greater worth.

The resource-based view has been widely used within the field of IS to understand how IT can lead to competitive advantages (e.g. Bharadwaj, 2000; Kearns and Lederer, 2003; Wade and Hulland, 2004). Sustained competitive advantage is achieved if the advantage "continues to exist after efforts to duplicate that advantage have ceased" (Barney, 1991). In an IS perspective, this indicates that while an IS implementation can result in competitive advantages, they are usually short-lived (Peppard and Ward, 2004).

While IS projects and implementations are generally known to be prone to failure, some organizations continuously realize positive business benefits through their IS investments, and thus produce a sustained competitive advantage. For a long time, IS researchers have focused on the external industry structure as a way to explain competitive advantage. However, in relation to IS, as in management and strategic literature, there is a need for a deeper understanding of the internal factors that contribute to obtaining and sustaining a competitive advantage (Ravichandran and Charlirmsak, 2005). Like Peppard and Ward (2004), we define sustainability in relation to IS as: "an organization's ability continually to deliver explicit business value from IS investment." In order to deliver the business value from IS investments, related resources need to be mobilized through relevant capabilities in the organization. For the purpose of this study and in line with other IS literature (e.g. Ravichandran and Charlirmsak, 2005; Ross et al., 1996), we define IT resources as either human, technological or relationship resources. The value-adding capabilities relevant to the IT resources can, for example, be technical skills, managerial ability or processes (Wade and Hulland, 2004), and are here defined in accordance with Bharadwaj's definition as a firm's ability to: "mobilize and deploy IT-based resources in combination or copresent with other resources and capabilities" (Bharadwaj, 2000, p. 171).

As argued by scholars within practice theory, resources cannot be viewed as more than potential resources before they are used (Feldman and Orlikowski, 2011). Thus, having IS organizational

capabilities to mobilize and leverage these resources through IS investments is paramount if an organization wants to enhance its competitiveness as some scholars have shown (e.g. Ross et al., 1996). Resources within the field of IS have been extensively described in literature. Through a review of RBV literature within IS, Wade and Hulland identified eight overall categories of resources: manage external relationships, market responsiveness, IS-business partnerships (manage internal relationships), IS planning and change management, IS infrastructure, IS technical skills, IS development and cost-effective IS operations (Wade and Hulland, 2004). While the overview provided by Wade and Hulland (2004) shows how IS resources have been extensively described in literature, we wanted to take a practical perspective on the critical capabilities needed to build an architecture resource – referred to as IS infrastructure by Wade and Hulland (2004). In this sense, the paper is more concerned with the process of deploying capabilities, whereas empirical studies on RBV have primarily adopted a variance approach, with resources and capabilities as independent variables and sustainable competitive advantage as the dependent variable (Kraaijenbrink et al., 2010). Thus, we seek to open the “black box” and enrich current theory using concepts from RBV as sensitizing devices on the case to show which capabilities need to be mobilized in order to build an architecture resource.

3 CASE BACKGROUND

LST is one of the biggest telecoms operating in Scandinavia both within the B2B and B2C market. LST was created in 1990 as a state-owned monopoly – exclusively covering all of its home country and encompassing all the old, regional telecoms that were merged into one. The merger in 1990 was carried out to create a powerful company that would be strong enough to thrive on a free, international market. In 1997, LST became a fully privatized company as the fixed telephony market was fully liberalized. Today, LST is currently executing its strategy to become further established in the Nordic countries through additional market consolidations.

The many mergers resulted in a heterogeneous and poorly integrated architecture – with several old legacy systems that were up to 25 years old. This posed severe problems for LST. For example, the lack of integrated systems made it impossible for LST to know whether its broadband customers were also subscribing to other LST services. In 2007, the rumors were confirmed that LST had launched a vast and ambitious EA project with the aim of discarding the old architecture and replacing it with a new architecture:

Those were the days where focus was on greenfield architectures [abandoning legacy architecture]. If we could just migrate the architecture then everything would be fine. Enterprise Architect

In the end, LST had to give up the EA project after having outsourced its human and architecture resources to the extent that the entire IT department was eliminated:

Those years, the internal IT organization was outfaced... There was simply no IT anymore. Senior Project Manager

Architecture failure and initiating IT rejuvenation: Not much more than a year after the public heard about how the ambitious EA project was intended to replace what was referred to as the company spaghetti architecture, the project was deemed a failure, resulting in a loss of more than two billion Danish kroner (approximately 337 million USD). In realization of the major risks associated with replacing the whole architecture through one big-bang implementation, the organization decided to build their architecture one project at a time. However, the management quickly realized that it would take many years before this process would lead anywhere. Thus, the organization would need to mobilize their organization in order to concentrate their efforts and achieve results within an acceptable timespan. Therefore, the organization initiated a new IT strategy during the fall of 2011. In 2012, the strategy and associated methods and processes were further refined and dubbed the “IT Rejuvenation Initiative.” As researchers, having access to such an initiative represented a unique opportunity to understand how an organization can succeed in mobilizing its internal resources and build the capabilities necessary to rebuild its architecture.

4 METHODOLOGY

Overall, the research was conducted as a case study. However, acknowledging the various uses of case study research in the field of IS (Cavaye, 1996), a more detailed characterization will be given. Firstly, from an epistemological point of view, the case study departs from the interpretivist research tradition. This implies that constructs emerged during the data collection and analysis rather than existing prior to entering the field. In this regard, theory was not used as an initial guide to collect and analyze data. Instead, theory was used as part of an iterative process of data collection and analysis (Eisenhardt, 1989). As explained by Walsham (1995, 2006), it can be desirable in interpretive studies to preserve a considerable degree of openness to the field data, and a willingness to modify initial assumptions and theories. Hereby, initial theories can be explained, revised or abandoned (Walsham, 1995). Accordingly, we initiated our data collection without having a prior theoretical lens in mind. As we learned about how LST had acquired the means to build their architecture, and the antecedents central to the case, a discussion was initiated on how different theories could explain how the organization had now become capable of successfully building their

architecture utilizing EA evaluation. The different theories informed the subsequent interviews until we settled on RBV as a suitable theoretical lens for explaining the phenomenon at hand.

4.1 Data Collection and Analysis

The data were collected at LST over an 11-month period from March 2014 to February 2015. An exploratory interview (Flick, 2006) was initially held with the intention of gaining some basic insights into the organization. Also, a number of observations were carried out within the first couple of months to get an in-depth understanding of how architects actually led the project-by-project approach. This initial data were subsequently used to inform semi-structured interviews. When learning about the large EA failure that still troubled the organization and how the IT organization had now gathered resources and skills to rebuild their architecture, more semi-structured interviews were planned to unravel the story. An overview of the gathered data can be seen in Table 1.

Table 1. Overview of the collected data			
Interviews	Duration	Date	Rationale
Senior Project Manager at LST	1:23:29	19/03 2014	Gain interviewed subjects' point of view (Flick, 2006).
External Consultant	00:44:38	18/06 2014	
Project Architect	1:01:55	18/06 2014	
Senior Project Manager at LST	00:55:57	18/06 2014	
Enterprise Architect at LST	00:56:08	06/08 2014	
Senior Manager	00:18:20	06/08 2014	
Domain Architect	00:46:15	06/08 2014	
Senior Project Manager at LST	00:50:02	04/11 2014	
Enterprise Architect at LST	00:50:38	19/02 2015	
Observations	Duration	Date	Supplement interviews understanding actual practice (Flick, 2006).
High-level demands of project	1:26:22	31/3 2014	
Detailed PA Workshop – with Vendor	3:01:13	4/4 2014	
Role-playing workshop: A role-play session on the Capability Matrix in stages of the project cycle	1:49:01	2/5 2014	
Examples of internal documents	Pages	Date created	To supplement interviews and observations.
NPV calculation	1	15/10/2010	
Business case template	60	09/12/2010	Documents indicate when tools and processes were deployed.
IT rejuvenation document	41	13/02/2012	
Introduction to business-aligned architecture	17	15/02/2013	Data triangulation (Flick, 2006).
Business-aligned architecture	6	04/11/2014	
Business/IT Strategy	6	07/08/2014	

Apart from the conducted interviews and observations, different types of documents were also collected. These included document toolboxes, strategy formulations, project artifacts, email etc. In total, this amounted to more than 500 pages of written material. These documents were used to

triangulate the interviews and observational data by looking at conflicts and contradictions between the data (Flick, 2006) while providing an overview of when specific tools and processes were deployed in the organization.

After the data collection was completed, we began to analyze the data. This involved relistening to tape recordings, revisiting documents and transcribing interviews. The transcribed interviews and field notes were afterwards coded using the NVivo software focusing on how projects were evaluated from an EA perspective. By subsequently using RBV as a theoretical lens, it was possible to later aggregate the different codes into overarching themes while memos were used to complement and make sense of the codes (Flick, 2006). The aim of the coding was not to quantify the qualitative data, but rather to make sense of the gathered data in a sequential way. By delimiting the coding to the setting of EA and RBV theory, a smaller number of themes were identified that were later classified as underlying capabilities for EA evaluation (Table 2).

Table 2. Overview of codes, memos and themes		
Code	Memo	Theme
<ul style="list-style-type: none"> • Define application domains • Define as-is application mapping 	Overview of current applications	Overview
<ul style="list-style-type: none"> • Define to-be application mapping 	Overview of future application landscape	Overview
<ul style="list-style-type: none"> • OPEX organization • NPV calculation • Business case template 	Financial overview	Overview
<ul style="list-style-type: none"> • Define project impact on applications 	Overview of project impact	Overview
<ul style="list-style-type: none"> • Identify business drivers 	Strategic process	Strategic coordination
<ul style="list-style-type: none"> • Establish architecture principles 	Strategic alignment	Strategic coordination
<ul style="list-style-type: none"> • Map capabilities 	Overview of business and IT capabilities	Enhanced overview
<ul style="list-style-type: none"> • Plan IT roadmap 	Map of how projects build capabilities	Enhanced overview
<ul style="list-style-type: none"> • Identify business visions • Discussions with senior managers • Dialogue with corporate management 	Dialogue	Enhanced strategic coordination
<ul style="list-style-type: none"> • Money allocated for strategic projects 	Strategic investments	Enhanced strategic coordination
<ul style="list-style-type: none"> • Method for identifying visions • Cost scenarios • Corporate management team sponsors 	Strategic method	Enhanced strategic coordination

These capabilities enabled organizational overview and strategic coordination. Both supported EA evaluation as an overarching capability utilized to rebuild the architecture resource of the company.

5 ANALYSIS: BUILDING EA CAPABILITIES TO REBUILD THE ARCHITECTURE RESOURCE

The failure of the previous EA outsourcing initiative was a powerful motivator for changing the EA implementation approach and building the architecture project by project. This required the organization to form new internal capabilities. We have identified that EA evaluation became the critical new capability in the effort to rebuild the architecture due to the “moving target” nature of building an architecture project by project. This capability consisted of a subset of underlying capabilities. The essential underlying capabilities were *strategic coordination* and the capability of maintaining an *organizational overview*. The capabilities are explained in detail in the following.

5.1 Rising from the Ashes Project by Project

With a shattered architecture resource, it became evident that something drastic had to happen if the organization was to maintain its leading market position. Hence, from 2009 there was an urgent need to recreate and strengthen the architecture. Goals were set to reduce IT costs by 30%. The portfolio had to be rationalized and reduced drastically from the more than 600 projects that were running in the organization at that time and goals were set to reduce service incidents by 50%. However, it took LST some time to realize that their current capabilities within the IT organization did not match their strategic and operational demands. In other words, they realized that they could not use IT to support and enhance the firm’s core competencies without first building IS functional capabilities to mobilize the underlying architecture resource. This has similarly been pointed out in literature (e.g. Ravichandran and Charlermsak, 2005). Thus, the organization realized that a complete rebuilding of the architecture resource project by project was necessary in order to cut costs and enable later, strategic initiatives.

The EA project that ended in 2008 without success meant that we had to start all over again. So we initiated this project-by-project approach where we – one project at a time – departed from the large amount of applications we had to clean them up and do small improvements. Senior Project Manager

The current architecture had become a burning platform. It carried the complexity of 25 years of product and process development at LST and was structured into silos that had supported different sales channels and product types such as landline and mobile. Hence, some drastic improvements had to be made to the current architecture. The vision was to incrementally build an architecture that would make the IT operations more efficient, but to do so would require the mobilization of the

organization's human and technological resources – much of which had been lost due to the failed architecture platform and outsourcing of human and technical resources within the IT organization.

5.2 Creating the Foundation for EA Evaluation

After the EA failure, the IT organization started to work on how their human resources and capabilities could be used when evaluating IT projects and investments. Over time, these capabilities became more refined through synergies and use.

Building organizational overview: One of the first things that was done was to create an overview of the existing architecture landscape to facilitate EA evaluation. This overview was seen as fundamental to improve and optimize the existing architecture by removing overlapping or redundant systems. The hope was that cleaning up the existing architecture would enable operational cost savings that could subsequently fund more strategic and business-oriented projects:

Basically we were in a position where we wouldn't be able to get any more money to do anything, so if we wanted to do something we needed to finance it by saving something. Enterprise Architect

Thus, a new organization was established with full responsibility for reducing the IT operational expenses. The team set out to map the application landscape to find overlapping or unnecessary applications that could be removed one at a time:

All the application owners and application managers were isolated into one organization, and they had a full OPEX [operational expenses] responsibility. Overall, they had an OPEX target, and it was their job to work with our architecture and say: Okay, we have 400 or 500 different, small applications. Can we rationalize those, so we can get rid of 140 of them, and still have the same IT capabilities? Enterprise Architect

This gave LST a complete overview of the application landscape by mapping the current architecture into 11 overall domains and enabled visible reductions in operational expenses. According to the architects at LST, this overview was a crucial first step in their ability to evaluate the ongoing projects.

I have a friend who is working as an architect with another company and he says their biggest issue is that they have absolutely no transparency. Working with architecture is a big challenge, because they don't have that transparency and holistic model we are trying to achieve. Enterprise Architect

Building strategic coordination: Through the first-level organizational overview capability, it was now possible for the IT organization to communicate the value of their architecture work to

management and shareholders. However, this overview was not enough to solve any real business issues.

So basically you could say for the past years the business hasn't really gotten anything that solved their overall pain points like time to market or product flexibility, those kind of things. Enterprise Architect

As a result, the architects started to work on identifying key business drivers by talking to business leaders and departing from the overall corporate strategy. Key drivers such as “digitizing the business” were then used as input for architectural principles to strategically guide and evaluate new IT projects – taking into account both the technical and business side. Furthermore, the business drivers were used as input for a higher-level overview capability.

Enhancing organizational overview: While the first-level overview capability only provided an overview of the technical infrastructure and related expenses, the next level also utilized input from strategic coordination – thereby enabling strategic decisions on new and existing technology. This overview consisted of a map of the high-level capabilities (different from the RBV theoretical construct) required by the business and residing in the existing architecture.

So, for example, if we wanted to do some new e-commerce platform, then what are the capabilities we want to introduce and what do we actually have already? How are they implemented? And what are the capabilities we could require? Enterprise Architect

The understanding of the organizational capability requirements and the existing capabilities supported by the IT architecture and systems were used to plan an overall IT roadmap. From an EA perspective, this gave the IT organization a more detailed understanding of their as-is architecture (currently supported capabilities), to-be architecture (requirements for organizational capabilities) and how to get there (the IT roadmap). This overview proved to be a highly beneficial organizational capability in itself since it provided an overview for the architects which enabled them to rapidly map business needs into existing or new solutions:

What I hear from my management team, and from external consultants helping us with this architecture process, is that they have never seen anything similar in terms of awareness about how many applications we have, what applications are within which domain, and what is the life cycle of these applications. Enterprise Architect

Using this method it was now possible to quickly assess what new capabilities would be required when introducing a certain platform, whether these capabilities could already be supported by the current architecture and how they should be implemented:

It has taken less than a week to prepare the RFP [request for proposal] material, because we have the descriptions of which capabilities belong within the domain, what do we expect the application to cover, and what are the reference architecture it fits into. Enterprise Architect

These new overview capacities were later utilized for enhanced strategic coordination.

Enhancing strategic coordination: The first-level strategic coordination capability was mainly enabling input from the business through interviews and by utilizing the corporate strategy. However, the second-level strategic coordination capability utilized the more advanced second-level overview to facilitate coordination through dialogue and discussions with senior business managers.

Instead of having the business say how they want to implement a given function, we wanted to discuss with them what capabilities they want to have. Enterprise Architect

These discussions were made possible through scenarios as a new method for coordination that utilized the prior capabilities through strategic visions, and overviews of costs and architecture.

We are aligning visions with expectations. So yes, these are your visions, but basically if we don't get more money, this is where we can get to with what we have. Then we made 6 scenarios with cost estimates for the next three years. Enterprise Architect

While this process was new to the IT organization, they now realized that the process was important for the organization to achieve its goals. Thus they worked to embed the processes as an organizational method that would be reused every year to scan the organization and translate the strategic needs into IT initiatives and projects:

This year we have been focusing on building a methodology. Because we haven't had that connection between IT strategy, business strategy and delivery strategy before. So we have tried to make it a repeatable process that we can repeat every year. Enterprise Architect

While the enterprise architects – and the architecture in general – had previously been seen as somewhat of a liability due to the failed architecture project, the corporate management was now also willing to engage in the strategic dialogue.

So now, every two weeks, we've been to the corporate management team, where we've been presenting our current findings, our working assumptions and the next goals that we have.
Enterprise Architect

Architecture evaluation capability: Concurrently with building and enhancing the overview and strategic coordination capability at LST, a number of new, formalized EA processes, structures and roles were used to support these capabilities, and enable architecture evaluation (Table 3).

Table 3. Overview of EA capabilities and facilitating processes, structures and roles	
Capability	New EA processes, structures and roles
Overview capability	As-is application mapping Activity-based costing
Strategic coordination capability	Business drivers Architecture principles
Enhanced overview capability	To-be application mapping Capability mapping Domain blueprints IT roadmap
Enhanced strategic coordination capability	Business visions Scenarios Business relationship management IT strategy
Architecture evaluation capability	Architecture checklists Formalized architecture approval in projects Design authority board Application strategy

The architecture evaluation capability constituted the overall capability – encompassing and leveraging all prior capabilities to generate a sustainable competitive advantage for LST. At first, the architecture capability enabled technical and financial evaluation of projects – for example, indicating how a new integration project would contribute to additional cost savings while new methodologies, tools and templates were developed for defining the application domains and evaluating projects. This was, for example, constituted through a new tool for architecture evaluation (Figure 1).

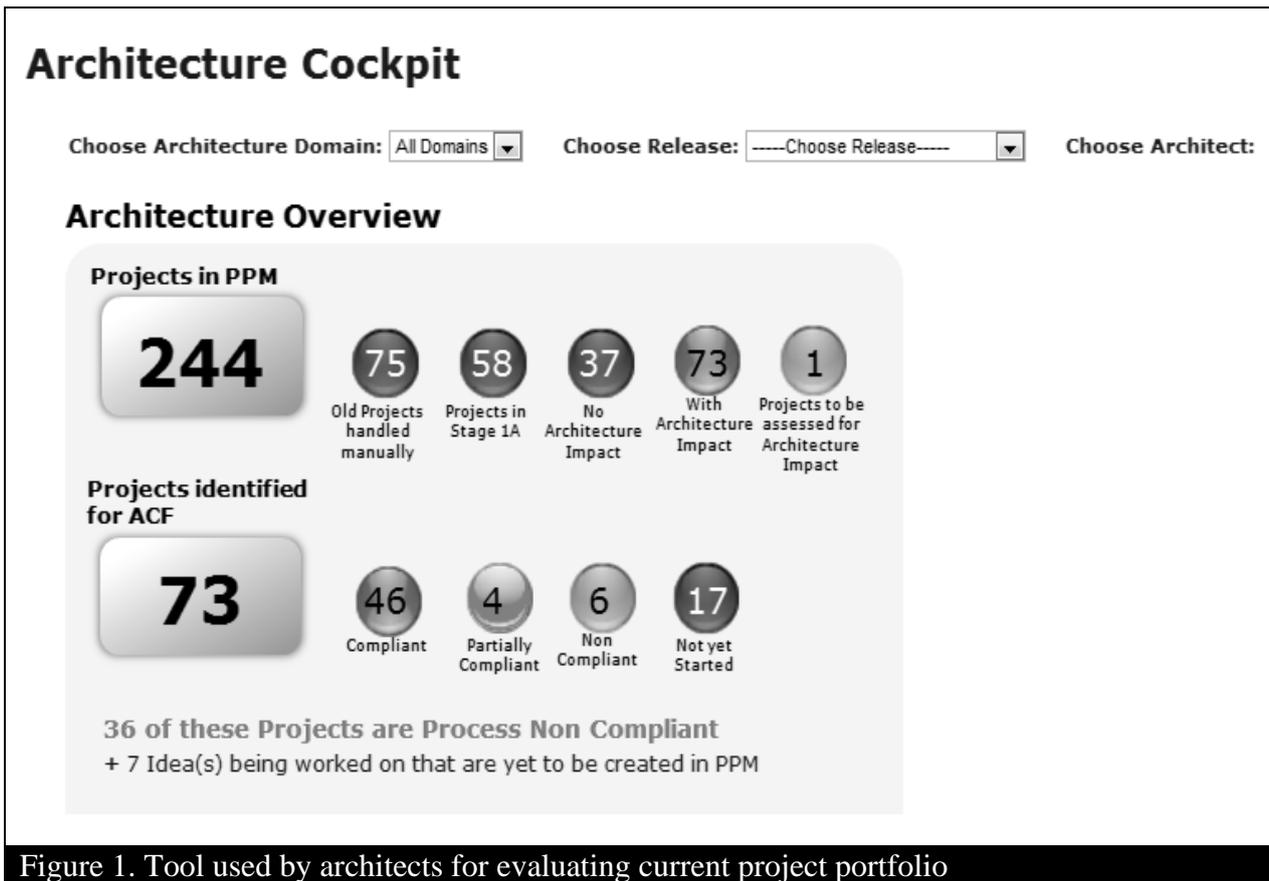


Figure 1. Tool used by architects for evaluating current project portfolio

As Figure 1 shows, this tool provided a complete overview of the portfolio of projects deemed to be relevant to the architecture and whether those projects lived up to the requirements set by the architects and expressed in the architecture checklists. In this sense, the architecture evaluation process became more formalized – ensuring a more thorough assessment.

I see the architecture process and the checklist as very important for LST, because two years ago we had some very skilled architects, but they had different opinions, and different ways to handle things. Then we got [...] this process to support the architecture and now we measure the same things, so the projects will meet the same assessment from the architects, the same process, the same questions so it's handled in a more standardized way. Before, maybe the architects forgot to ask some questions. Senior Manager

As the strategic coordination capability was built, the architecture evaluation started encompassing more strategic elements:

We have been working on the checklist for three or four years and I think we are on the second or third version of it. We ask in the checklist how we align with the IT business principles and the IT principles. Senior Project Manager

From around 2012, the architecture focus had shifted away from just cost savings into a focus on how the architecture resource could be leveraged as a resource for competition. For example, a range of new projects were launched together with new wholesale channels, a customer hub, customer applications, cloud integration etc., while the aim was to improve customer experience, simplify products and leverage mobile technologies.

From 2011, we started working on a new IT strategy which resulted in what we called IT rejuvenation where we wanted to focus our attention on three areas. First, we wanted to simplify our products because we always had thousands of different products – many of which were very old. So we wanted to reduce our product complexity so that we could also initiate some new products based on IP technology. At the same time, we wanted to improve the customer experience because this had become an essential competitive factor. Thirdly, we wanted to modernize our architecture around mobile technologies, but also IP and utilize high-speed broadband. It was essential that IT supported this process. Senior Project Manager

This shift in IT strategy focus required an even more sophisticated evaluation capability. This led the architecture checklist to consist of a larger number of EA considerations, taking into account architecture principles, IT and business strategy, and business requirements while the architects utilized strategies, IT roadmaps, design authorities, checklists and formal approval to evaluate new projects from an IT, business and strategy perspective (Bernard, 2012). In this sense, the EA evaluation capability went from a technical and financial focus to becoming a more holistic discipline – also taking into consideration strategic and business elements as the capabilities matured to address market needs for improved customer experience. This would require radical improvements to customer interaction, sales penetration, time to market and business process automation. While the architecture and IT operations had become more efficient, customers' experience now had to be taken to a new level and thus required more proactive and business-oriented projects. This required the very sophisticated architecture evaluation capability that had now been built.

We've been looking at the business side, we've been looking at the IT side, the IT delivery side, and we have been looking at the finance side of things. We have been having sessions with IT saying 'What are the applications we already have? What needs to be done if we want to do what the business wants?' We are taking that back into the cost scenarios and the impact scenarios – covering all dimensions. Enterprise Architect

However, without the enhanced overview and coordination capabilities that had been built between 2008 and 2012, the architects would have no foundation on which to build their evaluation capability.

6 DISCUSSION: THE ENTERPRISE ARCHITECTURE CAPABILITY MODEL

The case of LST provided a unique opportunity to understand how capabilities for EA evaluation are built – almost from scratch. Although a range of IS resources have been described in literature (Wade and Hulland, 2004), the case of LST provides a detailed example not only of how an IS resource – the architecture of LST – was mobilized through capabilities, but also how these capabilities were built over time, enhance and constitute each other in the context of EA evaluation. This was done by first gaining an overview capability that enabled the strategic coordination capability. The synergies between these two capabilities enhanced each other while new processes, structures and roles emerged (Table 3). Meanwhile, the overview and strategic coordination capabilities were utilized to build and refine the EA evaluation capability that first facilitated cost savings and rationalizations while later enabling more holistic evaluation – taking into consideration business requirements and coordinating with the business in different ways. Hereby, the case elucidates the process by which IS capabilities are built through firm-specific processes and resources over time (Amit and Schoemaker, 1993, p. 35).

For LST, these capabilities were essential to gain a competitive advantage from their architecture resource. But before the architecture could be leveraged as a strategic resource, the organization had to stabilize the architecture and minimize its operational costs. As these tasks were then fulfilled and the architecture matured, the capabilities were slowly enhanced to enable improved strategic evaluation of projects (Figure 2).

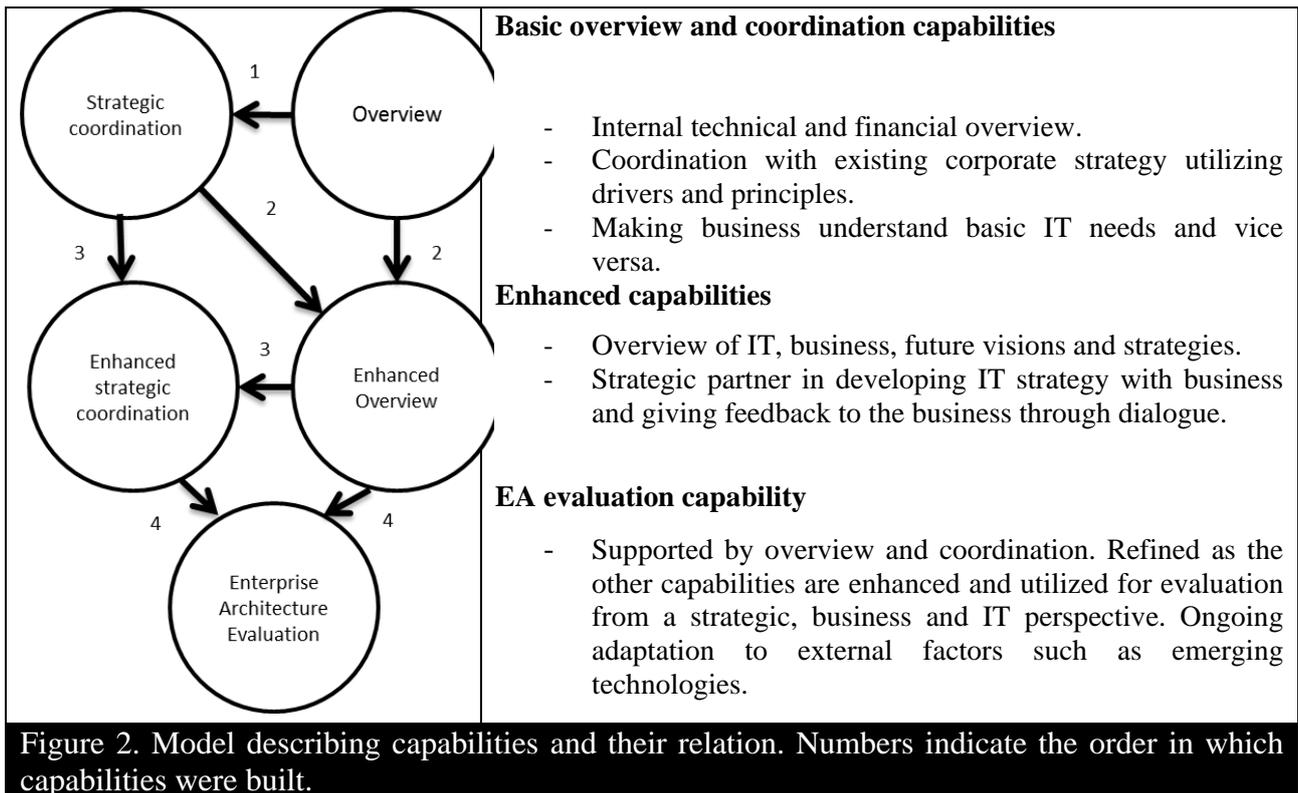


Figure 2. Model describing capabilities and their relation. Numbers indicate the order in which capabilities were built.

Although the function of the architecture capability changed over time, it represented an actual capability at both stages as a capability represents the firm’s capacity to deploy resources through processes to effect a desired end (Amit and Schoemaker, 1993). Then, as the strategic goal shifted away from just cost savings, the architecture capability similarly had to evolve. This underlines the fact that the EA evaluation capability inevitably changes as internal and external threats force new strategies upon organizations. We would argue that although the competitive advantage of a single project is short-lived (Peppard and Ward, 2004), the ongoing evaluation capability, and its adaptation, represents a sustainable competitive advantage for LST as it facilitates ongoing value creation through new projects’ improvements to the architecture resource. Likewise, the sequential and, to some degree, patch dependency of the architecture resource makes it valuable, sustainable, imperfectly imitable and rare (Barney et al., 2001). In the case of LST, the IT organization has been working on improving the architecture resource since the failure of 2008. To keep up with competition, the architecture resource will have to be continuously improved, and hence, the architecture evaluation capability will need to be reconfigured and refined.

While our data cannot confirm whether the EA evaluation capability created a competitive advantage from a financial perspective, the capability certainly created the potential by implementing strategies to respond to environmental opportunities such as the fast appropriation of new technologies. Meanwhile, it also contributed to neutralizing external threats posed by new

technologies and more cost-efficient competitors – while also avoiding internal weaknesses posed by an outdated architecture. Thus we would argue that the capability did facilitate a sustainable competitive advantage in accordance with (Barney, 1991). Similarly, LST's project-by-project evaluation of IS investments did continually add explicit business value (Peppard and Ward, 2004) by increases in architecture stability, reducing the yearly operational expenses of the architecture, reducing time to market and enabling new product innovations.

6.1 Contribution to Research and Limitations

Though the resource-based view has already been explored by other authors in relation to the field of IS, no previous studies have – to the best of our knowledge – explored the resource-based view and the attainment of sustained competitive advantage in the context of IS evaluation and EA. While our research does provide a useful example of how the resource-based view is relevant in this specific context, we believe that our most significant contribution is to the field of EA. As has been outlined, EA evaluation literature has been primarily preoccupied with deductive and prescriptive evaluation methods and measurements. However, with few exceptions (e.g. Andersen et al., 2015), no research has been conducted with the aim of discovering how EA evaluation unfolds in practice. In this regard, our research not only shows a very concrete example of how EA evaluation was carried out at a large organization, but also how successful evaluation can be used to gain competitive advantages if the right capabilities are built. We believe that our research approach offers a detailed view of how certain capabilities can be used to enable successful evaluation and that we provide a useful conceptual model to guide further research. Such studies could further explore the identified capabilities and their underlying practices in other organizations, but also look more into the process of how the capabilities are built, mutually constitute and enhance each other.

Another relevant avenue of research could be to explore the environmental context and its impact more deeply as the current case study mostly explores the internal threat of LST's architecture and how the IT department dealt with the architecture by building and mobilizing the architecture through key capabilities. However, since the architecture approach and the capabilities built are likely influenced by macro factors, other theories such as institutional theory (Scott, 2008) could provide valuable insights into how EA evaluation practices are shaped and rationalized through, for example, culture and logics (Thornton and Ocasio, 2008).

Our research is limited in the fact that it represents a single case study. Thus, we consider it possible that the study of a different organization would yield somewhat different results. While it seems reasonable that organizations need some overview of their technical architecture before building

other EA capabilities, similar arguments can be made that organizations can hardly build an overview without some sort of strategic coordination. However, since the initial overview at LST was only of a financial and technical nature, it was in this case not necessary to strategically coordinate outside of the IT organization to create this initial overview. Nevertheless, as we see it, it is not paramount whether the overview or strategic coordination capability is created first. What is important is rather the fact that these capabilities enhance and build on each other while also facilitating EA evaluation. Thus, we believe that this case provides a useful example (Flyvbjerg, 2006) of how organizations can build an EA evaluation capability.

6.2 Implications for Practice

While organizations are generally interested in measuring, quantifying and evaluating their ongoing portfolio of projects from an EA perspective and much literature describes ways in which this can be done theoretically (Andersen and Carugati, 2014), the case of LST suggests that organizations should first think about whether they have their key capabilities for overview and strategic coordination in place as these two capabilities provide the foundation on which EA evolution can be done. Without first mapping the architecture while having a basic understanding of the strategy of the firm, architects will have a hard time judging the relevance of projects in relation to the organization and its current architecture. Although this knowledge can, to some extent, reside within individuals, this was hardly the case with LST as the organization had outsourced almost all of its IT specialists. Thus, LST had to build the capabilities to create and mobilize their human resources as they began their project-by-project approach.

Although we did not touch upon the concept of EA maturity (Ross et al., 2006) directly in the analysis, it is clear that the architecture of LST did mature over the years from 2007 until late 2014, and that the role of IT and EA changed as the architecture matured. In the beginning, the EA focus was almost entirely on optimizing and consolidating the large application landscape, but around 2011, a shift started to happen. Although the IT department since 2007 had been left to suboptimize itself, the business started to require more enabling technologies such as cloud, mobile technologies and analytics – though there was still room for improvements within the application landscape. This signifies that organizations should think about how and when to refine and reconfigure their internal capabilities to match both internal and external threats and opportunities and that low architecture maturity organizations might have other needs than those with a high architecture maturity.

While increased digitization and its impact on the IT-business relationship has been described by literature (e.g. Weill and Woerner, 2014), few insights have been provided into how IT

organizations can best juggle demands for internal optimization and strategic investments in IT. In the case of LST, the management decided that more money should be allocated to strategic investments from 2013, but that these primarily should be allocated from savings within the IT operational expenses. In this way, the IT department sought to enable its business with new technologies and solutions while still having a relentless focus on optimizing its architecture without adding complexity to the architecture as the business was enabled with new technologies. We believe that this could be a useful technique for other organizations in similar situations.

7 CONCLUSION

Through our case study conducted at LST, we sought to explore how LST managed to build internal capabilities to mobilize and build a new architecture resource from scratch. Through our data collection and analysis, we identified how two initial capabilities, *overview* and *strategic coordination*, were initially built and subsequently enhanced each other and were utilized to form the overarching EA evaluation capability. This capability was exploited to build a new underlying architecture resource for sustainable competitive advantage. As the architecture matured, the architecture evaluation capability evolved. Thus, our research addresses the need for a deeper understanding of the internal factors contributing to obtaining a competitive advantage through IS investments (Ravichandran and Charlermsak, 2005) by building and utilizing EA evaluation capabilities. This is demonstrated through our capability model for EA evaluation showing the interrelatedness of the different capabilities. While our research has implications for both practice and research, we also acknowledge its shortcomings and welcome more in-depth studies of EA evaluation practices.

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PAPER 4

THE ROLE OF INSTITUTIONAL LOGICS IN SHAPING ARCHITECTURE GOVERNANCE: A CASE STUDY ⁹

Author(s): Peter Andersen, Per Svejvig, Andrea Carugati

ABSTRACT

Departing from a longitudinal case study at a Scandinavian telecom, we seek to explore the shaping of IT governance mechanisms related to enterprise architecture efforts—referred to as architecture governance. While empirically studying this subdomain of IT governance, we also contribute to IT governance literature in general. IT governance is often described as a management prerogative, however, using institutional logics as a theoretical lens and sensitizing device, we show how different logics emerged over time and influenced how the organization governed its architecture. These findings are discussed in relation to current practice and theory on both architecture and IT governance. Generally, the findings show how architecture governance is shaped through a complex, contextual and social process beyond rational, managerial decision-making. Finally, we propose that institutional logics can become embedded into governance practices. In this way, logics that are no longer dominant can still influence the way IT is governed.

Keywords: Architecture governance, enterprise architecture, institutional logics, institutional theory, IT governance, case study

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1 INTRODUCTION

During the implementation of information systems (IS), the disciplines of IT governance and enterprise architecture (EA) ensure that implementation's execution, planning, success and strategic alignment (De Haes and Van Grembergen 2009; Spewak and Hill 1993). While EA is often described as a holistic discipline concerned with technical architecture, overall strategy and business elements (Bernard 2012) IT governance is commonly referred to as: "specifying the framework for decision rights and accountabilities to encourage desirable behavior in the use of IT" (Weill 2004, p.3).

EA brings business benefits such as reduced IT costs, increased IT responsiveness, reduced business risk, data sharing, strategic agility and operational excellence (Ross and Weill 2005). While most EA projects seem not to realize these benefits (Roeleven 2010; Ross et al. 2006), architecture governance has been identified as the most important success factor for the EA effort (Schmidt and Buxmann 2011). Thus, a deeper understanding of architecture governance—the IT governance practices directed at the EA effort—might contribute significantly to the success of EA investments and projects.

Academic literature within both EA and IT governance tends to emphasize the roles of management, rational processes and best-practice frameworks (e.g. Debreceeny and Gray 2013; Ferguson et al. 2013) and thus, employs a normative approach, trying to outline the correct approach to govern IT (Jacobson 2009). This is also seen with governance maturity frameworks (e.g. Lazic et al. 2011; Simonsson et al. 2007) that emphasize linear and rational progression of IT governance toward increased formalization and adoption of best-practice frameworks. These include the IT Infrastructure Library (ITIL) and Control Objectives for Information and Related Technology (COBIT) (Ekstedt et al. 2010).

Both EA and IT governance literature have paid little attention to how organizations pursue the two disciplines in practice (Andersen and Carugati 2014; Andersen et al. 2015; Brown and Grant 2005, p. 698; Jacobson 2009; Simon et al. 2013; e.g. Winter and Schelp 2008), whereas we have found no study that takes a longitudinal approach to how IT governance is shaped over an extensive period.

Meanwhile, research using institutional logics has shown how organizations govern themselves and make decisions that are not fully rational or strategic, but based on accepted logics dominating the organizational field (Ang and Cummings 1997; Battilana and Dorado 2010; Mola and Carugati 2012). This inspired us to investigate the shaping of architecture governance practice over time to

understand how institutional logics may influence IT governance practice. Our intent is to provide new insights beyond the mainstream rationalistic description of IT governance in organizations, its definition and application.

Accordingly, we conducted a longitudinal case study in the IT organization of TDC—a major Scandinavian telecom with approximately 8.600 employees and an extensive history of EA initiatives—to answer the following research question: *How do institutional logics shape architecture governance practice at TDC?*

Data collection occurred between 2014 and 2015. The analysis was done using institutional logics as theoretical lens and sensitizing device (Patton 2002, pp. 452-462). Through coding and analysis of the qualitative data, we show how different, emerging institutional logics shaped architecture governance over time.

The remaining part of the paper is structured as follows. First, the theoretical foundation will be accounted for, followed by a justification of our employed methodology. After that, the case is described followed by an analysis informed by institutional logics. Based on the analysis, the paper provides practical implications, theoretical contributions, recommendations for further research and concluding remarks.

2 ARCHITECTURE GOVERNANCE CONCEPTUALIZATION

IT governance and EA are tightly linked and guide IT investments (Ross et al. 2006; Weill 2004). While the importance of the two disciplines is generally understood, the mutual interdependence of EA and IT governance has been largely overlooked (Tiwana and Konsynski 2010; Tiwana et al. 2013). Thus, we explore this relationship further. Rather than referring to two disciplines separately, we address them jointly as “architecture governance.” First, however, we must understand them individually.

2.1 IT Governance

IT governance is, like EA, a rather new research phenomenon within the field of IS and did not receive noteworthy attention before the late 1990s (Brown and Grant 2005). While various definitions of it exist, the most common seems to be the one provided by Weill: “specifying the framework for decision rights and accountabilities to encourage desirable behavior in the use of IT” (Weill 2004, p. 3). Meanwhile, other authors stress that IT governance is not only concerned with defining decision rights and responsibilities (*who*), but also *how* to govern IT. As Van Grembergen

(2013, p. 1) puts it, IT governance also “addresses the definition and implementation of processes, structures and relational mechanisms in the organization that enable both business and IT people to execute their responsibilities in support of business/IT alignment and the creation of business value from IT-enabled business investments.” However, both definitions begin with the assumption that IT governance is employed rationally in organizations. Additionally, neither of the two definitions demonstrates how IT governance can develop over time. In general, the temporal evolution of IT governance requires further attention (Tiwana et al. 2013).

As literature on IT governance has been conceptual (Brown and Grant 2005), research has not been able to fully unravel what factors influence the shaping of IT governance. Literature on strategic management has long emphasized that corporate success is established through an effective match between external relationships of a firm and its own internal capabilities (e.g. Kay 1995; White 1986). IT governance is largely concerned with creating business value by aligning with corporate strategy (De Haes and Van Grembergen 2009; Van Grembergen 2013), yet scant attention has gone to how external and internal factors influence the development of IT governance and how business alignment is created.

When reviewing literature on IT governance, Brown and Grant (2005) found that most research on IT governance conceptually examined IT governance frameworks’ propositions while few researchers attempted empirical studies on IT governance. Similarly, Williams and Karahanna (2013) highlight that, while past research has focused on the efficacy of various coordination mechanisms, insight as to *how* and *why* the various mechanisms take place are lacking. As such, there is little knowledge of how organizational context, politics and culture influence IT governance in practice (Brown and Grant 2005). Sambamurthy and Zmud (2000) noted that some case studies (Clark et al. 1997; Cross et al. 1997; El Sawy et al. 1999) indicated a gap between research and practice, yet some years later, it seems IT governance literature and practice are both highly centered on structures and frameworks. Among practitioners, this is expressed through a focus on formalized IT governance frameworks such as ITIL and COBIT (Aileen 2009; Ekstedt et al. 2010; ITGI 2011). Providers of these frameworks advise organizations to use consultancies and market analysts for guidance, comply with formal policies and standards and certify employees (ITGI 2011). Thus, IT governance practice and research emphasize rationalization, formalization and normative approaches, but neglect the social shaping of IT governance practices.

2.2 Architecture Governance

The foundation for EA was laid with IBM's 'business systems planning concept' and the subsequent development of the Zachman framework (Ahlemann et al. 2012; Zachman 1987). While EA began as an engineering discipline, it is today used in the design and realization of an enterprise's organizational structure, business processes, information systems and infrastructure in a holistic way (Ahlemann et al. 2012; Bernard 2012; Lankhorst 2005). This encompasses planning and understanding of the different organizational levels: business, operational and technology. For each, the current state (as-is) is described together with an envisioned (to-be) state (Wegmann 2002).

IT governance defines decision rights and accountabilities (Weill 2004) while addressing how processes, structures and relational mechanisms are implemented to create business/IT alignment (Van Grembergen 2013) Thus, we use the following working definition of architecture governance for the purpose of this paper: "the subset of IT governance processes, structures and relational mechanisms that support the planned IT architecture." Thus far, the issue of architecture governance—referred to as EA governance by Winter and Schelp (2008)—has received close to no attention within academic literature. However, IT governance has been addressed by practitioners (e.g. Aziz et al. 2005; Aziz et al. 2006), while there has been called for studies of IT governance within the context of architecture (Tiwana et al. 2013).

Architecture governance mainly governs the prioritization, planning and execution of projects related to current or planned architecture. Its practices include architectural reviews of project proposals, placement of architects on project teams and use of EA principles (Ross et al. 2006, p. 102-103). In contrast to corporate and IT governance, architecture governance practices are less developed and understudied (Winter and Schelp 2008).

To avoid confusion, we here specify that our research setting and case will revolve around the context of architecture governance and the architecture work, rather than IT governance in general. However, our research contribution is as much relevant to the field of IT governance in general. Consequently, we use the term "architecture governance" throughout the analysis section while our discussion and conclusion will take a broader view to also discuss the contribution to IT governance.

3 INSTITUTIONAL LOGICS AS THEORETICAL LENS

Institutional logics was chosen as theoretical lens as IT and architecture governance literature is largely based on assumptions of rationality and efficiency. By adopting a lens that accounts also for other forms of decision-making, the aim was to acquire new insights regarding the practice and evolution of IT governance over time.

Since the 1970s, institutional logics emerged as part of institutional theory (Thornton and Ocasio 2008). Institutional theory moves beyond classical assumptions of efficiency and rationality to include socially constructed beliefs, norms and rules that affect organizations' behavior and structure (DiMaggio and Powell 1983; Meyer and Rowan 1977). Following Scott, we define institutions as "comprised of regulative, normative and cultural-cognitive elements that, together with associated activities and resources, provide stability and meaning to social life" (Scott 2008, p. 48). Institutions exist and are maintained by the regulative, normative and cognitive-cultural elements that influence behavior (Scott 2008). Central to institutional theory is the concept of *organizational field*, "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 or products" (DiMaggio and Powell 1983, p. 148). Thus, the organizational field consists of all the organizations operating within the same domain and other organizations critically influencing the performance of these organizations, such as partners, competitors and regulators (Scott 2008). While top-down processes such as diffusion allow higher-level structures to shape, constrain and empower the structures and actions of lower-level ones, bottom-up processes can shape, reproduce and change the context at a higher level (Scott 2008).

The concept of Institutional logics was introduced by Friedland and Alford (1991) and has been used to explore the relationship between individuals, society and organizations (Thornton and Ocasio 2008). Institutional logics were later defined by Thornton and Ocasio as "the socially constructed, historical patterns of material practices, assumptions, values, beliefs and rules by which individuals produce and reproduce their material subsistence, organize time and space and provide meaning to their social reality" (1999, p. 804).

These logics shape the content, meaning and structure of institutions and influence individuals, markets, industries and organizations in general (Thornton and Ocasio 2008). Institutional logics have illustrated how organizations govern themselves and make decisions that are not always fully rational, but based on taken-for-granted social prescriptions that represent shared understanding of what constitutes legitimate goals and how they may be pursued (Mola and Carugati 2012). In this

way, organizations define and conform to these logics to be “proper” organizations (Boxenbaum and Jonsson 2008). Institutional logics bridge the macro, structural perspectives (DiMaggio and Powell 1983; Meyer and Rowan 1977) and more micro, process approaches (Zucker 1977) as individuals contribute in shaping and changing institutional logics (Thornton 2004).

Multiple institutional logics are available for both organizations and individuals (Thornton and Ocasio 2008) and have shown to shift and even conflict, often resulting in one dominant logic prevailing (e.g. Currie and Guah 2007; Hayes and Rajão 2011; Thornton 2002) while they in some cases have shown to coexist (Battilana and Dorado 2010) or form constellations (Goodrick and Reay 2011). By viewing logics as constellations that guide behavior, it is recognized that logics can combine to simultaneously influence professional work at a given time (Goodrick and Reay 2011).

Within IS literature, institutional theory has proven a useful theoretical lens and analytical tool, for example, in relation to IS outsourcing logics (Mola and Carugati 2012; Svejvig and Pries-Heje 2011) and enterprise systems (Gosain 2004; Liang et al. 2007; Svejvig and Jensen 2013). Institutional logics in particular have helped describe how institutional logics influence governance systems and working practices in longitudinal settings (Currie and Guah 2007; Mola and Carugati 2012). Thus, a longitudinal study of the relationship between IT governance and institutional logics could prove a promising avenue of research.

4 METHODOLOGY

To answer the research question, we employed a qualitative research. Qualitative research is of particular relevance to the study of social relations due to the increased pluralization of society (Flick 2006; Flick et al. 2004). It encompasses such methods as action-research, ethnography and case study research (Myers 1997). In IS research, qualitative research approaches have proven useful in explaining phenomena that traditional research approaches have found difficult to completely unravel (Myers 1997).

Following Stake (2005), we use a case study approach to provide a rich description of key events in and surrounding TDC. Acknowledging the various uses of case study research in IS research (Cavaye 1996; Myers and Avison 2002), we specify that our study, from an epistemological point of view, follows the interpretivist research tradition. Accordingly, constructs did not exist prior to entering the field, but emerged during data collection and analysis. In this regard, theory was not used as an initial guide to collect and analyze data. Instead, theory was used as part of an iterative process during the analysis (Eisenhardt 1989).

4.1 Research Setting

Purposive sampling (Kuzel 1992) was used to select TDC as the case subject based on a number of considerations. First, TDC makes an interesting case from an EA perspective due to its large size and international presence, while the organization underwent a number of mergers and acquisitions—making the integration of systems quite a challenge. Second, TDC is a somewhat old company that has gone through changes of ownership, strategies and size. Thus, due to the size and architecture history of TDC, the anticipation was that a longitudinal study of architecture governance at TDC could provide new insights to current theory and practice.

TDC is one of the biggest telecoms operating in Scandinavia in both B2B and B2C markets. As of 2014, it employed 8,594 people (full-time equivalent) and earned more than 3 billion euro in revenues (TDC 2014). It was created in 1990 as a Danish, state-owned monopoly—exclusively covering all of Denmark and merging all the old, regional telecoms into one. The goal of that merger was to create a powerful company, strong enough to thrive in a free, international market (TDC n.d.). In 1997, TDC became fully privatized as the fixed telephony market was fully liberalized. Today, it is executing its strategy to become further established within Scandinavia (TDC 2014).

The telecommunications sector within the European Union (EU) constitutes the organizational field of TDC by comprising resources, costumers, regulatory agencies and other organizations that produce similar products and services (DiMaggio and Powell 1983). This sector has been seen as a natural monopoly due to the large economies of scale and the difficulty of duplicating infrastructure (Geradin 2006). However by the late 1970s, economists, lawyers, policymakers, industrialists and consumers increasingly challenged this idea. They believed privatization would improve performance by inducing better prices, improving quality of service and stimulating innovation (Geradin 2006). Meanwhile, the 1970s saw standardization of telecommunication technologies due to regulative pressures from the EU. From the mid-1980s, additional directives and legislations liberalized various industries that had previously been monopolies (Geradin 2006). By the mid-1990s, the telecommunications sector had transformed and was no longer operating or viewed as a natural monopoly. By 1998, the EU decided to disallow exclusive rights for telecommunication and infrastructure. Despite differences regarding local governance and economic development, monopolies within the telecom industry were liberalized all over the world from around 1995–2005 (Ritsholm 2009).

4.2 Data Collection

Most of the data were collected over 11 months, from March 2014 to February 2015. Retrospective analysis illuminated key events over a 25-year period and the case study is thus longitudinal—providing temporal and contextual meaning to the studied phenomenon (Mason et al. 1997).

One of the authors did the interviews at the TDC headquarters in Denmark, except for two online interviews. Snowball sampling (Biernacki and Waldorf 1981) was used to identify actors with considerable knowledge of the architecture and IT governance practices. Also, we were particularly interested in people who had been within the company for a longer period. We did a total of 10 interviews and 3 supplementing observations to understand the interaction between project managers and architects (Table 1). With the consent of the respondents, we recorded each interview.

Table 1. Overview of collected data at TDC			
Semi-structured interviews	Duration	Date	Theoretical Rationale
Senior Project Manager	1:23:29	3/19/2014	To gain interviewed subjects' point of view (Flick 2006). We chose interviewees based on their involvement and knowledge of architecture governance at TDC.
External Consultant	00:44:38	6/18/2014	
Project Architect	1:01:55	6/18/2014	
Senior Project Manager	00:55:57	6/18/2014	
Enterprise Architect	00:56:08	8/6/2014	
Senior IT Manager	00:18:20	8/6/2014	
Domain Architect	00:46:15	8/6/2014	
Senior Project Manager	00:50:02	11/4/2014	
Enterprise Architect	00:50:38	2/19/2015	
Retired IT Manager	00:30:00	10/20/2015	
Observations	Duration	Date	To supplement interviews and understand practice (Flick 2006).
High-level demands of project	1:26:22	3/31/2014	
Workshop—with Vendor	3:01:13	4/4/2014	
Workshop: Capability Matrix	1:49:01	5/2/2014	To understand the formal documents used as governance tools and perform data triangulation (Flick 2006).
Examples of internal documents	Pages	Date	
Business case template	60	9/12/2010	
IT rejuvenation document	41	2/13/2012	
Business-aligned architecture	17	2/15/2013	
Business/IT Strategy	6	8/7/2014	

Apart from interview data and observations, we also collected internal documents. These included document toolboxes, strategy formulations, project artifacts and email. In total, this amounted to more than 500 pages of written material. Lastly, we reviewed many secondary data sources, such as annual reports, newspaper articles and published papers, for triangulation (Flick 2006) of the historic accounts, since retrospective analysis can be associated with recall errors (Singh et al. 2015). This data served as a foundation for the subsequent analysis.

4.3 Data Analysis

By May 2015, we discussed the gathered data and how different theories could inform analysis of the case and architecture governance practices. This involved several iterations of inductive coding (Thomas 2006).

This process of coding and viewing the project through different theoretical lenses lasted until July 2015, at which point we settled on institutional logics as a suitable theoretical lens and sensitizing device (Patton 2002, pp. 452-462) to understand and interpret the development of architecture governance practices over time.

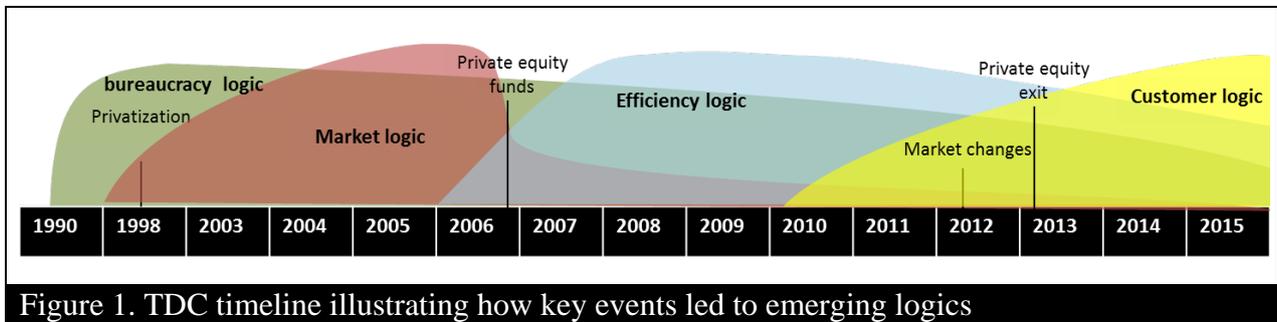
We continuously revised the inductive codes until we arrived at a table (see discussion, Table 2) dividing the case into key three overarching periods: 1995-2005, 2006-2010 and 2008-2015. Each of these periods related to tendencies within the organizational field, logics and governance practices. The inductive codes were shaped using the interview transcripts of the nine interviews collected from March 2014 to February 2015. This process largely resembled that of “pattern inducing,” suggested as the main technique for interpretivist studies of institutional logics (Reay and Jones 2015). Through this approach, logics are identified from data through coding in an inductive, bottom-up process (Reay and Jones 2015).

We later used the table as a framework for further and more in-depth, deductive, NVivo coding. These codes were used to judge the correctness of analytical distinctions within the table and guided the subsequent writing process. These codes used interview data, observations and collected documents. This resulted in a total of 91 different codes. For final confirmation of the analysis, we conducted one last interview in October 2015, discussing interpretations with a former IT manager who had been employed at TDC from its formation in 1995 and until 2002. As we found no contradictions between the data sources and our analytical distinctions and interpretations, we started to write up our findings by the end of September 2015.

5 ANALYSIS

The three overarching periods found through the data analysis each consisted of different dominating logics that changed over time (Figure 1). As TDC was establishing as a public monopoly in 1995, the dominating logic was a bureaucracy logic. From 1998, the privatization of TDC supplemented this bureaucracy logic with market logic, as TDC sought dominance within the European market through acquisitions and investments. An efficiency logic dominated the next period (2006–2010), due to increased consolidation within Europe and a new ownership structure

within TDC. This was followed by a customer logic (2010–2015) where TDC sought to increase its customer base within its existing markets through improved customer experience. These institutional logics were influenced by, for example, changes in ownership structure and market changes while each dominate at different points in time (Figure 1).



As illustrated (Figure 1), the four logics affected TDC at different times and even coexisted. They had a strong influence on the architecture governance practices within the IT organization. However, Figure 1 depicts our analytical distinctions as they emerged from our data. Reality, however, is more overlapping and complex. In this sense, Figure 1 is intended as a bird's-eye view, a generalization, of how logics changed over time from dominant to subordinate or secondary logics (Goodrick and Reay 2011).

Next, we describe both the bureaucracy logic and the market logic, as they seemed highly overlapping during most of the period from 1995 to 2005. Further, since this period involves data that goes more than 10 years back, it is hard to exactly determine which logic dominates when. However, until TDC became privatized in 1998, TDC was not influenced by the market logic (Figure 1).

5.1 Bureaucracy and Market Logic at TDC (1995-2005)

The Danish government created TDC in 1991 as a parent company to five previously independent, regional telecoms. In 1995, the five subsidiaries merged into one state-owned monopoly to create a powerful, Danish company that would thrive in the free, international market enforced by the EU (Gardel 1990). After the merger, TDC became a more bureaucratic organization, unlike some of the former subsidiaries, such as Jydsk Telefon, the biggest of them.

Before, when I worked for Jydsk Telefon, we were very technology-driven. For example, we had a big lab for voice recognition and other innovations. With the merger, we got a boss from Copenhagen who was a public servant. It becomes more a governmental organization with more power to the bureaucrats. (Former IT Manager 2015)

In 1998 TDC became fully privatized (TDC n.d.). As TDC had become fully privatized by 1998, the company started to leverage the expertise of its new investors. As a result, TDC became influenced by a market logic that supplemented TDC's bureaucracy logic. In general, the market logic had increasingly begun to dominate the telecom industry as the fierce competition and newly liberalized market in Europe caused more consolidation (Lerner 2014). In the case of TDC, market logic resulted in acquisitions all across Europe and an intensified focus on customers, leading to significant annual growth between 2000 and 2005 (Figure 2).

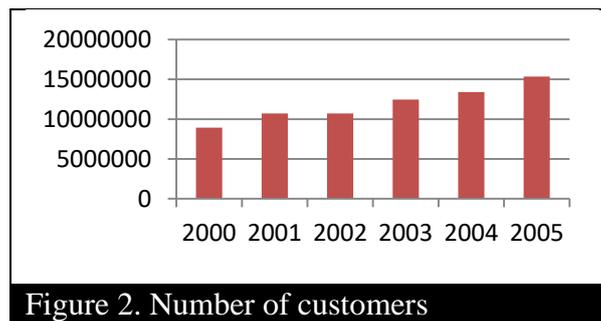


Figure 2. Number of customers

The goal was to drive growth and establish a strong foothold within the EU. By 2005, TDC provided services in twelve different European countries such as Denmark, Sweden, Norway, Great Britain, Germany, Lithuania, Latvia, the Netherlands, Austria and Poland (TDC 2005).

In the same way that TDC had been a public monopoly within Denmark, it now strived to dominate the European market. But it had little regard for internal optimization and efficiency. The Danish public criticized it as slow and bureaucratic (Dall 1999). While newly privatized telecoms were consolidating in Europe, TDC took criticism for being large, overstaffed, bureaucratic and influenced by governmental culture (Lerner 2014). In the sense, TDC was like many other telecoms at the time. The market logic encouraged it to compete in the newly liberalized market with mergers and acquisitions, but internally; TDC was largely bureaucratic and inefficient. For example, the senior executive officer (CEO) mentioned several times that he would not fire anyone from the company despite the competitive market situation. He maintained this position until 2003, when TDC had to lay off around 1,650 people—10% of the total workforce (Kjær 2003).

Architecture governance at TDC (1995–2005): The merger of the five subsidiaries into one company brought a large number of legacy systems together. From 1995, the IT organization was trying to integrate these systems and implement new, overarching ERP and enterprise systems which emerged during the early 1990s (Jacobs and Weston 2007). For example, in 1996 they invested in a new system for finance, billing and customer handling.

For each new IT investment, a dedicated group of people were put in charge of development and maintenance, once the system was operational. TDC started to establish formal governance frameworks for controlling the project portfolio. The IT architecture increasingly consisted of complex enterprise systems that needed to be integrated across business units that had been merged by 1995.

By the late 1990s, the competitors of TDC were using outsourcing to drive efficiency. TDC was considered largely behind in that area (Stenvei 2004). Thus, out of the approximately 16,600 employees within TDC as of 1998, 3,000 people were employed within the IT organization.

TDC had a gigantic setup where everything was handled in-house. When I came to TDC in 1998, we had almost 3,000 people working within the IT department! More than 1,000 of those people were developers. (Project Architect 2014)

As most of TDC's competitors had started to outsource part of their IT workforce, the senior management of TDC became influenced by these cultural-cognitive and normative pressures from the organizational field. However, this was initially resisted by bottom-up processes coming from the IT department still clinging to the bureaucracy logic that had persisted.

Sometimes, we would have our CEO ask if we shouldn't start outsourcing—primarily within maintenance. Then, we would spend some weeks on documenting that we shouldn't. We made some benchmarking showing that our maintenance was cheaper than most other options. We were quite good at that. (IT Manager 2015)

As TDC became privatized in 1998, TDC started to focus on its market and customers. The managers would each have one day a week where they would sit at the service phone, talking to customers. Within IT, this customer logic resulted in service-level agreement, defining and governing agreements between IT and the business, which was seen as the customer of IT. Also, IT began looking into buying custom-made and standardized IT solutions.

Overall, IT governance became formalized and standardized during the early 1990s, as a result of the logics of the public bureaucracy. In the late 1990s, the market logic made IT more customer-oriented, as IT management explored outsourcing and the procurement of standardized systems. While TDC did some outsourcing from 2002, it was still largely inefficient. This led a number of private equity funds to explore the possibility of acquiring TDC, making it efficient, then selling it.

5.2 Efficiency Logic at TDC (2006-2010)

By 2006, five private equity funds had joined forces to take over most of the TDC shares. This change of ownership structure resulted in a new, dominant efficiency logic at TDC.

The new owners hired a new CEO to run the company who publicly criticized how TDC had been run since its privatization.

I actually thought that, like for any other telecom in that situation, expense reductions and efficiency improvements were on the top of their list. But they were not. I was amazed by this. (Børsen 2007a)

The new CEO was surprised that so little had been done to drive the efficiency of the company. While the market had become saturated and competition fierce, the previous management had done little to drive efficiency. Thus, rather than streamlining and optimizing the business, focus had been on acquiring new companies and growing the customer base. This strategy was not in line with the logics of private equity business. Generally, private equity funds buy businesses to steer them through rapid performance improvement, then sell them (Barber and Goold 2007). Thus, the new owners imposed new requirements for cost control and cost transparency to increase the profitability of TDC through different institutional pressures. To begin, they restructured the board to include investment professionals from each of the funds, hired the new CEO to lead the company toward increased cost-control and facilitated an operational turnaround. By the beginning of 2007, the CEO announced that TDC would have to cut overall staff by approximately 7% a year. In May 2007, 465 people were laid off (Børsen 2007b). The same year, TDC started to sell off most of its acquisitions outside of Scandinavia while focusing on consolidations within the Scandinavian countries (TDC 2007).

Thus, while the number of employees had been somewhat stable between 2000 and 2005, it dropped from around 18,000 to around 10,000 between 2006 and 2010 (Figure 3).

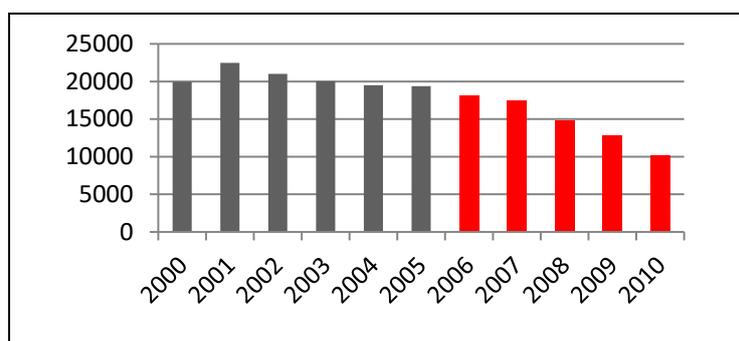


Figure 3. Number of employees from 2000 to 2010

By 2008, while TDC was still following the efficiency logic of the capital investment funds, the chairman of the board of directors announced that TDC had come far in terms of efficiency. Now it was time to start looking in new directions. As a result, a new CEO was hired to address its struggles with poor customer satisfaction, slow time-to-market and decline in the domestic market. However, the efficiency logic still dominated the company until around 2010.

Architecture governance at TDC (2006–2010): The CEO appointed by the private equity funds in 2006 quickly realized that the IT architecture of TDC was in a poor state of integration. The many mergers and acquisitions inside and outside of Denmark had resulted in a complex architecture consisting of a variety of unintegrated applications. There had been little focus on integrating the various applications from the many mergers or realizing synergies and efficiency.

When we introduced this new product [package of products such as television, mobile, broadband, music service and land line] it involved 35 different applications that had to be integrated—all of them. So the main obstacle was the sheer number of applications that had to be integrated in order to reach an architecture that was coherent and actually worked well. (TDC Senior Project Manager 2014)

The many applications and overall complexity of the architecture were becoming expensive for TDC to run and the efficiency logic of TDC started to affect the architecture governance. Now, it focused only on how the owners could increase efficiency to drive down costs.

Around that time TDC went from being a more balanced group into becoming a very financially engineered organization. Then, IT switches to disciplined cost management: We need to reduce our costs and we need to reduce our operational expenditures significantly because everything is calculated. (TDC Enterprise Architect 2015)

The efficiency logic first intensified focus on outsourcing. Outsourcing had been a predominant tool for cost saving among IT professionals and organizations since the 1990s. “The missionaries preached the gospel of outsourcing to the remaining unwashed enterprises of the time. For a while, it looked like outsourcing was going to happen everywhere” (Glass 2000, p. 95). TDC had ignored outsourcing when the bureaucracy logic was prevailing. However, under the new ownership structure, the CEO and CIO decided that it was the best way for the company to drive efficiency. Accordingly, TDC started to focus more on outsourcing from 2006. This happened over several waves and involved people within IT development, maintenance, support and operations of basic systems.

I think around 2007 we were around 800–900 people.¹⁰ The total cost of ownership from our applications alone was significant compared to our competitors. That was the time when we started looking at the outsourcing wave. If we wanted to do something radical around our architecture, we needed to finance it by saving somewhere else. (TDC Enterprise Architect 2015)

As TDC was beginning to exhaust its options regarding outsourcing of the IT staff, architecture infrastructure outsourcing had become an outsourcing trend among telecoms who were struggling to keep down expenses (Gurden 2007).

I was at an international telecom conference. There, we [the telecoms] were warned against what they called the cost spiral. It could not continue. The telecoms had to cut costs and reduce expenses, but something else also had to happen. They had to renew their IT platforms. That was what most tried to do—including TDC—and we failed. We have been through the same trajectory as many others. Like telecoms all over the world, we experienced that expenses were too high and we needed to cut costs because customers didn't want to pay as much. (Project Manager 2014)

The normative pressure led TDC to invest more than 268 million euros into an architecture migration project. The aim was to outsource the entire infrastructure of the company to a sourcing partner.

So, the idea was that we were outsourcing the IT operations and we were outsourcing the application development and then leveraging the capital that we were freeing up to fund the enterprise architecture program. Those were the days where focus was on greenfield architecture [outsourcing the IT architecture]. If we would just migrate the architecture, everything would be good. (Enterprise Architect 2015)

While the CEO expected overall productivity gains of between 20 and 30 percent and faster time-to-market by more than 60 percent, the outsourcing adventure did not last long before TDC had to give up on outsourcing the IT architecture by 2008. The 268 million euros were essentially lost, as no benefits were realized and IT operational expenses remained the same.

From 2008, the IT organization had a largely outdated IT architecture consisting of a number of legacy systems—some of which were up to 25 years old. These old and poorly integrated systems posed severe problems for TDC. For example, the lack of integrated systems made it impossible for TDC to know if its broadband customers also were subscribing for other TDC services.

¹⁰ In 2007, there were 675 employees within what was called: IT Nordic and around 1600 employees within the entire IT organization of TDC: Jb. 2007. "Slaget Styres Af Stærk It-Organisation," in: *Børsen*.

While the competitive market still required significant cost savings, further outsourcing was not an option: all expendable human resources had been outsourced and the architecture outsourcing project had failed. Instead, cost reductions were now sought through an intensified focus on streamlining the existing system landscape. This required a range of new architecture governance mechanisms around IT projects that had not been used during the outsourcing period.

You could say there wasn't really that much architecture work happening in the sense of how we worked with architecture in our projects. It was much more about how we architected the new platform. (Enterprise Architect 2014)

First, the IT management established a new organization for governing the application portfolio with full responsibility of reducing the operational expenses and streamlining the architecture.

What we did was to focus a lot on cost reductions and the governance we did was around facilitating that all the application owners, application managers and so on, were isolated into one organization and they had a full OPEX [operational expenses] responsibility. Overall they had an OPEX target and it was their job to work with our architecture. (Enterprise Architect 2015)

This rationalization required architecture governance of the complex application landscape, consisting of systems from all the previously merged companies and more recent mergers and acquisitions. Thus, TDC started to use detailed application roadmaps and divide the application landscape into 11 different domains, each with their own roadmaps.

Then, we started making roadmaps. For example, "what is the roadmap for these applications within my domain?" But still, with a very strong focus on reducing costs and increasing the stability in our platforms. (Enterprise Architect 2015)

Efficiency-focused governance drove this mapping into 11 overall domains. The company registered each application within the accounting system to provide a complete overview of expenses and savings. In just two years, from around 2009 to 2011, a total 206 out of 557 applications were decommissioned by the end of 2011.

On the individual project level, each project manager had to provide an overview of operational expenses and cost reductions upon delivery and use, with the assistance of the application domain manager. This overview—which had to be part of any project business case—also required approval by an approval board within finance before the project could be initiated. This effectively meant that an IT project could not be realized unless it contributed directly to cost reductions.

5.3 Customer Logic at TDC (2010-2015)

By 2010, the private equity funds had sold almost 30% of their shares, as is standard practice among private equity funds (Barber and Goold 2007). Thus, they had achieved high returns on their investment through the rapid performance improvements from 2006 till 2010. By 2013, all the private equity funds had sold their shares on the public stock market.

From around 2010, the changes within the domestic market and leadership structure resulted in a move away from efficiency as the dominating logic. TDC would now go through a cultural change program, with new performance measurements and organizational restructuring into four customer-facing units (Lerner 2014). Now, TDC had reoriented itself towards a customer logic, but the company did not discontinue its focus on cost savings or market growth entirely. Instead, the organization and individual work became increasingly guided by a constellation of logics (Goodrick and Reay 2011). While the customer logic had emerged and become dominant, the efficiency logic and, to a lesser degree, the market and bureaucracy logic, still persisted (Figure 3).

Architecture governance at TDC (2010–2015): As the efficiency logic persisted within TDC due to the fierce competitive environment, the IT organization still used efficiency and financially-driven governance. However, the management was now also beginning to realize they needed to focus on more than just efficiency. As a result, it launched a new IT strategy with three main focus areas.

After the big enterprise architecture program which ended in 2008 without success, we had to start over again. Then we started governing each project and look at the broad spectrum of applications we had to clean up. By 2011, they [the corporate management] initiated a new IT strategy which resulted in a focus on three main areas. (Senior Project Manager 2014)

The three areas were improved customer experience, simplified products and a rejuvenated platform. This essentially meant that the IT organization had to spread its investments across efficiency improvements, integrated solutions, improved network, customer content and digital customer experience. This was done by changing the formal governance procedure around the IT budget.

For the past 10 years, the business hasn't really gotten anything that solved their overall pain points like time-to-market or product flexibility, those kinds of things. So instead of having no strategy, we said, "Okay, now we are going to allocate a fixed amount of the IT budget for strategic development." (Enterprise Architect 2015)

One of the reasons for this shift in investments was that market conditions were changing. As broadband speed had increased over the years, new technologies and innovations based on broadband and IP were becoming increasingly important for customers, while customer experience had become paramount. So TDC now started to focus on new product innovations, relying on integrated solutions and new offerings, such as free music streaming, movies and different mobile applications (TDC 2011).

As the IT architecture had been simplified while TDC had been driven by an efficiency logic, the IT managers now had to make sure that overlapping applications were not introduced with the new strategy.

When you start controlling the introduction of new applications after having dramatically simplified your IT architecture, then you need to apply much stronger governance, and that's basically what we went through, and then we realized we needed to have a framework for working with architecture. (Enterprise Architect 2015)

To address this need, the architects at TDC developed a new governance framework, associated documents and tools to lead the effort to reduce costs, continuously optimize the architecture and make sure that business managers would not implement solutions not aligned with this plan. TDC also sought inspiration and external validity for their new approach by comparing it with a range of competitors and seeking advice through a leading IT service provider and two leading management consultancies. These normative pressures led TDC to create a new architecture governance methodology called: “business aligned architecture methodology” (Figure 4).

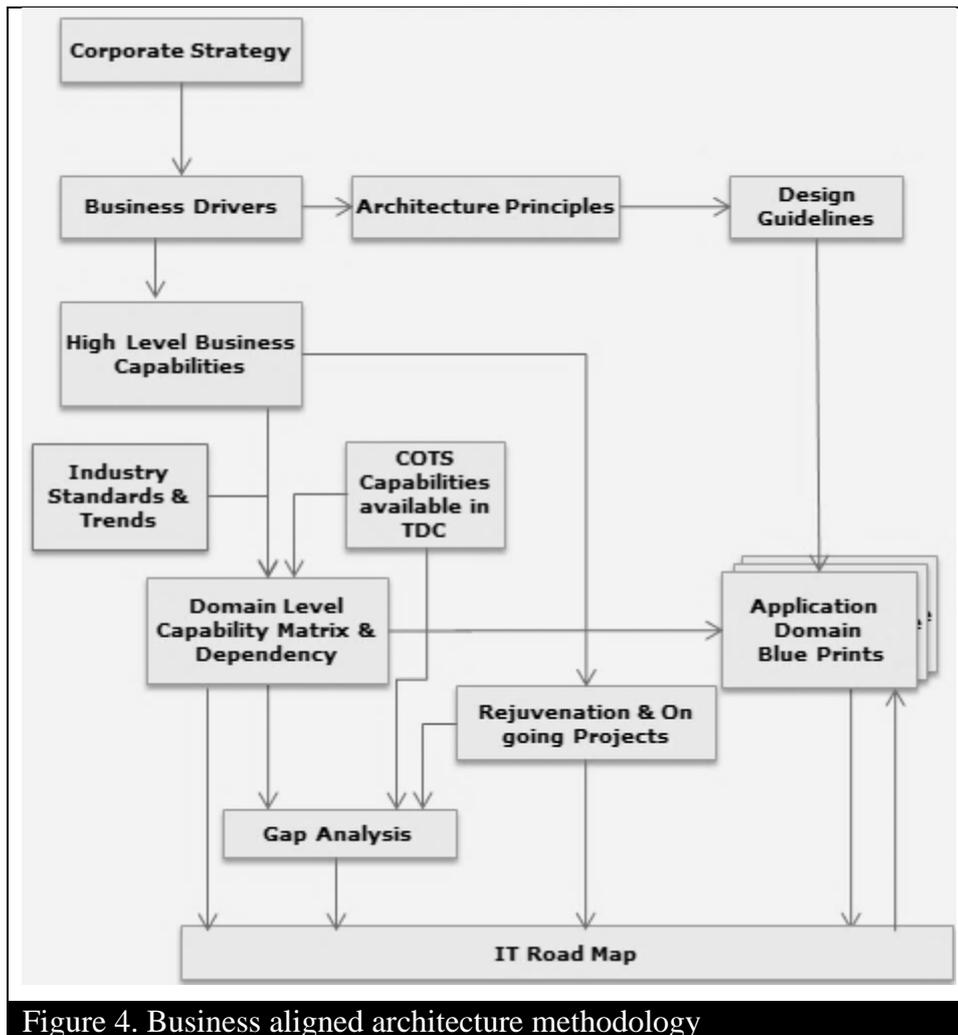


Figure 4. Business aligned architecture methodology

This methodology (Figure 4) would depart from the corporate strategy and interviews with senior managers within the business. Enterprise architects would then use the gathered information to identify business drivers, then formulate principles and design guidelines to govern the IT portfolio. The interviews with senior managers and business drivers also helped map high-level business capabilities. By looking at industry trends and new technologies, enterprise architects could identify possible gaps between the current architecture, capabilities and the business's needs. In the end, these inputs, together with detailed application domain blueprints, helped form a strategic IT roadmap to govern the IT portfolio and ensure alignment with IT architecture, financial control and strategic fit. Additionally, a range of new governance tools were developed, such as detailed architecture governance overview of the entire portfolio of IT projects and whether these projects conformed with the existing architecture. The tool provided a complete overview of the portfolio of projects deemed relevant to the architecture and whether those projects lived up to the requirements set by the architects and expressed in an architecture checklists.

The constellation of efficiency and customer logic also made TDC rethink its approach to outsourcing. While the old arrangement had focused on outsourcing the infrastructure to drive cost reductions, TDC now established a strategic partnership with a sourcing partner, keeping architecture governance and knowledge within TDC to ensure the proactive development of applications. Although TDC started to implement new methods for strategic investments and governance, it maintained focus on cost management.

TDC is in an extreme market where we have a lot of competition. There isn't much room for new investments. Often, the budget that we have in the beginning of the year is reduced later, meaning that we have to cut down on some of the projects. That is because of the competitive situation that we are in. (Project Architect 2014)

The constellation of logics led TDC to pursue an increasingly balanced approach to IT governance where investments were planning across new product innovation, integration of existing projects and optimization of the IT architecture. By 2015, as time-to-market and quality had become increasingly important, the senior information officer decided to increase the IT staff from around 380 to 430, while the IT organization started to look into how it could carry out its projects with less governance to decrease time-to-market. One method it used was decreasing the length of requirement specifications of new IT projects significantly (Elkær 2015).

6 DISCUSSION

As described above, TDC went through four different logics (Figure 3). Changing institutional pressures generated these logics since TDC was established in 1995 and until 2015. As our findings show, the shifting logics resulted in different architecture governance approaches (Table 2).

Table 2. How TDC went through dominating by logics that influenced governance practice			
Period	Bureaucracy, market logic (1995–2005)	Efficiency logic (2006–2010)	Customer logic (2010–2015)
Changes in organizational field	Regulative pressures from the EU and Danish government liberalizes the telecom industry. Standardization of technologies. Fierce competition within market and consolidations.	Private equity funds were thriving and acquired companies for profits. Equity owners make performance improvements. Saturated market and increased price competition.	Private equity funds sell shares. Rapid technology development: Technology moves to “All IP” while mobile technologies become increasingly widespread—breaking up the value chain and enabling new avenues for growth.
Dominant logic(s)	Compete through investments and acquisitions.	Drive efficiency, remove waste and redundancies.	Improve customer experience and become more innovative.
Secondary logics	Bureaucracy logic was secondary from the beginning of the 2000s.	Market logic and bureaucracy logic	Market logic, bureaucracy logic and efficiency logic
New governance practice	Compete through IT investments. Bureaucratize and formalize. Buy systems to support business processes. Make IT responsible for common governance methods.	Outsource to drive efficiency and reduce costs. Architecture governance focus on migration to a new IT platform. Reduce operational expenses. Remove redundant systems.	Outsource as a strategic partnership. Orient governance toward customers. Significantly improve customer experience. Govern from multiple perspectives.

The concept of constellation of logics (Goodrick and Reay 2011) is useful in describing how governance at TDC in the end followed strategies and goals related to efficiency, customers and innovation, but used heavy formalization to follow them—reflecting that the bureaucracy logic persisted to some degree. Viewing the shaping of IT governance as a changing constellation of logics also indicates how governance and practices within the IT organization result from competition or cooperation between logics (Goodrick and Reay 2011). Thus, while outsourcing of staff was an option during competitive market logic, it did not really take off before efficiency logic sought further cost reductions.

Although TDC did start to think more about its customers from 2010 to 2015, the efficiency logic still had some influence—probably because the telecom industry was still highly price-competitive. However, these two logics were rather conflicting. While the efficiency logic sought to reduce costs through outsourcing and optimization of the platform, the customer logic prioritized customer experience, quality and new product innovations. The conflict between the efficiency logic and customer logic led TDC to pursue the balanced approach to IT governance described in the analysis. In this way, the goals of the different logics could be realized.

Our analysis shows how different logics formed a constellation that resulted in IT governance from multiple perspectives. While the customer logic competed with the efficiency logic, they coexisted as shown through the different governance approaches. In general, our analysis suggests that different logics did indeed coexist for long durations (Table 2). While little is known as to how competing logics can coexist for longer durations (Marquis and Lounsbury 2007; Reay and Hinings 2009), our analysis suggests that this is facilitated by the governance approaches and that shifting logics are *embedded* into governance practices. This embeddedness of logics, sometimes into practices and artifacts such as checklists and tools, enables conflicting logics to coexist longer. For example, the dominating institutional logic at TDC changed around 2010. However, as the efficiency logic remained embedded into its governance practices, the efficiency and customer logic competed within the IT organization. While it has been shown how individual actors can support the ongoing existence of competing logics (Reay and Hinings 2009), we believe this is the first study to show how governance can similarly sustain the existence of competing logics.

6.1 Implications and Future Research

IT governance has been described as the discipline concerned with specifying the framework for decision rights and accountabilities (Weill 2004). Further, IT governance defines processes, structures and relational mechanisms within the organization to enable alignment and business value (Van Grembergen 2013). As such, IT governance literature has largely concerned rational, normative frameworks (e.g. Simonsson et al. 2007), resulting in linear progression of IT governance toward formalization and adoption of best-practice frameworks (Ekstedt et al. 2010). By using institutional logics as theoretical lens and sensitizing device to study architecture governance practice over time, the case study shows how architecture governance at TDC was not merely a result of linear progression toward increased formalization and control. Thus, our research provides a more detailed and dynamic picture of the shaping of architecture governance than traditionally provided. In the case of TDC, we saw how logics—shaped by the competitive environment, technological developments, normative and regulative elements—shifted TDC’s governance focus. This shows the complex, contextual process, involving competitive environment, strategy, internal conditions, culture, ownership structure and underlying architecture, that shapes IT governance. While literature has emphasized the importance of these contingency factors, it has thus far done so in a more deterministic sense; showing how one can choose the best governance approach based on certain factors (Brown 1997; Brown 1998; Peterson 2004; Weill and Ross 2005). We believe the current study is the first to unravel the black box of IT governance to show how the shaping of IT governance happens through the interplay of factors that cannot always be predicted or controlled.

By using institutional logics to study the antecedents of IT governance, we thus show that the traditional emphasis on rational choice in shaping IT governance is simplistic. This calls for more in-depth qualitative studies of IT governance, emphasizing its social, temporal and contextual shaping.

The potential business value of IT governance is generally understood (Buchwald et al. 2014; Weill 2004; Weill and Ross 2005). Meanwhile, recent research has shown the mediating effect of strategic alignment and different governance mechanisms in achieving business value from IT governance (Wu et al. 2015). While the study shows that IT governance does not deliver value without strategic alignment, the alignment literature has not used qualitative approaches (Chan et al. 2006; Wu et al. 2015). As a result, little is known about how and when certain governance mechanisms can be strategically aligned. We propose that institutional logics might be important in understanding alignment between IT governance and the business. One could, for example, imagine IT governance to be counterproductive, if the dominant logic within an IT organization is directed only toward cost reductions, while the corporate logic is oriented toward customer value and innovation. As our study shows, governance decisions were aligned, at various degrees, with institutional logics rather than solely with strategic choices. We believe this insight might spark new ideas on IT alignment literature as well as IT governance, with more emphasis on the institutional and social context. Strategic alignment is probably not enough to make IT governance successful. Rather, institutional alignment might be necessary. This implies that governance approaches should be aligned, not just with strategy, but also culture (Silvius et al. 2009), organizational field and organizational antecedents.

Our case study contributes to institutional theory by showing how logics can be embedded into governance practice. It thus facilitates the existence of competing logics over a longer duration. As our study, seemingly, is the first to explore the social shaping of IT governance through institutional logics, we hope more research on this matter will follow. We believe that such studies could enrich current knowledge on IT governance and clarify the relationship between changing institutional logics and IT management areas such as IT governance, project management and enterprise architecture.

6.2 Contributions to Practice

Our study also has a number of contributions to practice. Overall, it shows how IT governance can enable different strategies such as market growth, internal efficiency, innovation and greater customer experience—or even enable several strategies at once. It also shows that governance

mechanisms cannot be treated as static. While various maturity frameworks (e.g. Pederiva 2003; Symons 2005) can give the impression that IT governance adjustments stop at the highest maturity level, our case study shows that IT governance, in practice, undergoes continuous readjustments. New logics emerge from changes inside and outside of the organization. While different maturity frameworks do indicate the level of control and formalization, it can hardly indicate much about the adequacy of governance processes. Instead, IT should align and reassess these as overall company strategies and environmental conditions change. We believe that organizations, by knowing the factors that shape and influence their governance approaches, can make be more reflective when making decisions on governance.

7 CONCLUSION

In this study, we set out to investigate how institutional logics shaped architecture governance at TDC. By using institutional logics as a sensitizing device, we have shown what institutional logics and other factors shaped architecture governance at TDC over time. As TDC went through four different dominating logics, the overall governance approach changed. While mainstream literature on IT governance and EA emphasizes linear progression toward increasingly formalized and control-based governance, our longitudinal case study of 25 years of IT governance development at TDC shows that it is shaped through a complex, social process. We thus make an important contribution to IT governance literature by challenging rational models and frameworks that omit the social shaping of IT governance, as these have primarily been developed through a rationalistic view of organizations through the lenses of contingency theory, rational choice theory and agency theory (Jacobson 2009).

While it can be tempting for organizations to apply best-practice governance frameworks to their organization and measure governance maturity according to compliance with such frameworks, it is possible that this is counterproductive. In the case of TDC, the IT governance approach was shaped over a longer duration in accordance with the dominating logic at the time. These logics, in turn, came about due to a number of factors to which the organization had to adapt itself. If a company is not aware of how its governance approach reflects, or does not reflect, the logics of the organization, IT governance runs the risk of becoming counterproductive. Additionally, we make an important contribution to the current understanding of how competing institutional logics can coexist for a longer duration by suggesting that their coexistence can be facilitated through their embeddedness in governance practices.

The main limitations to our study are related to our methods. First, we were not able to conduct interviews and observations outside of the IT organization. This meant that we did not have a direct account from, for example, senior business executives. We made up for this by gathering a large amount of both public and internal documents describing the visions and challenges facing TDC. Second, gathering retrospective data can be associated with recall errors (Singh et al. 2015). As described in our methodology, we tried to triangulate and verify data based on personal recall to compensate for this limitation.

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PAPER 5

BEYOND THE FRAMEWORKS: ARCHITECTURE GOVERNANCE AT THE LEGO GROUP¹¹

Author(s): Peter Andersen

ABSTRACT

While the literature on IT governance and enterprise architecture (EA) largely focuses on normative frameworks, there is little knowledge regarding how these disciplines are actually carried out in organizations. As digitization is challenging organizations to adapt themselves, current theories and frameworks on IT governance and EA risk becoming increasingly outdated. Departing from a case study conducted at the LEGO Group (LEGO), architecture governance was studied. Architecture governance is seen as a subset of IT governance mechanisms, processes and structures related to the EA effort. As a result of the study, a number of factors related to the architecture governance effort were identified as critical in building LEGO's highly mature and integrated IT platform. Based on LEGO's approach to architecture governance, it is discussed how IT governance, in general, can be extended by alternative views that supplement and extend the traditional view on IT governance. Overall, the case shows how ongoing learning, collaborative networks, and adaptation were central to how the IT platform was built and governed at LEGO. Keywords: Enterprise Architecture; case study; information systems; project; resource-based view; capability

Keywords: enterprise architecture, architecture governance, IT governance, case study

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1 INTRODUCTION

Enterprise architecture (EA) initially emerged as a technical discipline (Zachman, 1987), but has become increasingly recognized as a crucial part of business and IT management. Over the years, it has received increased attention within research (Simon et al., 2013). EA is often described as a holistic discipline concerned with technical architecture, overall strategy, and business elements (Bernard, 2012).

For organizations, EA has proven to be an important asset that can provide a number of business benefits such as reduced IT costs, increased IT responsiveness, reduced business risk, greater data sharing, strategic agility, and operational excellence (Ross and Weill, 2005). However, achieving them has proven to be difficult and often unsuccessful (Ross et al., 2006, Roeleven, 2010). Meanwhile, researchers and practitioners have developed prescriptive frameworks, methods, and architecture guidelines to direct the EA effort within organizations (Andersen and Carugati, 2014, Simon et al., 2013). EA has become increasingly professionalized with formal educations and certification such as TOGAF, “The Open Group Architecture Framework” (Group, 2009). However, little research has sought to describe how EA is carried out and governed in organizations (Andersen et al., 2015, Simon et al., 2013).

EA scholars need to rethink how they can contribute in new ways to both practice and research so that EA efforts can be executed more successfully. In order to do so, EA research needs to go beyond prescriptive research describing traditional EA practices primarily rooted within the IT organization and preoccupied with, for example, mapping the technical architecture. Instead, the real, lived experience of EA work needs to be analyzed and understood in its complex social setting, and how organizations utilize EA today, and how it has developed over time. As some research has indicated, architecture governance – understood as the IT governance mechanisms, processes, and structures related to the EA effort – has been identified as the most important success factor for the EA effort (Schmidt and Buxmann, 2011). This inspired an in-depth investigation of the phenomenon to learn about the actuality of architecture governance and discuss how insights from the case could possibly contribute to the further development of the field through new insights.

The paper builds on a case study conducted at The Lego Group (LEGO), investigating the evolution of architecture governance practice of what went on to become one of the most successful toy companies in the world. The case study was guided by the following research questions: “*How is architecture governance carried out at LEGO?*” and “*how do the findings relate to mainstream architecture governance and IT governance thinking?*” The data collection was carried from over

two periods between 2012 and 2015. The analysis indicates that, although EA as a discipline is highly formalized, the enterprise architects at LEGO utilized few formal governance methods and frameworks. Instead, architecture governance was largely carried out by utilizing strong networks, ongoing learning, and a culture for collaboration and coherence that management sought to strengthen even further through a business transformation initiative.

The remainder of the paper is structured as follows. First, a conceptualization of IT governance, EA, and how the two disciplines mutually constitute architecture governance is provided. Secondly, the methods used to collect and analyze the data will be accounted for. Subsequently, a presentation of the analysis and findings of the case study is presented followed by a discussion of the findings in order to provide recommendations for further research and practical implications. Finally, a conclusion will be made based on the analysis and discussion of the case.

2 CONCEPTUALIZATION: IT GOVERNANCE, ENTERPRISE ARCHITECTURE, AND ARCHITECTURE GOVERNANCE

IT governance and EA are tightly linked. Without both, companies cannot invest wisely into IT (Ross et al., 2006). While the importance of the two disciplines is generally understood, the mutual interdependence of EA and IT governance has been largely overlooked. Rather than dealing with the disciplines of EA and IT governance separately, in this paper, they will be addressed jointly as ‘architecture governance’ because building the underlying architecture requires good governance, and because, to be effective, governance decisions must be guided by the architecture vision. First, however, both IT governance and EA will be introduced and conceptualized.

2.1 IT Governance

IT governance is, like EA, a rather new research phenomenon within the field of IS and did not receive noteworthy attention before the late 1990s (Brown and Grant, 2005). While various definitions of IT governance exist, the most commonly used definition seems to be the one provided by Weill: “Specifying the framework for decision rights and accountabilities to encourage desirable behavior in the use of IT” (Weill, 2004, p. 3). Furthermore, IT governance as a discipline is not only concerned with defining decision rights and responsibilities (who), but also with the question of how to govern IT. As Van Grembergen (2013, p. 1) puts it, IT governance also “addresses the definition and implementation of processes, structures and relational mechanisms in the organization that enable both business and IT people to execute their responsibilities in support of business/IT alignment and the creation of business value from IT-enabled business investments.”

However, as academic literature on the topic has been rather conceptual (Brown and Grant, 2005), research has not been able to fully unravel the ‘black-box’ of IT governance and explore how organizations implement structures, processes, and the relational mechanisms necessary for IT governance to ensure alignment and create business value. Thus, when reviewing current academic literature on IT governance, Brown and Grant found that “the majority of research on governance uses a conceptual examination of various IT governance frameworks propositions. Few researchers attempted to perform empirical studies on this topic” (Brown and Grant, 2005, p. 698). Similarly, Williams and Karahanna point to the fact that, while past research has focused on the efficacy of various coordination mechanisms, there is a lack of insight as to *how* and *why* the various mechanisms take place (2013). As such, research on IT governance remains aggregated with little knowledge on the impact of organizational context, politics, and culture (Brown and Grant, 2005). Sambamurthy and Zmud (2000) noted that some case studies (El Sawy et al., 1999, Clark et al., 1997, Cross et al., 1997) indicated a gap between scholarly research and practice. These studies showed how senior IT executives turned traditional governance upside down by using other mechanisms than those posed within the literature (Sambamurthy and Zmud, 2000). However, several years later, it seems IT governance literature and practice is still highly centered on governance structures and frameworks. This is expressed through the focus on formalized IT governance frameworks by practitioners such as COBIT, Val IT, ITIL, PRINCE2, Six Sigma, and ISO 27000 (Aileen, 2009, ITGI, 2011). Providers of such frameworks advice organizations to utilize IT consultancies and market analysts to provide guidance, use formal policies and standards, and certify employees (ITGI, 2011). Thus, IT governance practice tends to emphasize rationalization, formalization and normative approaches through the use of, for example, formal frameworks.

2.2 Enterprise Architecture

Overall, EA is a holistic discipline concerned with the technical architecture, overall strategy and business elements (Bernard, 2012). These elements are coherently described and understood through “principles, methods, and models that are used on the design and realization of an enterprise’s organizational structure, business processes, Information systems, and infrastructure” (Lankhorst, 2005, p. 3). This encompasses planning and understanding of the different organizational levels: the business, operational, and technology levels. For each level, the current state (as-is) is described together with an envisioned (to-be) state (Wegmann, 2002). EA has received increased attention within research (Simon et al., 2013), but is still in its infancy, while no common understanding and conceptualization of EA has been achieved.

As with IT governance, researchers and practitioners within EA have developed prescriptive frameworks, methods, and guidelines to direct the EA effort within organizations (Andersen and Carugati, 2014, Simon et al., 2013, Langenberg and Wegmann, 2004). Meanwhile, EA has become increasingly professionalized with formal educations and certifications such as TOGAF (Group, 2009), while little research has sought to describe the “actuality” of how EA is carried out and governed in organizations (Andersen et al., 2015, Simon et al., 2013). For organizations, EA has proven to be an important asset that can bring a number of benefits such as reduced IT costs, increased IT responsiveness, greater data sharing, strategic agility, and operational excellence (Ross and Weill, 2005).

2.3 Architecture Governance

Although the benefits of EA have been well documented within research (Lange and Mendling, 2011, Lange et al., 2012, Ross and Weill, 2005, Niemi and Pekkola, 2009, Niemi, 2006), organizations are often unable to realize them due to a lack of governance of the EA effort (Kearns and Sabherwal, 2007, Weill, 2004, Weill and Ross, 2005, Wu et al., 2014). Thus, architecture governance has proven to be the most important success determinant of EA management (Schmidt and Buxmann, 2011). The interdependence of governance and architecture is particularly visible in practices like architectural reviews of project proposals, placement of architects on project teams, and the use of EA principles (Ross et al., 2006, p. 102-103), and can be defined as “the practice and orientation by which enterprise architectures and other architectures are managed and controlled at an enterprise-wide level” (Group, 2011, p. 21). Overall, architecture governance ensures that the strategic EA plans are delivered and implemented. Figure 1 illustrates how architecture governance is conceptualized here as a subset of IT governance practices related to how projects are planned, managed, and executed based on the EA planning.

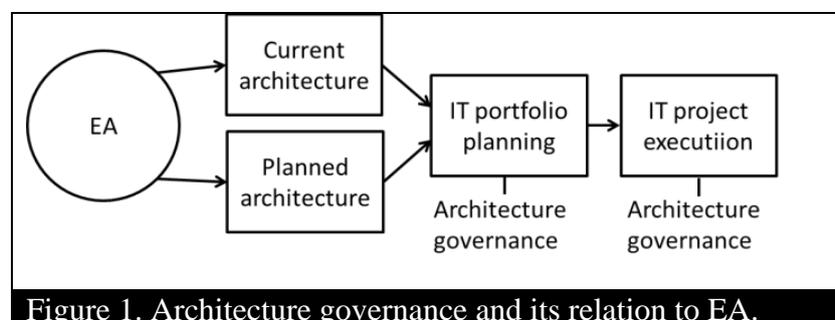


Figure 1. Architecture governance and its relation to EA.

As Figure 1 shows, architecture governance is mainly related to governing the prioritization, planning, and execution of projects related to the current or planned architecture. The EA effort can also be carried out through larger programs or smaller changes not categorized as projects, but still

involving architecture governance. Departing from this conceptualization, the current case study sets to investigate architecture governance by focusing on the efforts directed at building the IT platform at LEGO.

3 METHODS

Following Stake (2005), a case study approach was employed to provide a rich description of key events within, and surrounding, LEGO. Purposive sampling (Kuzel, 1992) was used to select LEGO as a case based on a number of considerations. Firstly, LEGO makes an interesting case from an EA perspective due to its large size and global operations – making the integration and standardization of data and processes quite a challenge. Secondly, LEGO has been known for its special culture based on Danish values of flat hierarchies, consensus, and openness combined with the ideals of the family owners. Thus, the anticipation was that LEGO could provide an interesting example of how architecture governance could be carried out in a somewhat different way than how the discipline is typically described. Thirdly, LEGO has had tremendous success the last decade after a remarkable turn-around in 2004. In relation to this, it would be interesting to learn about how architecture governance practices developed within LEGO possibly contributed to the success of the company. The data were collected over two phases. The first phase lasted from March 2012 till July 2012, while the second phase was from August 2014 till April 2015. A retrospective analysis was utilized to understand key events over more than 20 years. As such, the case study is of longitudinal character – providing temporal and contextual meaning to the studied phenomenon (Mason et al., 1997).

The interviews were conducted at the LEGO headquarters in Billund, Denmark and via online video and telephone interviews. Interviews were conducted with a wide range of people such as the Chief Executive Officer (CEO), the Chief Information Officer (CIO), the head of IT operations, the head of the EA team, and a number of enterprise architects, internal consultants, and IT project managers. With the consent of the respondents, each interview was recorded. Snowball sampling (Biernacki and Waldorf, 1981) was generally used as a method to identify actors with considerable knowledge of the LEGO IT platform, architecture governance practices, and strategic insights. The first phase of interviews and observations was carried out from March 2012 till July 2012 and consisted of one observation and 10 interviews with key informants within corporate IT (Table 1) to learn about the intentions of a new business transformation project carried out across LEGO to increase coherency and collaboration across the organization.

Table 1. Overview of collected data during the first phase.

Interviews are indicated by an “T”, observations by an “O”				
Method	Time	Participant(s) from LEGO	To understand/explore	Dur
O	Mar.12	IT Town Hall Meeting	Business transformation program	00:46
I	Mar.12	Head: PM Excellence Team	Project model and execution of projects	00:35
I	Apr.12	Head: Change Management	Transformation and its execution within IT	00:20
I	Apr.12	Senior Change Manager	Execution of the business transformation	00:28
I	Apr.12	Change Manager	Execution of the business transformation	00:31
I	Jun.12	Head: Project Portfolio	The governance of the project portfolio	00:27
I	Jun.12	Change Manager	Execution of the business transformation	00:23
I	Jul.12	CIO	Strategic intentions of the transformation	00:23
I	Jul.12	Program Manager	Governance of large architecture programs	00:14
I	Jul.12	Head: Change Management	Transformation and its execution within IT	00:16
I	Jul.12	Change Manager	Execution of the business transformation	00:18

By August 2014, the second phase of data collection was initiated. Now, the business transformation effort had finished, and focus shifted to understanding how architecture governance had developed during and after the transformation program. Since one of the aims of the transformation program was to enable collaboration and governance across the entire organization, interviews were also conducted with the CEO and the Head of Technology and Open Innovation. During the second phase, 13 interviews (10 held individually and three as focus groups) were conducted together with five supplementing, non-participant observations of the so-called EA challenge sessions where a team of architects governed the ongoing project portfolio from an EA perspective (Table 2).

Table 2. Overview of collected data during the second phase.

Interviews are indicated by an “T”, observations by an “O” and focus group interviews by an “F”				
Method	Time	Participant(s) from LEGO	To understand/explore	Dur
O	Aug.14	Challenge Session Participants	Understand architecture governance	01:30
O	Sept.14	Challenge Session Participants	Understand architecture governance	01:30
F	Oct.14	Head: IT Operations and CIO	Transformation impact on arch. gov.	01:38
O	Nov.14	Challenge Session Participants	Understand architecture governance	01:30
I	Nov.14	Enterprise Architect # 3	Arch. gov. and challenges	00:43
I	Nov.14	Enterprise Architect # 2	EA challenge sessions	00:48
F	Nov.14	Enterprise Architects # 1, 4	IT platform and governing principles	02:29
F	Nov.14	Enterprise Architects # 1, 2, 3	Current arch. gov. practice	01:00
I	Nov.14	Enterprise Architect # 5	Arch. gov. vs. business strategy	26:29
I	Nov.14	Enterprise Architect # 6	Learn about current approach to EA	23:56
O	Dec.14	Challenge Session Participants	How projects are governed	01:30
O	Dec.14	Challenge Session Participants	How projects are governed	02:30
I	Dec.14	Head: IT Operations	Development of arch. gov.1990s–2014	01:13
I	Dec.14	Project Architect	How architects work with business	00:52
I	Jan.15	Head: Logistics, Corporate IT	Discuss development of the IT platform	00:53
I	Feb.15	CEO	CEO’s view on arch. gov.	00:20

I	Mar.15	Enterprise Architect # 1	Influence of transformation program	01:03
I	Apr.15	Senior Director, Technology	Governance across business	00:23

Apart from the conducted interviews and observations, different internal documents were also collected. These included strategic principles, architecture governance documents, IT platform overviews, guidelines for architecture challenge sessions etc. In total, this amounted to more than 200 pages of written material. Lastly, a large amount of secondary data sources were reviewed, such as annual reports, newspaper articles, published papers etc., for triangulation (Flick, 2006) of the historic accounts, as retrospective analysis can be associated with biases such as recall errors (Singh et al., 2015). In this way, it was made sure that specific events were studied through several accounts and supplemented by written, internal material and public documents.

Interview transcripts and research notes from interviews and observations were subsequently used in an iterative, inductive coding (Thomas, 2006) using the Nvivo software. Through this coding, three key themes emerged that were relevant to how architecture governance was carried out at LEGO. These were the *LEGO light program* started in 1999, a *business transformation* program initiated in 2011, and recent plans to build a new *engagement IT platform*. This was followed by a deductive coding through which text segments were formed into codes for each of the three themes (Figure 2).

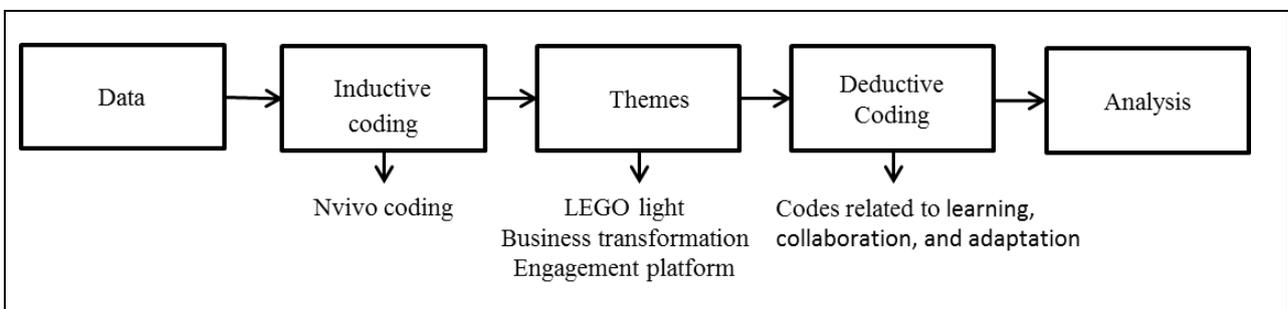


Figure 2. Illustration the data analysis process.

The analysis of the codes within each theme led to the identification of learning by doing, collaborative networks, and adaptation as key to the way LEGO built and governs their IT platform.

4 LEGO INTRODUCTION

In 1932, LEGO was founded in Billund – a small town in Denmark. In 1958, the LEGO brick that today is essential to the company was launched. Since, it has transformed the company from a small carpenter’s workshop, into a global manufacturer of toys. By September 2014, LEGO had grown to become the biggest toy company in the world with more than 10 years of consecutive growth and 14,762 employees. Revenues were generated from products sold and distributed across 140

countries and the turnover reached 28.6 billion DDK (approximately 3.93 billion Euros) by the end of 2014. When asked, the CIO largely attributed the success of the company to the IT platform, which was built and governed by a number of collaborative processes across the company.

The enterprise IT platform is our strength. We are running all these super coherent collaborative processes...the outcome is a platform that we can leverage the hell out off. (CIO, 2014)

The case shows how architecture governance has traditionally been carried out at LEGO and how the CIO utilized a business transformation process to strengthen collaborative architecture governance mechanisms across the organization further.

5 ANALYSIS AND FINDINGS: ARCHITECTURE GOVERNANCE AT LEGO

Through the analysis, it was revealed how the IT platform had been an important factor in LEGO's recent success. According to the CIO, the importance of the IT platform was known by all the senior executives.

It is all the software and hardware that runs beneath human interaction. The proven success of that platform – where other companies have failed and we have succeeded – means that the top leadership team understands the value of this integrated platform and which strategic principles it is designed around and how it hugely contributes to the bottom-line of the company. (CIO, 2014)

Interestingly, by talking to IT leaders and enterprise architects, it was revealed how the IT platform was governed by collaborative teams and knowledge receding within individual employees. Rather than relying on formalized frameworks, tools, and processes, architecture governance at LEGO seemed to be highly informal. Still, architects and the CIO claimed that everybody in the organization understood the importance of the IT platform. From an architecture governance perspective, three ingredients contributed to the success of the IT platform: collaborative networks, learning by doing, and ongoing adaptation of the governance effort.

5.1 Architecture Governance through Learning by Doing

One of the first steps in understanding how LEGO utilized architecture governance was to investigate the development of the LEGO IT platform and talk to one of the fathers of the IT platform – who has 28 years of experience within the company. Interestingly, it was pointed out that the IT platform was the result of several failed attempts to implement a common enterprise resource planning system across the organization. This journey started in the early 1990s with enterprise solutions becoming increasingly popular. At this point in time, LEGO implemented different

instances of enterprise systems from the same vendor, but with no governance regarding master data management or global processes. Subsequently, the senior executives decided to gather all the different systems and data on one server in Billund. As everything started to malfunction, management realized that they were sitting on a dying IT platform.

Driven by an intensifying crisis within the company, an architecture governance program called LEGO light was initiated to sort out the company's data and processes. With LEGO light, the aim was to establish a global, efficient, and simpler IT platform. The people working with LEGO light understood that a successfully implemented IT platform required fundamental changes to the autonomy of the business and close collaboration within LEGO and with its suppliers and retailers.

We standardized payment conditions. This suddenly meant that you have 60,000 customers [retailers] that you have to go out and talk to. That is a lot! But you won't get done if you don't start. We made some hardcore decisions at that time. (Senior Director, Corporate IT Operations, 2014)

The LEGO light program that was initiated around the end of 1999 essentially focused on building the future IT platform for LEGO, and bringing order to the information warehouse. From a hardware perspective, the focus was on SAP solutions as the global set-up with global standards. This meant, from a business perspective, that business processes across LEGO had to be standardized and governed.

In the end, by guiding the LEGO light program with a simple set of principles and having sufficient backing from management, the relatively small team began having success with globally standardizing the IT landscape and enforcing architecture governance around data standards and global processes. However, LEGO did not utilize theoretical knowledge or normative frameworks related to architecture governance.

We didn't use those conceptual words. It was taught by pain. We were beaten so much by the two previous enterprise installations that the third time we got it right by taking all the information from the previous failures into consideration. We learned from these failures, one thing LEGO is very good at is learning from mistakes. (Senior Director, Corporate IT Operations, 2014)

Although LEGO had now begun implementing architecture governance, the company had still not fully built a mature underlying architecture, and the work on the IT platform continues to this day. Interestingly, many of the people who worked on the LEGO light project are still working within the company more than 15 years later. According to the CIO, LEGO's cultural emphasis on

learning and curiosity coupled with the ability to retain employees has created a special ability to learn from past mistakes and continuously improve the IT platform and architecture governance approaches.

You don't fire people for making mistakes; you fire people for not asking for help. Because that is the sort of value-based company that we are, and because of the behavior we have around learning. Sometimes we start poorly, but in the end, we actually become pretty sharp at doing things. LEGO is a constant learning machine. (CIO, 2014)

As pointed out by the current CIO, the ideas behind LEGO light were intuitively right and architects and IT managers knew (from their experience and learning) the importance of governing data and processes. Consequently, the CIO decided to formalize this learning into eight strategic principles when he came into the company in 2007.

He [one of the IT platform fathers] intuitively did the right thing, but I was afraid that if he got a brick in the head – and I don't mean a LEGO brick, but something heavier – would we then be able to solve, guide, and guard the enterprise platform? So, we made some strategic principles saying this is how we run, this is how we design the enterprise platform, and these are the principles we live and die with. (CIO, 2014)

The first and most important of these principles is: one LEGO Group based on global standards and global processes. The second is that any new application is a strategic decision.

The crisis at LEGO continued until 2004 when it was at its peak. At this point in time, a new CEO was hired to facilitate a turn-around of the company. The first step of this turn-around was to streamline the supply chain and build the underlying IT platform. From an architecture governance perspective, this was largely supported by establishing a range of collaborative networks.

5.2 Architecture Governance through Collaborative Networks

Like most other organizations, LEGO has typical IT governance functions within the IT organization such as a portfolio management office and steering groups for IT projects. However, critical to architecture governance and the LEGO IT platform were the Process Expert Networks (PEN), and EA 'challenge sessions'.

For LEGO to build a mature IT platform, it was necessary for the organization to start enabling global processes and an integrated supply chain. As a result, LEGO started to create process owners, document their processes, and create architecture governance to support the effort. This

involved PENs at an operational, tactical, and strategic level. At the operational level, key users from the business were put together with, for example, an application architect to improve functional solutions and processes. At the tactical level, there would be cross-functional teams with process-owners ensuring global thinking and integration while super users, consisting of both IT and business managers, would ensure strategic and global coordination. These networks created alignment between the business and IT by making business people manage and own part of the LEGO IT platform.

The PEN is a group of IT and business people who get to own part of the platform. So, they are accountable for part of the platform and need to consider which changes needs to be made. (Senior director, corporate IT operations, 2014)

Thus, the different PENs served to bridge the functional and organizational gaps within the organization. They also governed the overall process optimization through formal audits and reviews, by approving the processes documentation in project, and giving input to the business cases. However, the PEN network also ensured knowledge sharing across the organization and delivered business process training for the organization. Essentially, the organization served as a think tank that informed the line functions of the importance of architecture across the business.

While PEN took care of the global processes across LEGO, another important network for architecture governance at LEGO was the EA challenge sessions. Here, projects deemed to have an impact on the architecture were challenged by a network of architects, with representatives from IT management and business. Today, the challenge session is a forum where the current EA excellence team – which coordinates the overall EA effort across the business – challenges the current pipeline of projects.

They [project managers and responsible architect] are there to be challenged: "Why are you going this way? Have you thought about this? What are the criteria? Have you adhered to our IT strategic principles?" Those kinds of questions. (Enterprise Architect, 2015)

During the challenge session, a one-page checklist is discussed in relation to the project. The checklist goes through whether standard architecture deliverables have been made, such as security and infrastructure analysis, followed up by questions related to the impact on the IT platform, what the complexity is, if there are new applications involved etc. Additionally, the project responsible must identify the top three architecture risks, which are then discussed during the challenge session. On commonality to both the challenge sessions and the PEN network was a shared vision and goal

to protect the LEGO IT platform. Without being approved in the challenge sessions, a project could not be initiated.

During the challenge sessions, it is also decided whether a design authority should be assigned to the project. The design authority ensures architecture governance throughout the whole project by making sure that the projects follow what has been agreed upon during the challenge session, and that no unforeseen architecture problems arise. According to one of the architects currently involved as a design authority, the strategic principles formulated by the CIO were often used by the architects as guidance.

Apart from the challenge sessions and PEN network, architecture governance at LEGO involved collaboration across the organization – involving many stakeholders. For example, the IT department would often train and assign their own process owner from within IT if they could not find one from the business. Thus, the responsibility could sometimes be within or outside of the IT organization. According to the CIO, this could work for LEGO because they had a very flat organization.

LEGO is an extremely flat organization. The more flat the organization you have, the less you have to worry about formal things, like where the business process owners and the business architects sit. (CIO, 2014)

As the LEGO IT platform matured, and new business challenges arose, architecture governance and the role of the architects shifted. Initially, the IT organization at LEGO had to focus the governance effort on building and protecting the IT platform. Now, due to emerging digital opportunities, LEGO had to reconfigure its architecture governance efforts to gain increased business proximity, embrace innovation and become more agile.

5.3 Architecture Governance Adaptation

By September 2011, LEGO had nearly tripled its turnover since 2005 by optimizing the business internally regarding the IT platform and supply chain. Meanwhile, the number of employees had grown from 3,500 to 10,000. While LEGO had always had a culture for collaboration due to a flat hierarchy and family values based on *imagination, caring, fun, creativity, and learning*, there was a need to now push collaboration even further to remove the barriers that had grown between different business divisions and the IT organization. By making the organizational hierarchy even flatter across the whole organization, and removing the formal board, the aim was to become more innovative and deal with the silos that had grown as the organization had tripled in size. Therefore,

the CEO introduced a business transformation initiative across LEGO. The aim was to strengthen the LEGO culture while making the organization more agile, innovative, and competitive – despite its larger size – by utilizing collaboration and networks even more as architecture governance mechanisms.

Within IT, the organization was moved closer to the business together with the architects by structuring the IT organization around the main business areas: marketing, operations and business enabling. According to the CIO, it had become essential to move IT closer to the business. Instead of being structured as a traditional plan, build, run IT organization, the IT organization now needed to look beyond its own efficiency and focus on the value added for the entire organization. Instead of deep, functional experts in narrow areas, people needed a broader skillset and the ability to adapt and collaborate. For the enterprise architects, this meant that they became distributed across the areas of the business to increase their proximity to the business and govern the architecture proactively. Meanwhile, the functional synergies were kept by having an overall virtual organization – the EA excellence team. According to the CIO, LEGO had to adapt and transform itself because of the recent growth. Because of the size of the organization, it was no longer pivotal to centralize the knowledge around, for example, architecture. Instead, the rationale was that the organization had now become large enough to distribute the knowledge across the vertical lines of the business. By involving architects from all business areas, synergies and coordination between the business areas was enabled. Additionally, the distribution meant that the enterprise architects could proactively shape the portfolio.

It is about shaping the decisions and being proactive early. You get the good results not by having a theoretical mandate and saying ‘this is how things are’, but by being involved early with the business, shaping them, making them understand the rationales that you have. (Enterprise Architect, 2015)

According to the CIO, the business transformation at LEGO had resulted in stronger collaboration across business areas. This made it much easier for the CIO to bring the architecture matter to the level of the senior executives.

There is nearly no politics in this company when you consider the size, which is really weird, but it is because that is the level of collaboration we have. For me, it is like Christmas every day. For a CIO, if a company with different departments cannot collaborate, you kill any initiative, and you also kill the architecture in it. (CIO, 2014)

The issue of architecture was now brought to the business leaders and senior executives through collaborative governance across LEGO, which made sure that major IT investments were aligned across the business and involved the right people.

I really believe we have that [a good governance process] and you can explore that further with Henrik Amsinck [the CIO]. He's a maestro at that. We're doing governance collaboratively across the organization and involving the low levels, high levels, and so on. It's an excellent process. I have great confidence in that. (CEO, 2015)

These collaborative processes were, for example, used in relation to new product launches where it would be made sure that all key people were involved.

Part of our innovation process is that all the big players are present and part of the discussions already at the early stages of our innovation process. For example, we discuss what the risks are from a supply chain point of view. (Head of Technology and Open Innovation, 2015)

By 2015, LEGO was more innovative than ever, and the number of digital initiatives within the company had grown from 5 to 30% within a couple years. While LEGO was launching a range of new products – bridging the physical and digital world – the company had launched new digital consumer platforms such as a digital education platform and an open innovation platform. While the old IT platform had been built and governed to ensure a well-integrated and stable IT platform, the intensified focus on digital engagement with consumers led management to explore the possibility of building a second IT platform oriented towards consumer engagement. From an architecture governance perspective, IT management started looking into a more agile, bottom-up approach where structured and clear business cases would not be favored over experimental and innovative ideas. Meanwhile, collaboration with users, vendors, and business would be taken even further. Overall, traditional approaches to architecture governance would persist regarding the old IT platform, while new approaches and skills were required for LEGO's next IT platform. While LEGO had governed its old IT platform on the principles established on learning from the LEGO light program, these principles, and the approach to architecture governance, were increasingly challenged by more agile principles as LEGO started to explore bimodal approaches to govern and organize IT (Gartner, 2015).

6 DISCUSSION AND CONTRIBUTION: ARCHITECTURE GOVERNANCE BEYOND THE FRAMEWORKS

By looking at architecture governance as a subset of IT governance processes, structures, and mechanisms, a range of new insights emerged concerning IT governance, in general, and its relation to EA. While the literature on IT governance is dominated by a normative discourse and frameworks (Hansen and Kræmmergaard, 2014), few researchers have attempted to perform empirical studies on the topic (Brown and Grant, 2005, p. 698, Williams and Karahanna, 2013). By studying architecture governance at LEGO, the ambition was to enrich the field with new perspectives and insights beyond current frameworks. From the findings, a number of key insights emerged that extend and supplement the traditional view on IT governance, in general (Table 3).

Table 3. Comparison of traditional and alternative view of architecture governance.		
Focus	Traditional IT governance view	Alternative IT governance view
Conceptualization	A framework for decision rights and accountabilities to encourage desirable behavior in the use of IT (Weill, 2004, p. 3). Definition and implementation of processes, structures and relational mechanisms in the organization (Van Grembergen, 2013)	Cross-functional, collaborative networks, holistic planning of IT investments, and joint decision-making
Support	Both business and IT people to execute their responsibilities in support of business/IT alignment (Van Grembergen, 2013)	Dialogue, common goals and responsibilities. Becoming innovative and collaborative
Evolution	A linear progression towards the formalization of roles, responsibilities, processes, structures, and relational mechanisms (e.g., Simonsson et al., 2007)	Dynamic, ongoing adaptation of governance
Value	Better investments into IT (Weill and Ross, 2005). Business/IT alignment (De Haes and Van Grembergen, 2009)	Learning and innovation

As Table 3 shows, four focus areas have been identified. The findings of the case – here referred to as the alternative view – will be discussed in relation to the traditional IT governance view.

Conceptualization: On one hand, architecture governance at LEGO encompassed traditional governance by allocating decision rights and accountabilities. On the other hand, the analysis also pointed to the fact that architecture governance consisted of cross-functional, collaborative networks to enable the holistic planning of IT investments while decisions were rarely made in isolation. As such, the case study of architecture governance suggests that IT governance can be viewed as a more holistic discipline than traditionally conceptualized – encompassing cross-functional networks and joint decision-making that goes beyond the boundaries of the IT

organization. This calls for a broader conceptualization of IT governance that also emphasizes common responsibilities, consensus, and joint decision-making.

Supports: A central goal of IT governance is to support business/IT alignment. The traditional view is that the IT organization can achieve this by sustaining and extending business goals and needs (De Haes and Van Grembergen, 2009). While architecture governance at LEGO did strive to support alignment between the wishes of the business and architectural requirements, architecture governance at LEGO was as much focused on driving innovation through collaboration, and business proximity. This challenges current research to explore how IT governance can facilitate innovation between the business and IT organization rather than just mapping the needs and wishes of the business into IT solutions.

Evolution: Architecture governance at LEGO did not just follow a linear progression towards more formalization of governance mechanisms. While governance was formalized over the years related to architecture and portfolio management, there were also indications of rethinking in relation to the transformation project in 2011. At this point, the internal structure of the IT organization was reconfigured to mirror the three overall business areas. This resulted in new collaborative networks and virtual organizations governing the architecture across business areas such as the EA excellence team, which enabled the architects to become proactive and maximize collaboration with the business. Recently, LEGO again started to question its governance approach as they considered building a new IT platform for engagement of consumers as digitization had become increasingly important. These insights somewhat challenge the traditional, linear view expressed by, for example, governance maturity frameworks (e.g., Simonsson et al., 2007) by indicating that IT governance does not necessarily progress towards increased formalization and delegation of responsibilities.

Value: Traditionally, the value proposition of IT governance has been to enable better investments into IT (Weill and Ross, 2005) and business/IT alignment (De Haes and Van Grembergen, 2009). However, LEGO's approach to architecture governance also emphasized the importance of learning. The CIO stressed that making mistakes was not seen as a problem, but a natural part of learning. To him, not asking for help from others was worse than making a mistake. As it was pointed out by some employees, this culture worked because of LEGO's ability to retain employees for many years while the IT organization was determined to not to outsource skills essential to the IT platform. This learning culture enabled continuous improvements of the governance approach, the skills of the employees, and the IT platform. While IT governance at LEGO did enable

alignment with the business, the focus was equally on facilitating collaboration that would enable new innovations and improvements to the IT platform that, according to the CIO, could hardly be captured through an investment calculation. These findings challenge current research to rethink the value proposition of IT governance.

While the current study points towards an extended view of IT governance, which also encompasses elements, such as learning, collaboration and adaptation, it is important to note that it does not advocate a replacement of current insights and literature on IT governance, which serve as an important foundation. Rather, the attempt is to further enrich the current body of knowledge with new insights and perspectives.

6.1 Contribution to Practice and Research

The current study contributes to EA and architecture governance as the issue of governing the EA effort has received little attention (Löhe and Legner, 2012). At the same time, the study contributes more broadly to IT governance literature through the four alternative views, which provide new insights by, for example, supplementing traditional conceptualizations of IT governance (Table 3). Hopefully, these alternative views will stimulate and enrich the fields of IT governance and EA in the same way that the field of project management has undergone considerable rethinking (Berggren and Söderlund, 2008, Cicmil et al., 2006, Winter et al., 2006, Svejvig and Andersen, 2015, Laursen and Svejvig, 2015).

For practitioners, the current study shows how LEGO became more innovative and collaborative in their governance efforts. This was partly driven by increased digitization, which, similarly, has led organizations to explore approaches such as bimodal IT. This involves having separate modes of IT delivery where one supports traditional, integrated systems and databases while the other focuses on time-to-market, innovation, and consumer-oriented technologies (Bygstad, 2015). For practitioners, the case of LEGO gives some indications as to how traditional IT governance can be supplemented by alternative governance approaches that might be helpful in dealing with an increasing demand for digital process and product innovations.

7 CONCLUSION AND LIMITATIONS

While IT governance literature and practice seems to emphasize normative, formalized frameworks and approaches to IT governance, the current case study of architecture governance shows that IT governance also goes beyond mainstream architecture governance thinking and frameworks. Architecture governance encompasses elements that do not necessarily rely on external expertise, frameworks, or formalization. Instead, LEGO seems to emphasize, collaboration, learning, and adaptation through their approach to governance. Also, architecture governance did not seem to have a clear progression towards increased formalization and control. Hence, it is here proposed that that researchers and organizations look beyond existing, normative frameworks and recognize that the success of EA initiatives might also be highly dependent on developing governance mechanisms that leverage, and are deeply rooted in, the organizational culture and context (Aasi et al., 2014). From the findings of the case, four alternative ways are proposed to think about architecture governance and IT governance within practice and research. These are related to what IT governance supports or enables, how it is conceptualized, how it evolves and matures, and what the value proposition of IT governance is.

As the research represents a single case study, it has certain limitations. Arguably, the case study stimulates further investigations and theory building (Flyvbjerg, 2006) within the areas of architecture governance and IT governance. As the current case represents a single case study of a somewhat distinctive organization, further in-depth case studies are necessary. While architecture governance relied heavily on ongoing learning, collaboration, and adaptation for LEGO, this might not be the case for other organizations, while there could also be unexplored drawbacks to relying on the knowledge of few seniors. Nonetheless, by deviating from the traditional, formalized, normative, and rationalistic view of governance expressed in most literature, LEGO has proven, through one of the most remarkable turn-arounds and business transformations in history, that there is still much to learn about how IT can be governed in organizations, and that it might be time to look beyond the framework of IT governance.

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PAPER 6

DESIGNING IT GOVERNANCE: UNDERSTANDING THE INTERPLAY BETWEEN INSTITUTIONAL LOGICS, ORGANIZATIONS, AND IT GOVERNANCE

Author(s): Peter Andersen

ABSTRACT

Previous research has shown how contingency factors such as organizational objectives and characteristics influence IT governance design. In spite of the importance of previous research, there has been no theorizing on how a certain IT governance design is applied according to organizational and individual practices, values, and rules. To this end, the current paper draws on institutional logics to investigate how IT governance design is applied. This is done by means of a multiple case study in three organizations. Comparison of the cases shows that organizations employ different strategies for IT governance design in dealing with institutional logics. From this, a theoretical framework is developed on strategies for IT governance design when dealing with institutional logics. The strategies relate to (a) *challenge* the dominant logic (b) *exploit* the dominant logic (c) ongoing *adaptation* if a volatile institutional environment causes changes in logics over time. The study contributes to a greater understanding of IT governance design and the central role institutional logics play when organizations seek design IT governance according to their organization, technologies and their IT architecture.

Keywords: IT governance, multiple case study, IT architecture, institutional logics

1 INTRODUCTION

Information Technology (IT) governance has been defined as “the leadership and organizational structures, processes and relational mechanisms that ensure that an organization’s IT sustains and extends its strategy and objectives” (De Haes and Van Grembergen 2004). Effective IT governance has proven instrumental in managing IT, as it contributes to overall organizational success and competitiveness (Weill and Ross 2005a; Weill 2004). But how should diverse organizations design IT governance to best fit their unique circumstances? There is general consensus the success and effectiveness of IT governance rely on an optimal match between its design and the particular organization (Bowen et al. 2007; Rau 2004; Sambamurthy and Zmud 1999; Weill and Ross 2004a, 2005a, 2005b). Without an appropriate design, IT governance might be ineffective and lead to low performance of the IT organization (Ali and Green 2012), failure to plan and implement the IT architecture (Fonstad and Robertson 2006a), failure to realize IT project benefits (De Haes and Van Grembergen 2013), and ultimately low overall organizational performance (Prasad et al. 2010). Accordingly, one-size-fits-all approaches cannot be applied to heterogeneous organizations (Van Grembergen 2003; De Haes and Van Grembergen 2004). Due to this fact, various studies have investigated the influence of contingency factors on IT governance design. These studies have outlined how IT governance design should consider the organizational structure and strategic objectives (Brown, 1997; Weill & Ross, 2004a, 2005a; Weill, 2004), and the IT capabilities supporting the organizational strategy (Schwarz and Hirschheim 2003). These elements influence the design of centralized, decentralized or balanced (federal) governance structures (Brown, 1997; Sambamurthy & Zmud, 1999; Schwarz & Hirschheim, 2003; Tiwana & Kim, 2015; Tructures, Williams, & Karahanna, 2013; Weill, 2004). While much has been done in furthering our knowledge on how IT governance structures can be designed, there is evidence in organizational research that the design of organizational structures (e.g. DiMaggio & Powell, 1983) and organizational goals (Glynn 2000) are influenced by the spirit of the time, institutional properties (Orlikowski 1992), and institutional logics (Thornton and Ocasio 2008) that permeate the context in which organizations operate. While there is some evidence that context, strategic objectives, and institutional logics play a role in shaping the design decisions of an organization (Andersen, Svejvig, & Carugati, 2016; Ang & Cummings, 1997; Beck, Gregory, & Marschollek, 2015; Furusten, 2013; Mola & Carugati, 2012), little theorizing has been done on the contextualization of institutional logics and institutional properties in diverse contexts (Carugati, Fernandez, Mola, & Rossignoli, Forthcoming). Specifically, for IT governance decisions, there is a lack of theorizing in relation to how IT governance processes and mechanisms are designed, and what factors beyond

organizational strategy might influence the design of IT governance processes and mechanisms. Accordingly, many questions in relation to IT governance design remain unanswered. For example, do organizational norms and practices influence whether a certain governance design is appropriate? Will mechanisms for collaboration and engaging diverse stakeholders (Fonstad and Robertson 2006a) be equally successful in diverse organizations? How do technologies and the IT architecture impact the way organizations approach IT governance design? Are technologies and the IT architecture imperatives that organizations rationally design IT governance in accordance with? Or are they largely resisted by existing norms and practices within organizations? And if so, how do central actors, such as IT managers, attempt to deal with such resistance if they perceive a need to design IT governance in relation to new technologies or IT architectural needs?

This study theorizes further on IT governance design by going beyond strategic choice and non-interacting single contingencies such as size, resources, and industry (Brown & Grant, 2005). Based on extant evidence of the relation between institutional logics and organizational decisions (e.g. Carugati et al., n.d.; Ocasio & Radoynovska, 2016), this study draws on institutional logics as the concept that influences IT governance decisions. Through norms and cultural rules, institutional logics have proven to influence all parts of organizational life such as practices and individual behavior (Thornton and Ocasio 2008), strategic choice of firms (Durand et al. 2013; Miller et al. 2011) and organizational structures (Glynn and Raffaelli 2011). Further, organizations and institutional logics are influenced by institutional properties (Orlikowski 1992) encompassing internal dimensions (e.g. culture, IT architecture, business strategy) and environmental pressures (e.g. competitive forces, regulations, and technological development). By studying the often neglected (Ali and Green 2012; Garfield and Watson 1997; Niemann 2006; Wadgner and Newell 2004) institutional and cultural aspects of IT governance design, the hope was to generate new insights that would provide practitioners with a deeper understanding of how to design IT governance. Thus, the paper is structured around the following research question: “How do institutional logics influence the design of IT governance?” The research question was answered through three case studies in diverse organizations.

The three cases were analyzed using institutional logics (Thornton and Ocasio 2008) as a theoretical frame and sensitizing concept (Patton, 2002, pp. 452-462). Through a cross-case analysis, different logics were identified for each case. As each organization strived to implement an IT governance design, the logic(s) of each organization influenced the IT governance design. By analyzing how each organization tried to deal with institutional logics in relation to designing IT governance, it is

theorized that organizations can apply different strategies that enable them to deal with institutional logics when implementing an IT governance design.

The paper is structured as follows. The next section describes current literature on IT governance design and how the paper seeks to supplement existing knowledge within the literature stream. The subsequent section describes institutional logics and its relevance as a theoretical frame. Then, the methodology and cases of the paper are described. The findings section first describes the prevailing logics in each organization and then moves on to describe strategies employed by each organization in designing IT governance in relation to the prevailing logics. The findings subsequently outline the role of institutional properties and how they relate to prevailing logics and the IT governance design. The discussion section follows, integrating the findings to develop a framework conceptualizing strategies that can be employed in dealing with institutional logics. Based on the discussion of the findings, guidelines are offered as to how business and IT executives can design IT governance. The limitations and suggestions for future research are then outlined before concluding the paper.

2 IT GOVERNANCE DESIGN

By strategically designing the IT function, IT governance ensures that an organization's IT initiatives sustain and extend the business' strategies and objectives (IT Governance Institute 2005). Thus, IT governance introduces a degree of organizational standardization in relation to how IT is managed (Van Grembergen, 2003, p. 347). As organizations increasingly began to integrate data and information systems, scholars began to explore how the organizational structures could be adapted to information system integration (Agarwal and Sambamurthy 2002; Ein-Dor and Segev 1982; Power 1983). This led a range of researchers to explore different types of governance design addressing the organizational need for centralization versus decentralization of IT decisions and structures (Malone 1997; Patel 2002; Sambamurthy and Zmud 1999; Weill 2004). As a result, IT governance designs are described as representing either centralized, decentralized or hybrid (federal) structures (Huang et al. 2010). These IT governance designs have shown to be the result of different contingency factors (Brown & Magill, 1994, 1998; A. E. Brown & Grant, 2005; Sambamurthy & Zmud, 1999) that relate to organizational structure, business strategy, industry, and firm size (Brown & Grant, 2005). Sambamurthy and Zmud (1999) studied IT governance using the theory of multiple contingencies to understand how multiple contingency forces – related to corporate governance and strategy – induce different modes of IT governance. Brown and Magill (1994) also studied IT governance in relation to multiple contingencies, with a similar focus on

corporate strategies, visions, firm structure and culture, but with no explicit focus on the interplay between IT architecture and IT governance. These studies did not explore new forms of IT governance, but limited their research to investigating contingency factors for applying existing, archetypical governance designs (Brown & Grant, 2005). Consequently, Sambamurthy and Zmud (2000) proposed that research on IT governance could benefit from moving away from the monolithic view on IT governance structures. According to them, the distinction does not necessarily represent practice, as IT governance designs shift over time and encompass both centralized and decentralized elements. Instead, Sambamurthy and Zmud proposed a new avenue for IT governance research exploring how IT governance structures can be designed around critical IT capabilities (Sambamurthy and Zmud 2000). This resulted in research on IT governance design moving beyond the basic centralization–decentralization issue of IT governance, to focus on the IT capabilities and mechanisms used (Peterson, O’Callaghan, & Ribbers, 2000; Peterson, 2004; Schwarz & Hirschheim, 2003). Rather than focusing on governance structures alone, research aimed at understanding the managerial rationale for designing and evolving governance arrangements as a response to environmental and strategic imperatives that drive new business models and demand IT leadership to position the enterprise to exploit these technologies (Sambamurthy and Zmud 2000; Schwarz and Hirschheim 2003).

Recognizing that new insights might be gained from taking a broader view on IT governance and how it is designed, IT governance design is here defined as “the design of IT governance structures and mechanisms in response to institutional logics and properties.” The idea of IT governance mechanisms is based on the work by Fonstad and Robertson (2006) who emphasize that linking mechanisms are necessary for IT governance decisions to be implemented. Here, IT governance mechanisms are viewed as “processes and documents that connect the overall IT governance decision structure to the IT initiatives of the organization”. These mechanisms include business/IT participation, strategic dialogue, shared learning and communication (De Haes and Van Grembergen 2004). Institutional properties (Orlikowski 1992) are included as strategic, environmental, and internal conditions can influence how governance mechanisms and structures are designed, while institutional logics similarly influence organizational behavior (Thornton and Ocasio 2008). In this way, emphasis is put on the interplay between strategic choices and the external environment, encompassed in the work by Schwarz and Hirschheim (2003), while stressing the generative factors that reside within the organization itself and the interaction between internal and external factors.

Literature on IT governance design has focused on the overall structures and responsibilities within the IT unit resulting from strategic objectives, IT capabilities, and organizational structure. Although some researchers are still exploring IT governance design as a strategic choice between either centralized or decentralized structures (e.g. Besson & Rowe, 2012), the effect of institutional forces on decision-making in organizations, already highlighted in literature, should be incorporated to create a broader theory for the design of IT governance in organizations. There is a need for further theorizing on the topic beyond these structures to create a fuller picture of how organizations design IT governance. For example, there is a need to understand the relationship between institutional properties and IT governance design, strategies for IT governance design, as well as the relationship between IT architecture and governance design (Schmidt, C. and Buxmann 2011; Smits and Hillegersberg 2013; Tiwana and Konsynski 2010).

3 THEORETICAL FRAMING: INSTITUTIONAL LOGICS

The concept of institutional logics was introduced by Friedland and Alford (1991) and has been used to explore the relationship between individuals, society and organizations (Thornton and Ocasio 2008). Institutional logics were later defined by Thornton and Ocasio as “the socially constructed, historical patterns of material practices, assumptions, values, beliefs and rules by which individuals produce and reproduce their material subsistence, organize time and space and provide meaning to their social reality” (Thornton & Ocasio, 1999, p. 804). Through this process, institutional logics shape the content, meaning and structure of organizations (Thornton and Ocasio 2008). Multiple institutional logics are available for organizations as well as individuals (Besharov and Smith 2014). They may shift and even come into conflict (Glynn 2000), often resulting in one dominant logic prevailing (Currie and Guah 2007; Hayes and Rajão 2011; Thornton 2016) while, in some cases, they have been shown to coexist (Battilana and Dorado 2010) or form constellations of logics (Goodrick and Reay 2011). By viewing logics as constellations that guide behavior, it is recognized that logics can combine to simultaneously influence professional work at a given time (Goodrick and Reay 2011).

Institutional logics legitimize and shape organizational forms and managerial practices (Greenwood et al. 2010) and “underpin the appropriateness of organizational practices in given settings and at particular historical moments” (Greenwood et al., 2010 p. 522). Negative consequences can arise if new practices are implemented not in line with an extant logic. Similarly, governance structures and working practices have shown to be influenced by extant logics (Currie and Guah 2007; Joseph et al. 2014; Mola and Carugati 2012; Quirke 2013). While literature has largely viewed institutional

logics and properties as organizational constraints, they can also be acted upon, leaving various strategic opportunities for organizations in dealing with institutional logics (Ocasio and Radoynovska 2016). As multiple logics influence organizations simultaneously, the resulting institutional pluralism can produce organizational heterogeneity and possibilities for strategic differentiation (Greenwood, Raynard, Kodeih, Micelotta, & Lounsbury, 2011) and heterogeneous governance responses (Ocasio and Radoynovska 2016). Within broader management studies, institutional logics have been used to understand the influence of ownership structure on strategic behavior (Miller et al. 2011), the influence of nonmarket institutional logics on market behavior (Greenwood et al. 2010), the diffusion of governance practices in organizations after accepting an institutional logic (Andersen et al. 2016; Shipilov et al. 2010).

In summary, institutional logics have proven a powerful frame to understand how organizational forms, strategies, and governance are shaped by the logics influencing organizations. For this reason, institutional logics were chosen as a theoretical frame to further theorize on how organizations design IT governance.

4 METHODOLOGY AND CASES

The study reported here is based on a project conducted over a three-year period involving three large, Danish organizations, focusing on each organization's IT department. A multiple case study design was employed, as case studies investigate a phenomenon in its natural context through the use of qualitative tools and techniques for data collection and analysis (e.g. Cavaye, 1996; Eisenhardt & Graebner, 2007) – thus providing a detailed understanding of a phenomenon in its context (Cavaye 1996). This was relevant as it was sought to theorize further on IT governance design beyond mainstream conceptualizations, thus generating novel insights through the case findings (Brown & Eisenhardt, 1997; Eisenhardt & Graebner, 2007). A multiple case study design was employed – rather than a single case study design – to ensure that the findings were not the result of idiosyncrasies of a particular case (Cavaye 1996; Miles et al. 2014), thus ensuring transferability of the findings (Shenton 2004). Further, as institutional logics were chosen as a theoretical frame, the hope was that a multiple case study design would reveal how different institutional logics in each organization might influence the IT governance design. Moreover, case studies provide a detailed, contextual understanding through which it is possible to theorize on the relationship between IT governance design and institutional logics. Furthermore, case studies are suitable for answering “how” questions concerning a phenomenon within some real-life context (Yin 2009) while they have also proven useful for extending and building theory (Eisenhardt and

Graebner 2007; Eisenhardt 1989; Walsham 1995). Multiple case sampling adds further confidence to the findings. By looking at contrasting cases with relevant communalities, it was sought to specify *how* (Miles et al. 2014) certain IT governance designs are applied in organizations.

4.1 Case selection

The three case organizations were: The TDC Group (TDC), The LEGO Group (LEGO) and Aarhus University (AU). Purposive sampling was used (Kuzel 1992; Miles et al. 2014) to select the three cases (Table 1) based on relevant similarities and differences (Benbasat 1987).

Table 1. Characteristics of the three cases selected as of 2014			
Company	Aarhus University	TDC A/S	The LEGO Group
Since	1982	1990	1932
Employees	11,500	8,600	14,800
Revenues (in DKK)	6.2 billion	23.3 billion	28.6 billion
Ownership structure	Public sector	Public limited company	Family-owned
Industry	Research and education	Telecommunications	Toy manufacturing
Estimated IT architecture Maturity (Ross et al. 2006)	Level 1-2	Level 2-3	Level 3-4
Headquarters	Aarhus, Denmark	Copenhagen, Denmark	Billund, Denmark
Market	Denmark	Scandinavia	Global

First, regarding similarities, the cases are large enterprises as defined by the European Commission, regarding size and revenues (European Commission 2015). In Denmark, each of the organizations is the biggest within its respective industry: research and education (AU), toy manufacturing (LEGO), and telecommunications (TDC). Second, all cases were selected as they are considered ‘top performers’ within their industry. Among over 17,000 universities world-wide, AU is ranked in the top 100 by many influential rankings (Lindgaard 2016). TDC has been the leading provider in Scandinavia within its core segments such as cable television (Pedersen 2014) while LEGO recently surpassed Mattel to become the biggest toy manufacturer in the world (Milne 2015). As all organizations were top performers within their industry and market, it was expected that they would also have a professional approach to governing their IT architecture. Also, it was expected that the size of the organizations would cause difficulties governing the IT architecture, as the IT architecture gets more complex as organizations grow (Beese et al. 2016; Hinton and Kaye 1996; Möller et al. 2011). This can lead to an increase in expenses and IT complexity if one does not manage the architecture accordingly (Ross et al. 2006; Schütz et al. 2013). Third, all three organizations were established before 1990, when enterprise systems began to emerge (Brown and Vessey 2003). Although TDC was established as a collective telecommunications company in 1990,

its current IT architecture has its roots in old, regional telecoms established in Denmark around the 1950s (TDC n.d.). Thus, all three cases have had IT architecture difficulties with old legacy information systems, process standardization, and data integration (Ross et al. 2006). The focus on cases with old and complex IT architectures was chosen due to the limited theorizing so far on the relationship between IT architecture and IT governance (Schmidt, C. and Buxmann 2011; Smits and Hillegersberg 2013; Tiwana and Konsynski 2010). Fourth, the cases are all traditional, Danish organizations operating mainly within Denmark. Although institutional logics were not chosen as a theoretical frame in advance to selecting the three cases, the intention was to exclude country-specific cultures and practices as a potential cause of diverse IT governance designs between cases (Thornton and Ocasio 1999). In this way, it would be possible to attribute different IT governance designs to other factors such as corporate culture, strategy or logics.

Regarding differences, each organization had, firstly, different IT architectures that posed diverse challenges. This related to IT architecture maturity levels, which largely describe the degree to which a company has standardized shared processes and integrated data across these processes (Ross et al. 2006). Second, the three cases have different ownership structures: public institution, family-owned company, and public company as ownership structures have often shown to influence the prevailing logics in organizations (e.g. Miller et al., 2011). While conventional wisdom holds that family businesses have a more long-term orientation than public companies, little is known as to how the two are actually different. While some studies suggest that family-owned businesses outperform other businesses over the long term, other studies have suggested the opposite. As such, the matter remains disputed (e.g. Kachaner et al. 2012; Miller et al. 2007; Morck et al. 2005). As IT governance and IT architecture are both regarded as strategic disciplines (Broadbent et al. 1999; Cash et al. 1992; King 1995; Ross et al. 2006; Weill and Ross 2004a), it was relevant to include a family-owned business in order to theorize on the possible impact of this ownership structure on the IT architecture work and IT governance. Similarly, it has been suggested that managers in public institutions apply different management procedures than standard managerial prescriptions due to environmental differences (Bretschneider 1990), but the differences between public and private sector companies in relation to IT governance have received little attention (Ali and Green 2007; Sethibe et al. 2007; Winkler 2013). Accordingly, the chosen cases were not selected for *literal replication*—focusing on predicting similar results. Rather, the cases were chosen for *theoretical replication*—predicting contrasting results for anticipatable reasons (Yin 2009, p. 54). The hope was that the theory-based diversity between the cases could result in additional findings beyond what each case individually contributed (Stake 2006). The similarities between the cases additionally

limit the level of theorizing to large organizations with complex underlying IT architectures and legacy systems, but also allow for more robust theory within this context (Eisenhardt and Graebner 2007).

4.2 The three cases

Founded in 1928, AU employs around 11,500 people (Aarhus University 2016) and had 6.2 billion DKK in revenues as of 2014 (Aarhus University 2014). From 2006 to 2007, AU went through mergers with five other formerly independent research and university institutions: the Aarhus School of Business, the Herning Institute of Business Administration and Technology, the Danish School of Education, the National Environmental Research Institute, and the Danish Institute of Agricultural Sciences. In 2010, AU also went through a substantial restructuring that merged the nine former faculties into four main faculties: Science and Technology, Arts, Health, and School of Business and Social Sciences. It also centralized the once autonomous IT departments of AU into one department. Then, the new IT department had to create a common IT architecture for all of AU by consolidating the IT architecture of AU and the five research and university institutions it had merged with. In this way, the merger posed significant challenges related IT architecture complexity, integration of data, and standardization of processes across AU.

TDC is the biggest telecommunications company in Denmark and among the biggest in Scandinavia, with approximately 8.600 employees and an extensive history of IT architecture initiatives. It was created in 1990 as a Danish, state-owned monopoly—exclusively covering all of Denmark and encompassing all the old, regional telecoms established in the 1950s. The merger in 1990 aimed to create a powerful company, strong enough to thrive on a free, international market (TDC n.d.). In 1997, TDC became fully privatized as the fixed telephony market was liberalized. Today, TDC is executing its strategy to become further established within Scandinavia (TDC 2014). Similar to AU, TDC had a complex IT architecture due to its size, and a number of mergers and acquisitions. TDC is also a somewhat old company that went through changes regarding ownership, strategies and size. Thus, due to its size, historical development, and IT architecture, a case study on TDC seemed likely to yield new insights to current theory and practice.

LEGO was founded in Billund, Denmark in 1932. In 1958, the company introduced the LEGO brick that transformed LEGO into a global manufacturer of toys. By September 2014, LEGO had grown to become the largest toy company in the world (Davidson 2014) with more than 10 years of consecutive growth, 14,762 employees and revenues generated from products sold across 140 countries. Revenues reached 28.6 billion DDK by the end of 2014 (The LEGO Group 2014). The IT

architecture at LEGO is the result of several failed attempts to implement a shared IT architecture across the organization. This journey started in the early 1990s when enterprise solutions became increasingly popular. By the end of the decade, LEGO found itself in severe crisis, intensified by a lack of governance around the IT architecture resulting in a lack of process and data integration. Today, after more than 10 years of maturing the IT architecture of LEGO, the senior management recognizes the IT architecture as an important strategic asset for the company in line with the LEGO brand.

4.3 Data Collection

Data collection was carried out in the three organizations from April 2013 to July 2016.¹² Data was collected through three sources: interviews, documents, and observations. The accumulated data from the cases amounts to 46 interviews, 21 observations (meetings, briefings, and workshops) and more than 1000 pages of internal documents (Table 2).

Table 2. Data overview		
Data source	#	Description of positions, observations and document examples
Aarhus University (approximately from May 2013 – May 2014)		
Interviews	15	Chief information officer, project managers, IT developers, vice president of IT, IT architects, head of IT development
Observations	12	IT architecture coordination meetings, IT project vendor meeting
Internal documents	+370 pages	Email correspondence between IT architects, architecture principles, reference architecture, project and program descriptions
External documents	+70 pages	Annual reports, newspaper articles, public statements
The TDC Group (approximately from March 2014 – February 2015)		
Interviews	10	Enterprise architects, IT architects, project architect, external consultant, senior IT manager, domain architect, senior project manager
Observations	3	High-level demands of project, project architect workshop (with vendor), role-play session on IT capability tool in project stages
Internal documents	+500 pages	NPV calculation, business cases, IT rejuvenation document, introduction to business-aligned architecture, business/IT strategy
External documents	+200 pages	Annual reports, newspaper articles, public statements
The LEGO Group (approximately from March 2012 – April 2015)		
Interviews	23	chief executive officer, chief information officer, head of IT operations, enterprise architects, IT project architect, head of logistics, corporate IT, senior director of technology, head of project management excellence team, head of change management, change managers, head of project portfolio organization
Observations	6	IT town hall meeting, IT architecture challenge sessions

¹² Most of the data collection was finished by April 2015, but some supplementary interviews were held at a later stage to confirm and supplement findings. These were held on October 20 2015, June 26 2016 and July 4 2016. The periods in table 2 display the duration of the primary data collection of each case, not including the supplementary interviews.

Internal documents	+200 pages	Strategic principles, IT governance documents, IT architecture overviews, guidelines for architecture challenge sessions			
External documents	+300 pages	Annual reports, books, newspaper articles, public statements			
Total (all cases)		Interviews	Observations	Internal documents	External documents
		48	21	+1070 pages	570

Snowball sampling (Blernacki and Waldorf 1981) was used to identify actors with considerable knowledge of the IT architecture and IT governance practices within each case. Most interviews were conducted at the headquarters of each organization, while some were conducted via online video and telephone interviews. Interview guides (Kvale 2008) were developed for each interview, outlining the interview questions and their sequence. The interview guides were changed either when new perspectives emerged (such as the impact of logics on IT architecture) or when the respondent had a different role in the organization or different knowledge. For example, the interviews with the chief information officer (CIO) focused on strategic intents while IT architect interviews focused on understanding the IT architecture and how it was governed. Detailed field notes were recorded for each observation and interview by the author. These were subsequently refined with additional notes and impressions. A distinction was made between what was observed and own interpretations (Flick, 2006, pp. 286-287). All interviews were recorded and all central interviews transcribed.

Some interviews were retrospective to unveil how the organization and IT governance had developed over time. In order to address the possible shortcomings of examining the cases through retrospective interviews, multiple perspectives were sought through comparison with internal documents and other informants. This enabled cross-checking and triangulation of the retrospective data (Flick 2009) to ensure credibility of the studies (Guba 1981). While the interviews were the primary data source, they were also supplemented with observations during which descriptive and reflective field notes were taken about what was seen, heard, and experienced in each observation. Another way to ensure credibility was to interview stakeholders with different roles and within different management layers in each organization – thus ranging from the most senior executives such as chief executive officer (CEO), and CIO (at TDC it was not possible to access senior executives) to project managers and system developers. In this way, individual viewpoints and experiences could be verified against each other, providing a rich picture of the attitudes and practices (Shenton 2004) in relation to IT governance. During the roughly three years of data collection between the three cases, frequent debriefing sessions were held to discuss alternative approaches, and changes to the course of action. This helped test ideas and interpretations and identify possible biases and preferences (Shenton 2004). This was done through workshop

discussions with research peers and informal meetings with key informants within each case. In all three cases, key informants were asked to read and comment on central quotes, case reports, and parts of the analysis to further confirm credibility. This was done with an IT manager at AU, a senior IT manager at LEGO, and an IT architect and manager at TDC.

4.4 Data Analysis

Through the analysis, it was sought to theorize (Eisenhardt and Graebner 2007; Eisenhardt 1989) through concepts and patterns (Orlikowski 1993). The concepts were constructed through a cross-case analysis wherein identified similarities and differences were compared between the cases to shape overall *themes* (important concepts emerging from the data). Generally, the cross-case analysis followed three steps as described below.

Step	Rationale	Description	Outcome
I: Exploratory analysis	Form initial understanding	Initial analysis of data through discussions, coding, and creating case reports.	Research question, theoretical frame, case reports, and preliminary themes
II: Forming cross-case themes	Compare findings across cases and identifying cross-case patterns	Formulate questions based on step I used to identify final themes. Form themes by analyzing case reports and discussing findings across cases.	Cross-case themes.
III: Theorizing	Theorize on the relationship between institutional logics and IT governance design	Identify final themes for comprehensive analysis and theorizing.	Strategies for IT governance design in dealing with institutional logics and IT governance design archetypes

Step I: Exploratory analysis. The initial analysis was done by reading interview transcripts and observational notes, listening to audio recordings, and going through internal and external documents acquired on the three cases. While doing so, inductive, descriptive (Miles et al., 2014 p. 74) codes were used to summarize passages of data (Appendix A). The exploratory analysis laid the foundation for understanding and interpreting each case as it provided an understanding of major events, organizational characteristics (Table 1), culture, and opinions of informants in each organization. The analysis was summarized in a short case report (Stake 2006) for each case (Appendix B). These reports were used for initial comparison by discussing them with colleagues within the field. The reports were revised as new insights emerged. Through this process, new ideas appeared on the relationship between codes. Related codes were then grouped into preliminary themes (Miles et al. 2014) for each case. As the reports indicated that each organization employed different governance designs, it was theorized that organizational differences could result in

different IT governance designs. As the main differences were related to the organizational culture, internal IT architecture, industry, ownership structure and markets, it was decided to draw on institutional theory and study how these influence IT governance design. This led to the formulation of the research question and the choice of institutional logics as theoretical frame. By grounding the findings in the contextual cases, transferability was ensured by enabling the reader to better judge how the particular findings can be transferred to other situations (Shenton 2004). In this way, it was possible to explore similarities and differences between the cases. This was the first step in piercing through the individual patterns to draw a more complete theoretical picture (Eisenhardt 1991) and enable comparability between the cases (Flick 2006).

Step II: Forming final cross-case themes. The final cross-case themes were identified by first formulating questions to guide the cross-case analysis (Table 3). These questions were formed in relation to the individual case reports, the research question, the theoretical frame, and the preliminary themes for each case.

Table 3. Examples of questions posed to the data	
1.	How is IT governance designed in each organization?
2.	What might have led to these designs?
3.	What logics exist within the cases?
4.	What might have caused these logics?
5.	What is the relationship between logics and governance design?

Subsequently, a new round of coding was done revolving around the questions posed to the data (Table 3) involving careful re-reading of the data (Fereday and Muir-Cochrane 2006) in relation to the questions. The cross-case analysis followed a dialectic process of both deductive and inductive coding (Miles et al. 2014). Deductively, data from each case were coded and matched with the preliminary themes. Inductively, some emerging codes were found not to match the preliminary themes. Some of them were merged into new themes while others were discarded due to too little data support from all three cases. This resulted in the following final cross-case themes: institutional logics, strategies for IT governance design, emerging technologies, IT architecture, and organizational characteristics and strategy (Table 4).

Table 4. Final cross-case themes			
Case	AU (codes)	TDC (codes)	LEGO (codes)
Theme I: Institutional logics	29	32	37
Theme II: Strategies for IT governance design	16	12	20
Theme III: Emerging technologies (inst. property)	17	23	27
Theme IV: IT architecture (inst. property)	27	30	36
Theme V: Organizational characteristics and strategy (inst. property)	31	25	23

The findings section was structured around the first four themes while the last theme was subsumed into the others by, for example, discussing the influence of ownership structure in relation to the IT architecture and IT governance design. All coding was done using the qualitative data analysis software NVivo. Although external documents (e.g. LEGO Annual Report, 2014) were not used as data for the actual coding, they were subsequently used to strengthen the robustness of the final themes.

Step III: Theorizing. The cross-case themes were subsequently used as an outset to synthesize the findings and theorize on the relation between institutional logics and IT governance design. The theorizing followed an iterative process of induction and deduction (Bourgeois 1979) where inferences were made based on the analysis (going through e.g. case reports and themes) and extant theory, thus engaging in a process of disciplined imagination involving trials and errors (Weick 1989). Through this iterative process of theorizing, metaphors (Kendall and Kendall 1993; Morgan 2006) were used as a tool to view the findings from different angles, in order to create new ways of understanding (Morgan 2006). Through this theorizing, relationships between the cross-case themes (Table 4) were established into a coherent account of how institutional logics influenced the IT governance design of each organization. Different metaphors were specifically used to understand and make abstractions by highlighting certain parts of the analysis until logics within each organization crystallized. The robustness of these emerging theoretical relationships were tested by alternating between the abstractions made and specific instances of the study (Rivard 2014). This involved going back to the coded data, central interviews, and the case reports to discuss the adequateness and robustness of the emerging theory.

5 FINDINGS: INSTITUTIONAL LOGICS AND IT GOVERNANCE DESIGN

In this section, the findings from the cross-case analysis are presented by structuring them around the five cross-case themes: *institutional logics*, *strategies for IT governance design*, and institutional properties – encompassing the themes *emerging technologies* and *IT architecture*. Collectively, the themes reveal how institutional logics interact with IT governance design in each organization. The findings are illustrated through central quotes from the interviews. The following sets the stage for the different institutional logics in each case.

5.1 Institutional logics

Each of the three cases displayed different institutional logics that influenced individual and organizational behavior. LEGO always had a culture for collaboration due to a flat hierarchy and a

family logic based on the core values of the company: *imagination, caring, fun, creativity, and learning* (The LEGO Group 2016).

We have the following six values: fun, imagination, creativity, quality, leaning and caring. Caring to me is very much where the collaborative issue is born and maintained. LEGO has always been very good at creating strong, warm relations between employees and that is why LEGO is such a flat organization. Whatever you do in LEGO, you can walk straight into the CEOs office and talk to him (CIO, 2014)

According to the CIO, the values of LEGO enabled close relationships between employees across management levels as employees had little regard for the formal hierarchies. This was a product of the LEGO heritage with the family owners emphasizing the company's core values.

You can talk to anybody about everything. There is not even an eye for what management level you are on. We do not even think about that we should only meet people at our own management level. We are very much connected. It is all about connection and deep relations, which are all a part of the LEGO heritage (CIO, 2014)

AU was influenced by a dominant autonomy logic. This logic seemed to originate from the research tradition of the university, and was thus, well established. In this way, it influenced both the academic and administrative staff within AU.

We think very academically here and that means that you cannot go through with something without including everybody. Everybody is an expert, thinks independently, critically, and asks questions about everything. This culture for research freedom and autonomy at AU also rubs off on the way things work within the administration. This has been a challenge to us in relation to governing the architecture and documenting processes (Head of IT Development 2016)

After the university merger, the new IT department of around 250 people (full-time equivalent) and a project portfolio of more than 100 projects had been centralized. However, the autonomy logic posed difficulties in relation to having a centralized IT governance design. IT developers were proud of their skills and used to solve local problems, but had a hard time adjusting to centralized decisions regarding how individual information systems should be designed in accordance with the overall IT architecture. Meanwhile, the university management was critical towards common IT solutions and, initially, sought to continue developing and implementing local IT solutions.

At TDC, three overarching periods were found; each consisted of different dominating logics that changed over time. As TDC was established as a public monopoly in 1995, the dominating logic was a bureaucracy logic.

With the merger, we got a boss from Copenhagen who was a public servant. It became a more governmental organization with more power to the bureaucrats (Former IT Manager, 2015)

From 1998, TDC was privatized and the bureaucracy logic was supplemented with a market logic where TDC sought dominance within the European market through acquisitions and investments.

We bought up businesses in different countries that were driven completely autonomously from an IT point of view (Former IT Manager, 2015)

As TDC was acquired by five private equity funds, a new period dominated by an efficiency logic (2006-2010) started. The new owners imposed requirements for cost-control and cost transparency to increase the profitability of TDC. This was done by including investment professionals on the board and by initiating an operational turn-around. In 2007, while TDC was selling off acquired companies outside of Scandinavia (TDC 2007), the CEO announced that TDC would have to cut staff by approximately 7% per year (Børsen 2007b). The efficiency logic was later followed by a customer logic (2010-2015), as the private equity funds sold their shares on the public stock market. Through improved customer experience, TDC sought to increase its customer base within its existing markets. As the former logics still persisted to some extent, TDC became increasingly guided by a constellation of logics (Goodrick and Reay 2011).

5.2 Strategies for IT Governance Design as a Response to Logics

Through the cross-case analysis, a different strategy for dealing with institutional logics was found for each case. While TDC adapted their IT governance approach as the institutional logics shifted, AU sought to contest the dominant autonomy logic. A third strategy was employed by LEGO where the IT management sought to exploit the dominant family logic through their IT governance design.

Adapt IT governance to logics. Up until the late 1990s, TDC was considered overstaffed and bureaucratic (Dall 1999). From an IT governance perspective, the bureaucracy logic led the IT organization to formalize governance frameworks for controlling the project portfolio. The market logic results in a customer focus that did not exist when TDC was a public monopoly. IT governance now starts revolving around the business side as a customer. All services are defined, while an accounting system is put in place so that IT can charge the business for each IT service. As TDC was acquired by the private equity funds, the efficiency logic started to influence the IT

governance design which went towards an exclusive focus on how the owners could increase efficiency to drive down costs from around 2006-2007.

From 2006-2010, TDC became a financially engineered organization. We need to reduce our costs and we need to reduce our operational expenditures significantly because everything is calculated (TDC Enterprise Architect, 2015).

While TDC was considered bureaucratic and over-staffed, the new efficiency logic led the company to explore outsourcing arrangements.

In 2007, we were around 800-900 people¹³. The total cost of ownership from our applications alone was significant compared to our competitors. That was when we started looking at the outsourcing wave (TDC Enterprise Architect, 2015).

In this period, IT architecture outsourcing had become a trend among telecoms struggling to curb expenses (Gurden 2007). This normative pressure (DiMaggio and Powell 1983) led TDC to invest more than 268 million Euros in a project that would outsource the entire IT architecture – not just IT developers. The CEO expected productivity gains of between 20 and 30%, and time to market decrease by 60%, but the outsourcing project failed in 2008. From 2008, the IT organization was left with an outdated IT architecture consisting of many legacy systems – some of which were 25 years old. These old and poorly integrated systems posed severe problems. Now, cost reductions were sought through an intensified focus on streamlining the existing IT architecture by designing new IT governance structures. The IT management established an organization for governing the application portfolio with full responsibility of reducing the operational expenses and streamlining the IT architecture.

We focused a lot on cost reductions. The governance was about isolating all the application owners and application managers into one organization with full OPEX [operational expenses] responsibility (Enterprise Architect, 2015).

The rationalization required IT governance of the complex application landscape. Thus, TDC divided its application landscape into 11 different domains and roadmaps. This mapping was driven by efficiency-focused governance where each application was registered in the accounting system to provide an overview of expenses and savings. In two years from around 2009 to 2011, 206 out of 557 applications were decommissioned. Furthermore, each project manager was required to

¹³ In 2007, there were 675 employees within what was called: IT Nordic and around 1600 employees within the entire IT organization of TDC: Jb. 2007. "Slaget Styres Af Stærk It-Organisation," in: *Børsen*.

estimate reductions in operational expenses resulting from each project with assistance from the Application Domain Manager. The estimation had to be approved by the Finance Department, which only approved projects leading to cost reductions.

Although the customer logic became dominant from 2010 to 2015, the efficiency logic persisted. Due to the competitive environment, the IT organization kept utilizing efficiency and financially driven IT governance. However, management now launched a new IT strategy with three focus areas: improved customer experience, simplified products and rejuvenated IT architecture. Now, the IT organization had to spread its investments across efficiency improvements, integrated solutions, improved network, customer content and digital customer experience. This was done by making changes to the IT budget procedures.

For the past 10 years, the business hasn't got anything solved like time-to-market or product flexibility. Now we are going to allocate a fixed amount of the IT budget to strategic development (Enterprise Architect, 2015).

The constellation of logics led TDC to pursue a balanced IT governance design where investments were balanced across new product innovation, integration of existing projects, and optimization of the IT architecture.

By 2015, as time-to-market and quality had become increasingly important, the CIO decided to increase the IT staff from around 380 to 430 while investigating how IT projects could be carried out with less governance to decrease time-to-market of new IT projects. This was done, for example, by significantly decreasing the length of requirement specifications of new IT projects (Elkær 2015).

Exploit logic. From 2005 to 2011, LEGO had tremendous success. Revenues increased from 6 billion DKK to 20 billion DKK while the number of employees almost tripled from 3,500 people to more than 10,000. Increasingly, the size of the company was posing problems.

Due to the increase in size, organizational silos had grown within the company according to the Chief Operating Officer. Similarly, the CIO saw a need to redesign IT governance and the IT organization.

We had this typical "plan, build, run" IT organization. It is a very narrow, tunnel-vision way of looking at IT where you sub-optimize yourself, but IT is connected to the business. It is wrong to think that just because you optimize yourself, you optimize the business (CIO, 2012)

Instead, the CIO sought to create a closer collaboration with the business while making the IT organization more agile. This was done by removing governance structures across LEGO through a cultural change project dubbed 'Step Up'. Within IT, the IT board was removed and replaced by mechanisms for collaboration, while nine out of ten formal governance boards were removed across LEGO (CIO, 2014).

It is about removing a lot of formal boards, so you force collaboration to be between human beings instead of thinking that the board will take care of that. In Step Up we removed nine out of ten boards in the LEGO Group and forced collaboration directly between employees (CIO, 2014)

The mechanisms for collaboration were strengthened by exploiting the existing family logic at LEGO. In this way, the aim was to make the organization more agile, innovative, and competitive – despite its increased size.

It has very much been about continuing to run the LEGO Group from the valued-based focus we always have had (CIO, 2014)

Instead of the traditional governance structures, the new mechanisms enabled collaboration between management levels and the involvement of experts in decision-making depending on the situation.

I really believe we have that [a good governance process] and you can explore that further with Henrik Amsinck [the CIO]. He's a maestro at that. We're doing governance collaboratively across the organization and involving the low levels, high levels, and so on. It's an excellent process. I have great confidence in that! (CEO, 2015)

These mechanisms would go beyond individual business areas such as IT and involve different types of networks where key stakeholders from IT and business would be involved.

Part of our innovation process is that all the big players are present and part of the discussions already at the early stages of our innovation process. For example, we discuss what the risks are from a supply chain point of view (Head of Technology and Open Innovation, 2015)

Another collaborative network designed for governing the IT architecture at LEGO was the Enterprise Architecture challenge sessions. Here, projects deemed to have an impact on the IT architecture were challenged by a network of architects, with representatives from the IT management and business. Today, the challenge session is a forum where the current Enterprise Architecture Excellence Team – which coordinates the overall IT architecture planning across the business – challenges the current pipeline of projects.

They [the responsible project manager and architect] are there to be challenged: "Why are you going this way? Have you thought about this? What are the criteria? Have you adhered to our strategic IT principles?" Those kinds of questions (Enterprise Architect, 2015)

During the challenge session, a one-page checklist would be discussed in relation to the project. The checklist ensured that standard architecture deliverables had been made, such as security and infrastructure analysis, followed up by questions related to the impact on the IT architecture, the complexity of the project, if new applications were involved etc. Additionally, the project responsible had to identify the top three architectural risks, which were then discussed during the challenge session. Another essential network was the Process Expert Network that engaged key stakeholders from across the business in creating global processes (Chief Enterprise Architect, 2014). One commonality of the challenge sessions and the PEN network was a shared vision and goal to protect the IT architecture of LEGO. Without being approved in the challenge sessions, a project could not be initiated.

The CIO noted that the culture of the company made it possible for him to design effective IT governance around joint decision-making and collaboration that, on the surface, might seem inefficient.

It looks like we are doing less action because we are talking about a decision or change for a long time, but when you finish with that and everybody nods and says "I am on board," you execute like a flash of a second! That is what you have to learn when you are on board here. You have to respect the networks and talk to everybody whether they are high or low. You have to get everybody on board, get their feedback and adjust your decision and do timely changes and so on, but then when you execute, you feel no resistance. (CIO, 2014)

By utilizing the dominant family logic of the organization, the IT management had been able rearrange governance structures and create mechanisms for engaging key stakeholders.

Challenge logic. At AU, the university administration was centralized as a result of the university merger. Before the merger, IT governance at AU was spread among each of the previously independent faculties.

The university is the result of a huge merger of nine different faculties and one administration. Each with its own way of doing things, with ten different ways of conducting IT – ten different ways of doing everything! (CIO, 2014)

Although the IT management was formally capable of centralizing the IT governance decision making by only having one CIO and IT organization, the logic made it hard for developers and stakeholders within the different faculties to understand and respect the centralized decision-making.

We have had cultural barriers for the IT development [...] The organizations have had a hard time prioritizing the area of IT as there has been no distinction between “nice to have” and “need to have” (Aarhus University 2010)

Although IT governance structures regarding decision-making were formally centralized, the autonomy logic caused problems as the faculties would buy their own information systems without formal approval one project manager describes it.

It was impossible to get anywhere with IT because the old faculties had enough money to just find their own solutions. When there was a disagreement regarding a common solution, they just found their own (Project Manager: Network integration, 2014)

The autonomy logic existed both between the faculties, but also between IT managers, IT architects, developers, and project managers. According to another project manager, one important project would never have been completed in time if they were to wait for a mandate from the management. Instead, the project was completed in time due to civil disobedience.

The autonomy logic was a problem in relation to, for example, managing a coherent architecture and having common priorities because it led to decentralized decision-making.

Much would have been easier if AU had more top-down decision-making, but AU is definitely not like that. We have many different interests, a very distributed decision-making process between the different deans and so on. Top-down does not fit our culture (IT Manager, 2016)

The IT management sought to deal with the decentralized decision-making on the upper management level by establishing networks at the middle management level. The middle management would then influence and inform the upper management regarding IT investments and IT architecture.

When you are in an organization where there is no understanding at the top-level management as to why governing the architecture is important, then you are forced to do things through a middle-out process, but then it just takes much longer time. However, creating a network among the middle-

management can have a quite big effect in the long run. We get influence in the end coming bottom-up from the middle management to the top management (IT Manager, 2016)

While networks were established for system owners (representatives from business), IT architecture coordination, and portfolio planning, the logics also influenced how individuals within the IT organization behaved. While emphasis had been on individual skills, creativity and solving local problems, the IT management needed common approaches for project management, IT architecture, and programming. Over a five-years period, the dominant autonomy logic was challenged by hiring IT staff from organizations with a different culture, and by employing common frameworks for project management, IT governance and portfolio management. Furthermore, part of the IT staff received IT architecture training and certification to create shared understanding and competencies (Internal Document, 2014).

However, IT governance was still a main challenge due to a lack of backing and understanding from the upper university management. While a new network had been established to involve the upper management level in IT project prioritization across the university, it had previously shown to be a difficult matter.

IT governance is still a main challenge to us because we still don't know if the new network is going to work since it was initiated recently. We had a hard time getting the people in the previous network to meet, and they never had a real mandate to make decisions. We tried to involve the university management before, but it is simply not possible to make them come together to prioritize the most important projects across AU. There are also too many technical details for them. (Head of IT Development, 2016)

Overall, the IT management had success in challenging the autonomy logic within IT to move towards a more coordinated and holistic IT governance, but at a larger scale, the autonomy logic still persisted at the university.

We did manage to change the culture to some degree within IT. We think more holistically about shared processes and planned changes. I think we achieved that. But the old culture is still there in the background and we still have trouble with the former faculties. For example, the former business school is very autonomous and will sometimes try to initiate own local solutions. (IT Manager, 2016)

In this way, AU challenged the existing autonomy logic within the IT organization by seeking to implement a new administrative logic. While all three organizations sought to employ different

strategies for their IT governance design to deal with different institutional logics, other institutional properties similarly influenced the three organizations.

5.3 Institutional Properties, Logics and IT Governance Design

Different institutional properties (Orlikowski 1992) were found to interact with the institutional logics to mutually constitute and shape the IT governance design within each case. They will be described here in order to give a fuller and more contextual understanding of how IT governance design emerges as a result of the interaction between institutional logics and other factors. While previous studies have outlined IT governance design as either the outcome of strategic choice, or have deterministically viewed IT governance design as the result of technological or organizational imperatives, the results from the case studies suggest a more dialectic relationship between IT architecture, technologies and the IT governance design in each organization.

IT architecture and IT governance design. Due to the sampling of large and old organizations, it was assumed that the internal IT architecture of each organization would be of major importance to the IT governance design due to complex IT architectures that might have developed over the years (Beese et al. 2016; Hinton and Kaye 1996; Möller et al. 2011). Each organization also had IT architectures at different maturity levels (Ross et al. 2006). The cross-case analysis shows that the IT architecture posed diverse challenges that influenced the IT governance design.

AU had the least mature IT architecture of the three organizations. After the university merger, the large landscape of different information systems posed a number of problems. These involved overlapping information systems, lack of integration between the different systems, and data inconsistencies. The IT department, for example, had to consolidate nine different email systems into one. The overlapping and redundant information systems and processes had become critical problems that, if not addressed in time, could pose a significant threat to the organization. In order to consolidate and simplify the IT architecture, the IT organization needed to move towards a centralized governance structure as this would enable common priorities and ensure that new, overlapping information systems were no longer introduced (CIO, 2014). In this way, the state of the IT architecture made a centralized IT governance design preferable. While the need for IT architecture integration and consolidation was recognized by the IT management (Aarhus University 2010), the case of AU shows that the IT management could not deal with the IT architecture difficulties without challenging the dominant logic of the organization as it influenced the established practices and rule structures. The logic simply shaped individuals' understanding of technology. While the IT management saw a need to think about and plan the IT architecture

coherently, developers and project managers saw their autonomy as more important than centralized decision-making and strategies.

Overall, most of the important projects that we did were not governed by a central strategy. They just happened. I have a goal, a precise goal, and I know exactly how to get there (IT Developer, 2014)

In this way, the understanding of the IT architecture, and its relation to the IT governance design, was mediated by the dominant logic that shaped behavior.

From around 2009 until 2012, the main focus at TDC was similarly to consolidate the IT architecture since many information systems were brought together from the various mergers and acquisitions. These mergers and acquisitions were a direct result of the strategic choices caused by earlier market logic. With the equity owners, TDC implemented the disciplined cost management IT governance plan to rationalize the portfolio, reduce costs, and stabilize operations (Enterprise Architect, 2015). The IT architecture was central for the equity owners to realize their efficiency goals and most governance was, thus, around reducing the operational expenses of the IT architecture. The later focus on innovative, integrated, digital solutions also required an integrated and optimized IT architecture. Although the IT architecture seemed central for realizing the different goals and strategies imposed by the logics of TDC, the shifting focus of governing the IT architecture was not a result of a long-term deliberate strategy. Rather, the shifting focus was something the organization was forced into as the ownership structure changed.

Yeah, I understand. I don't think you can necessarily say that [the IT architecture is the result of a deliberate design]. I think each of the phases has been something we have been forced into [by changes in ownership structure]. However, if you look at it retrospectively, then it seems like it makes perfect sense (Enterprise Architect, 2014)

At TDC, the IT architecture did not determine the IT governance design, or the other way around. Instead, it seemed that the different owners of TDC saw different opportunities and challenges in relation to the architecture, depending on the logic they brought to the company. The logic within the IT organization would then be changed by making changes to the IT management, restructuring the IT organization, and implementing new performance goals centered, for example, on reducing operational expenses within the IT organization.

LEGO seemed to have the most mature IT architecture. While LEGO, on the one hand, focused on collaborative mechanisms through their IT governance design, it was central for the IT management

to protect and govern the integrity of their mature IT architecture generally perceived as a competitive advantage.

It has cost us enormous amounts of time and money. In turn, if you look at our strategy, our IT architecture is now one out of seven strategic assets, together with our brand (Head of IT Operations, 2014).

This was done by formulating governing principles centered on protecting the IT architecture. Furthermore, each challenge session would require both a security and infrastructure analysis in relation to the impact on the architecture.

How does the solution fit with our principles? We make governance regarding the security analysis and look at the infrastructure analysis to identify major risks to the architecture (Enterprise Architect, 2014)

While LEGO had focused on both collaboration, but also on protecting the IT architecture through their IT governance design, new technologies were now challenging the current architecture as digitization was becoming a strategic driver. Potentially, this would challenge the way LEGO had thought about governing their architecture thus far.

Everything that we made came out of enormous cohesion and shared understanding. An amazing journey. But we simply have to think differently now. We have developed a solid IT architecture, but how do we move on from here? (Head of IT Operations, 2014)

Technological changes and IT governance design. Across the three cases, strategic documents and interview data indicated that each organization faced technological changes. While the IT governance design in each organization had been centered on achieving goals imposed by different logics or solving IT architecture difficulties, IT managers across the cases stressed the need to adapt their organization to these technological changes.

As TDC started to employ a balanced IT governance approach that would also grow its customer base, new technologies and innovations based on broadband and Internet Protocol telephony were becoming increasingly important for improving customer experience. As a result, TDC planned new product innovations relying on integrated solutions and new offerings such as free music streaming, movies and mobile applications (TDC 2011). In this way, the technological development required a closer collaboration between IT and business.

The CEO of LEGO similarly stressed that LEGO was challenged by digitization. Although LEGO had a mature IT architecture, LEGO was impacted by digitization in many different ways that challenged the way IT was currently governed.

We're not savvy enough regarding where software development is heading now, like smaller applications, disruptive business models, omnichannel landscapes, e-commerce, web-based services, cloud-based services, and so on. We're not nimble enough there (CEO, 2015)

Consequently, the CIO had restructured the IT organization to directly mirror the four business units of LEGO. IT architects, business relationship managers, solution developers and project managers were assigned to one of the three domains. In this way, IT would be enabled to better explore new digital solutions together with the business.

It is about shaping the decisions and being proactive. You get the good results, not by having a theoretical mandate and saying this is how things are, but by being involved with the business early on— making them understand the rationales that you have (Enterprise Architect, 2014)

In the end, the CIO of LEGO decided that a new IT architecture would have to be created for customer-facing applications and that a different IT governance design would have to be applied for that particular IT architecture. While the existing IT architecture had been an important competitive advantage by supporting the global supply chain of LEGO, it did not address an increasing need for LEGO to engage directly with its consumers and provide customized experiences. The new IT architecture would provide new functionalities for consumers in short iterations through user-centric design, self-governing teams and agile development. Structured and clear business cases would not be favored over experimental and innovative ideas. Meanwhile, collaboration with users, vendors, and business would be taken even further.

Overall, existing approaches to how the IT architecture was governed would persist for the old IT architecture, while the new IT architecture would be governed differently to address new technologies. To a large extent, the aim was to rely on the existing logic of the organization to take collaboration further internally, but also to strengthen collaboration with vendors and consumers.

Consumers want to engage, they want to have a dialogue, they want to talk to each other, and they want to talk to the brand and the company. That has always been a strength of the brand, but that strength has been increased so much on the back of the digital economy (CEO, 2015)

Additionally, an initiative was started by the CIO to adjust the mindset of the employees to work in a more agile, adaptable, and independent way.

It is important that we create a capability and mind-set shift in LEGO's ability to embrace digitization and in line with the expectations of our growing digital audience (Internal document, 2016)

Similarly, the IT management at AU experienced an increased need to support new technologies regarding digital exams and supplying an enhanced study experience through learning management systems.

We are now formulating our first digital strategy as digitization has become increasingly important. We looked into industry trends regarding new developments within education and research. Where are things, for example, heading regarding e-learning? We believe that the campus experience is central to our university, but we need to figure out how to augment that digitally through things like blended learning (Head of IT Development, 2016)

Although new technologies required a more agile and business-oriented IT governance design, it did not involve moving back to the old way of doing things autonomously within the different faculties. While control and a centralized IT governance design were still needed, the IT management stressed that balancing agility and IT governance control was becoming not only a technical problem, but also a problem to the new logic they had tried to establish within IT.

It is not a good solution to give up on existing IT architecture principles to keep up with fast-paced technologies and, for example, again allow developers to do whatever suits them. We need to give them flexibility in adapting services and user-interfaces that are provided on the basis of a stable IT architecture. Working both in an agile and a structured way at the same time is becoming a problem, but we need to protect our backend IT architecture while being flexible. This is a challenge to the culture that we have worked to establish within IT (IT Manager, 2016)

In this way, technological changes challenged the way each organization designed their IT governance and the underlying logics influencing these IT governance designs. Meanwhile, the IT architecture of each organization posed different challenges that similarly influence each organization's ability to capitalize on new technologies and to decide what IT governance design might be appropriate. In turn, the maturity of the IT architecture within each organization was influenced by whether the organization had employed a merger and acquisition strategy. While both AU and TDC attributed their IT architecture difficulties regarding a lack of information system

standardization and integration to previous mergers, the CEO of LEGO emphasized the fact that LEGO did not have a history of mergers and acquisitions and that this was one of the reasons why their IT architecture was so well integrated and mature.

We haven't really made any significant acquisitions. We've hardly made any. One of the ways companies mess up their IT architecture is actually going through acquisitions. We've had the privilege of not having to deal with that, and that has allowed us to have a fairly stable environment (CEO, 2015)

In this way, the IT governance design of each organization emerged out of an intricate interplay between the IT architecture, IT governance design, institutional logics, and organizational strategies.

6 DISCUSSION

This paper presented a cross-case analysis of IT governance design in three different organizations. IT governance design has been approached through the frame of the often taken for granted institutional logics that reside within organizations. IT governance design showed to be influenced by the institutional logics and properties such as technological changes, the IT architecture, and strategies of each organization. The analysis suggests that organizations have different strategies for IT governance design available in dealing with institutional logics. The strategies relate to (a) *challenge* the dominant logic (b) *exploit* the dominant logic (c) ongoing *adaption* if a volatile institutional environment causes changed in logics over time. Thus, the findings contribute with a theoretical framework as to strategies for IT governance design in dealing with institutional logics.

By applying an institutional perspective to the study of IT governance design, the findings inform research on IT governance design. Specifically, the paper theorizes on the challenge of implementing an IT governance design in relation to existing logics, but also on how institutional properties such as strategies, technologies, and IT architecture are central elements that similarly influence the interplay between IT governance designs and logics. Research has shown how certain contingency factors influence IT governance design. These studies have outlined how IT governance design should consider organizational structure and strategic objectives (Brown, 1997; Weill & Ross, 2004a, 2005a; Weill, 2004) as they influence the implementation of centralized, decentralized or balanced (federal) governance structures (Brown, 1997; Sambamurthy & Zmud, 1999; Schwarz & Hirschheim, 2003; Tiwana & Kim, 2015; Tructures et al., 2013; Weill, 2004). Thus, these studies have shown that certain factors might influence an organization's choice of IT

governance design. While research on IT governance has subsequently moved towards studying the impact of a certain governance design on the overall effectiveness of IT governance (Ali and Green 2012; Bowen et al. 2007; Bradley et al. 2012; Van Grembergen and De Haes 2009; Huang et al. 2010; Prasad et al. 2010, 2012), there has been no theorizing on the strategies, difficulties, and tradeoffs that organizations deal with when implementing IT governance designs. As the three cases indicate, logics can go against a certain IT governance design, shift over time, or complement a governance design. Thus, it is here theorized that IT governance designs are more successfully implemented if the existing organizational logic(s) are considered, and the organization in question devises a strategy in dealing with the logic(s). Without such a strategy, a given IT governance design is likely to fail due to a mismatch between the organizational logic(s) and the governance design. These findings are in line with recent theoretical developments on institutional logics suggesting that strategies can be applied in accordance with existing institutional logics (Ocasio and Radoynovska 2016).

In relation to studying the interplay between institutional logics and IT governance design, institutional properties were further drawn upon in the analysis. By studying the three organizations longitudinally through retrospective analysis, it was possible to gain deeper insights into how technological changes and the maturity of the IT architecture (Ross et al. 2006) affected the choice of IT governance design. While it has been recognized that technologies are increasingly impacting organizations, industries and the global economy itself (Brynjolfsson and McAfee 2011, 2014; Hansen and Sia 2015; Hendrix 2014; Matt et al. 2015), there is little knowledge on how emerging technologies influence existing IT governance designs in organizations. It has been proposed that emerging technologies are challenging conventional dichotomizations within IT governance literature, such as centralization versus decentralization (Tiwana et al. 2013). Similarly, the cross-case analysis shows that each organization became increasingly attuned to new technologies such as cloud computing (Iyer and Henderson 2010), business analytics (Chen et al. 2012), and omnichannel retailing (Brynjolfsson et al. 2013) that challenged how IT should be governed. As emerging technologies were seemingly on the rise, stakeholders within each of the three cases increasingly asked themselves how this would impact their IT governance design. Does this mean that organizations should redesign their IT governance in order to better employ new technologies? The analysis suggests that organizations design IT governance to address a dual need of managing the internal IT architecture while dealing with the challenges and opportunities of new, external technologies. These can be seen as two institutional pressures, each having the power to influence institutional logics and drive the IT governance design in a certain direction. While much

institutional literature views institutional pressures as constraints to which organizations must respond (e.g. Greenwood et al., 2011), this view has shown to overlook the available strategic opportunities and choices that organizations have in acting upon them (McPherson and Sauder 2013; Oliver 1991). Similarly, the three cases illustrate that organizations strategically adapt to these pressures and shift their focus between adapting to technological changes and managing the IT architecture. Both elements were important to all three organizations, but not equally important at all times. While LEGO was building a new, modular IT architecture that would support continuous delivery to consumers, real-time analytics, and faster time-to-market, they still viewed their existing IT architecture as a strategic asset that needed to be kept and governed to support the existing global supply chain. While TDC sought to become more innovative and launch more digital products, they similarly emphasized that continuous improvements to the existing IT architecture were necessary for driving further efficiency and launching new solutions. At AU, management was similarly aware that it could not give up centrally governing the IT architecture. All three organizations had a fundamental need to govern shared business processes, systems and data. In this way, the central question is not whether organizations should redesign IT governance in the face of new digital technologies. As the existing IT architecture matures, new technologies emerge, and the institutional logics of organizations change, it is unlikely that one, unique IT governance design can, or should, persist over time. This implies a more dynamic view on IT governance design than traditionally employed. While current literature has outlined how organizational characteristics and objectives determine an appropriate IT governance design (e.g. Weill, 2004), the current paper takes a step further to theorize that organizations should strategically implement and adapt their IT governance design in accordance with the prevailing logic(s) and institutional properties. However, at the same time, the prevailing logics within organizations frame how they think about the challenges and opportunities posed by external technologies and the internal architecture. This means that institutional logics both limit and enable strategies in dealing with the issues of IT architecture and technologies. This is best exemplified by TDC where IT managers, in the end, sought a balanced IT governance design seeking to achieve goals related to optimizing the IT architecture and pursuing new digital technologies at the same time. This finding is in line with recent developments within research on institutional logics showing how strategic choices are shaped by available institutional logics and that institutional heterogeneity leads to heteronomous business models, strategies, and possibilities to capture value (Ocasio and Radoynovska 2016). As IT governance has been identified as the prime impetus for IT value in organizations (e.g. Van Grembergen & Haes, 2016; Weill & Ross, 2004b), it is important to understand how institutional logics might lead organizations to design, or redesign, IT governance

to capture value in new ways through IT. However, the current study is the first to show how logics influence IT governance design. The study has a number of implications for both practice and research.

7 IMPLICATIONS FOR PRACTICE

The study has provided robust descriptions of alternative strategies that organizations can employ when designing IT governance in accordance with prevailing logics. The different strategies for IT governance design are contingent on the particularities of each organization. It requires a delicate appreciation of the culture of the organization, IT architecture, and the role of emerging technologies. Senior executives must understand the interplay between these elements when deciding on an appropriate IT governance design. As strategic choices are available in dealing with institutional logics and properties, an IT governance design can be decided upon in accordance with the prevailing logic(s) of the organization, the IT architecture needs, external technologies, or a mix of these elements. While especially senior IT managers are aware of both external technologies and the internal IT architecture, it is equally important to consider the mediating role that institutional logics have as to how organizations understand technology in general, and the way logics affect how individuals within the organization think about and work with technologies (both the IT architecture and external technologies). If senior executives are aware of the role of institutional logics in designing IT governance, these logics can be adapted to, challenged or exploited depending on the characteristics of the prevailing logic(s). This implies that it might not be preferable to employ certain strategies depending on the situation. In the case of TDC, institutional logics were largely imposed on the IT organization as shifting owners took reign over the company. IT managers finding themselves in a similar situation will likely have a hard time challenging normative pressures coming from the corporate management and owners. Likewise, it seemed reasonable that the IT management at AU had to challenge the dominant autonomy logic simply because the unintegrated IT architecture required a more centralized approach to IT governance. In this case however, the IT management did not seek to challenge the logic across the university, but only within the IT organization itself. In the case of LEGO, the family logic was so embedded into the stable environment in which LEGO had always found itself – due to no mergers or changes to the overall ownership structure. Consequently, one could theorize that organizations like LEGO with a well-established logic would have a hard time challenging the existing logic(s) and, instead, would have to identify ways to exploit the logic(s), or only challenge the logic locally within the IT organization. While senior executives and IT managers have strategic choices available in dealing

with institutional logics, institutional logics are also subject to institutional pressures, values, beliefs, and rules that are influenced by actors, the individual organizations, and the overall society (Friedland and Alford 1991). Although logics can be acted upon, they are not something that can easily be changed or manipulated. Therefore, practitioners should carefully consider which strategies are realistically feasible in their particular situation. The cases of AU and TDC indicate that top-down cultural change initiatives supported by senior executives might be more easily implemented. TDC changed its IT governance approach several times as new logics were imposed by new owners, such as the private equity owners. The new owners would change the logics and practice within the IT organization by imposing new key performance indicators, changing the management team, and initiating a cultural change project across the organization. AU tried to deal with the logic and IT governance through a middle-out process. While AU did change their IT governance design between 2010 and 2015, the IT managers did emphasize that the process took a long time, and would have been easier if the senior executives had supported the change in logics and IT governance design. In this way, it is possible to change the logic within the IT organization with sufficient backing and understanding from senior executives – although it is probably harder. At LEGO, the CIO emphasized that he mostly needed to formalize and strengthen networks that had always been central to LEGO as an organization.

Lastly, all three organizations illustrate that IT governance cannot be treated as static, but undergoes continuous redesigning in relation to the elements identified through the analysis. This is a necessity in order to maintain an ongoing fit with changing technologies, the evolving IT architecture, and the possibility of shifting institutional logics. For this reason, senior executives and IT managers must attempt to identify the implications of key events inside or outside the organization on the relationship between the IT architecture, the current logic(s) and the IT governance design. For instance, as the senior management at LEGO recognized digitization as a key strategic driver, they reevaluated their IT architecture, IT governance design, and the adequateness of the existing mindset and culture. The CIO of LEGO believes that addressing all these elements is central if the company is to use digital technologies to enhance product experience, leverage digital channels for retailing, improve systems and processes, and generally improve the productivity of the IT organization.

8 LIMITATIONS AND FUTURE RESEARCH

Despite the theoretical contributions of the current paper to IT governance literature, the paper has certain limitations. First, a possible limitation is the number of cases represented in the study. While it is possible that more cases could have yielded more insights, in-depth studies and in-depth analysis of few cases were given higher priority in this study. This does not invalidate the findings reported in this paper. Rather, it opens up possibilities for other researchers to further theorize on the relationship between institutional logics and IT governance design. Second, while this paper contributes with a theoretical framework as to strategies for IT governance design in dealing with institutional logics, it is possible that further strategies or adaptations to these strategies can be found. For example, it has recently been shown how the convergence of institutional logics in public-private partnerships can result in the balancing of norms and practices (Beck et al. 2015). Likely, this would result in a slightly different strategy than the one employed by AU as the aim would not be to challenge and replace the current logic, but rather adjust it. Third, the cases were chosen because they all represent large and long-standing organizations. For this reason, the findings can only to some extent be transferred organizations that are either smaller or more recently established. All three cases reported here had old legacy systems, or were struggling with an unintegrated IT architecture as the result of several mergers. While the issue of IT architecture is important to small and medium-sized companies (e.g. Bernaert, Poels, Snoeck, & De Backer, 2014), these face different challenges in relation to their IT architecture and will approach the issue of IT architecture somewhat differently (Bidan et al. 2012). Therefore, while small and medium-sized organizations are influenced by the issue of IT architecture, it is likely that the IT architecture would play a different, or less significant, role compared to organizations struggling with complex IT architectures or old legacy systems. In this way, a study of the interplay between institutional logics and IT governance design in smaller and more recently established organizations might prove a prolific research avenue with regard to understanding different dynamics in relation to the IT architecture and possibly, different IT governance designs and priorities. Fourth, all cases were chosen to be Danish companies. Resultantly, it is possible that the logics found in these cases would not commonly exist in, for example, American companies. In the case of LEGO, their family logic emphasized collaboration within IT, but also across the company. This might work particularly well for LEGO as Scandinavian companies have been found to have less departmental conflicts – thus enabling effective collaboration across departments (Jaworski 1996). Still, research has indicated that different types of ownership structure such as family-owned businesses do result in differentiated strategies and logics (Greenwood et al. 2010; Kachaner et al. 2012; Miller et al.

2011). As LEGO is also a global company, it seems likely that a similar IT governance design could also work for organizations outside of Scandinavia. Nevertheless, readers should be aware of the fact that the logics found in the three cases do not necessarily represent the logics commonly found in organizations, and that country-specific contexts might influence what logics tend to dominate. Still, this fact should not limit the transferability of the study, as the framework for different strategies for IT governance design in dealing with institutional logics does not rely on the particular logic, but rather, on how the logic matches the IT governance design. Nor does it influence the theoretical relationship between IT governance design and institutional logics. A fifth limitation is related to the use of retrospective analysis. While drawbacks of retrospective analysis were addressed through data triangulation, some of the analysis goes back more than twenty years. Therefore, emphasis was put on the more recent years in each of the cases. Preferably, future studies will be able to provide even richer longitudinal insights as to how IT governance design and institutional logics develop and influence each other over time.

Although the current study theorizes on the relationship between institutional logics and IT governance design, and outlines a framework regarding strategies in dealing with institutional logics, further research is needed to investigate the relationship between different ownership structures, specific logics, IT governance designs, and other organizational characteristics. For example, LEGO had a particular IT governance design that seemed to emphasize trust and collaboration more than TDC and AU, but it is unclear from the current study whether other family-owned organizations might employ a similar IT governance design focusing on engaging key stakeholders (Fonstad and Robertson 2006a). While several interviewees emphasized the relation between how IT governance was done and the particular culture of LEGO, it was also evident from internal documents that LEGO sought to exploit the culture for collaboration due to its increase in size over the years. Therefore, an interesting avenue of research would also be to further explore the relationship between institutional logics, ownership structures, and IT governance designs in order to build more robust theoretical relationships between, for example, the use of mechanism for engaging stakeholders, the size of organizations, and their prevailing logics.

9 CONCLUSION

The current study set out to investigate how institutional logics influence the design of IT governance. While previous studies have been valuable in identifying relevant contingency factors that influence which IT governance designs might be appropriate, the current study builds on those insights by investigating how prevailing logics in diverse organizations interact with the IT

governance design in each organization. In doing so, it is revealed how the institutional logics, which guide and shape behavior in organizations, influence IT governance design, but can also be strategically acted upon when designing IT governance. Institutional logics mediate the organizational understanding of technology by framing organizational actors' attitude towards what an appropriate IT governance design is, and how work should be carried out. The three cases show that organizations will have a hard time implementing an IT governance design without thinking strategically about how such a design might fit with the prevailing logic(s). To this end, the paper contributes with a theoretical framework on strategies for IT governance design in dealing with institutional logics. In this way, the paper supplements previous studies that have emphasized the relationship between IT governance design and overall organizational characteristics and strategic objectives, but done little to theorize on how these designs can subsequently be implemented in the IT organization.

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APPENDIX B: SAMPLE FROM THE CODING PROCESS

Quote example	Codes	Cross-case theme
<i>We have the following six values: fun, imagination, creativity, quality, leaning and caring. Caring to me is very much where the collaborative issue is born and maintained. LEGO has always been very good at creating strong, warm relations between the employees and that is why LEGO is such a flat organization. Whatever you do in LEGO, you can walk straight into the CEO's office and talk to him</i>	COLLABORATION FAMILY VALUES FLAT HIERARCHY	Institutional logic
<i>When you are in an organization where there is no understanding at the top management as to why governing the architecture is important, then you are forced to do things, middle-out, but then it just take much longer time. But creating a network among the middle-management can have a quite big effect in the long run. We have influence in the end coming bottom-up from the middle management to the top management</i>	MIDDLE-OUT STRATEGY IT GOVERNANCE	Strategies for IT governance design
<i>Consumers want to engage, they want to have a dialogue, they want to talk to each other, and they want to talk to the brand and the company. That has always been a strength of the brand, but that strength has been increased so much on the back of the digital economy</i>	DIGITAL ENGAGEMENT TECHNOLOGIES	Emerging technologies (inst. property)
<i>This culture for research freedom and autonomy at AU also rubs off on the way things work within the administration. This has been a challenge to us in relation to governing the architecture and documenting processes</i>	IT ARCHITECTURE CULTURE	IT architecture (inst. property)
<i>The digital age will change our enterprise strategy in a number of dimensions. We have given you some examples, but there is no way of knowing them all.</i>	STRATEGY ORGANIZATION	Organizational characteristics and strategy (inst. property)

APPENDIX B: CASE REPORTS

Case Report: Aarhus University	
Key characteristics	Danish university established in 1982. Today it has approximately 6.2 billion DKK in revenues and approximately 11,500 employees. Located in Aarhus, Denmark.
IT governance design	Centralized after the university merger. Formalized processes around project management, and portfolio management. Before the merger, there were not much IT governance in place in relation to IT architecture, IT projects etc. created IT architecture principles.
Culture	Culture is influenced by values such as independence, freedom of research, and critical thinking.
IT architecture	Complex and unintegrated after the university merger. Lack of understanding and support from the university management. Formulated architecture principles, but it was similarly hard to get backing for those from the management. Implemented an integration bus to integrate the many different systems.
Strategy	After the university merger, Aarhus University is seeking to establish itself further as a top university worldwide. The IT department seeks to support this, but has for many years focused on integrating the IT architecture of the previously independent faculties.
Case Report: The TDC Group	
Key characteristics	Telecom focused on the Scandinavian market. Established in 1990. Originally a merger of the regional state-owned telecoms in Denmark. Later privatized and bought by private equity. Today public limited company employing around 8,600 employees and approximately 23.3 billion DKK in revenues. TDC went through several different ownership-structures. The company went from public monopoly to private limited company and was later bought by private equity and later sold again on the public market.
IT governance design	Focus shifted over the years. During the period as a public monopoly the IT governance was formalized. Later TDC strived to increase customer base. Private equity owners made IT organization responsible for reducing operational expenses. Later, focus shifted towards digital solutions and customer experience.
Culture	More top-down than LEGO and AU. Managers mention that the way things work are influenced by the company's days as a public monopoly, but also that things have changed a lot over the years.
IT architecture	For years, the IT department has been focused on cleaning up the company's underlying, complex IT architecture, consisting of old, legacy systems. Lately, digitization has redirected TDC's focus on customer-based initiatives: new, integrated services, product innovations, improved customer service.
Strategy	Around 2012, TDC went from a disciplined cost-management IT plan towards a strategy emphasizing a rejuvenated IT architecture and radical improvements to customer experience, sales penetration, time-to-market, and automation.
Case Report: The LEGO Group	
Key characteristics	Global Toy Company established in 1932 with approximate 28.6 billion DKK in revenues. Owned by the Kirk Kristiansen family. Nearly bankrupted, but went through a turnaround in 2004 facilitated by the current CEO. Headquarters in Billund, Denmark. Global hobs in Asia, the Americas, and Europe.
IT governance design	Collaborative networks that go beyond the IT unit. Protect the IT architecture.
Culture	Trust, caring, fun, creativity, learning, and imagination. Flat hierarchy. Anybody can approach a senior manager.
IT architecture	A main competitive advantage according to CEO and CIO. Very mature. The IT architecture was part of the reason why LEGO was almost bankrupted. There was no focus on the underlying supply chain and operations.
Strategy	Globalization and digitization are two key strategic drivers. This challenges the IT architecture and the way IT is organized. Have tried to foster further collaboration across the organization due to this.