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Institutional Perspectives on the Process of Enterprise Architecture Adoption

Duong Dang¹ · Samuli Pekkola²

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Abstract

Organizations often adopt enterprise architecture (EA) when planning how best to develop their information technology (IT) or businesses, for strategic management, or generally for managing change initiatives. This variety of different uses affects many stakeholders within and between organizations. Because stakeholders have dissimilar backgrounds, positions, assumptions, and activities, they respond differently to changes and the potential problems that emerge from those changes. This situation creates contradictions and conflicts between stakeholders that may further influence project activities and ultimately determine how EA is adopted. In this paper, we examine how institutional pressures influence EA adoption. Based on a qualitative case study of two cases, we show how regulative, normative, and cognitive pressures influence stakeholders' activities and behaviors during the process of EA adoption. Our contribution thus lies in identifying roles of institutional pressures in different phases during the process of EA adoption and how it changes overtime. The results provide insights into EA adoption and the process of institutionalization, which help to explain emergent challenges in EA adoption.

Keywords Enterprise architecture · EA adoption · Institutional theory · Institutionalization process

1 Introduction

Enterprise architecture (EA) attempts to improve alignment between business and information technology (IT) management and support IT planning and decision-making (Magoulas et al. 2012; Ross 2009; Simon et al. 2014;). EA is of interest to both private- and public-sector organizations. For example, the United States and Finland, where a large number of such projects have been implemented, have enacted laws that oblige state agencies to use EA, such as the Clinger-Cohen Act 1996 and the E-Government Act 2002. Because multiple actors participate in or are affected by such projects (Jonkers et al. 2006; Shah and Kourdi

2007), understanding all stakeholders' perspectives is crucial for successful adoption (Dang and Pekkola 2016).

EA adoption refers to how organizations actually use EA, or how EA works there (Dang and Pekkola, 2017). EA is adopted through EA projects or EA programs consisting of several projects. EA adoption process is a process where EA becomes a mundane practice of an organization (Iyamu 2009; Weiss et al. 2013). Although the process includes many phases, there are different views (c.f., Armour and Kaisler 2001; Armour et al. 1999; Banaeianjahromi and Smolander 2017). For example, Banaeianjahromi and Smolander (2017) identified three phases: pre-development, development, and post-development, while Armour and colleagues (Armour and Kaisler 2001; Armour et al. 1999) divided it in five phases: initiating the process, characterizing the baseline architecture, developing the target architecture, planning the architecture transition, and planning the architecture implementation. We view EA adoption including two main phases: EA initiation, where EA functionalities are created, and EA implementation, where those functionalities are deployed. EA functionality refers to the architectural descriptions of the organization's current and future state, general principles for their architecture, and a roadmap to the future state (Niemi and Pekkola 2017).

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EA adoption studies have often ignored the challenges of institutionalizing EA (Dang and Pekkola 2016; Hylving and Bygstad 2019). Instead, they have studied on frameworks (c.f., Simon et al. 2013; Dang and Pekkola 2017), the benefits and success factors of EA adoption (c.f., Schmidt and Buxman 2011; Lange et al. 2015), agile EA adoption (c.f., Bondar et al. 2017; Alzoubi et al. 2018), and problems with EA (c.f., Kappelman and Zachman 2013; Ajer and Olsen 2018). However, they provide little or no insight into institutional and stakeholder factors in EA adoption from the viewpoints of senior managers and chief information officers [CIOs], project managers and enterprise architects, and IT specialists and non-IT civil servants, for instance.

While literature has indicated the importance of cognitive, normative, and regulative pressure on adoption intention (Khalifa and Davison 2006; Krell et al. 2009; Liang et al. 2007; Teo and Pian 2003; Yoon and George 2013; Zheng et al. 2013), little is known about how these pressures affect the adoption process. EA literature on the institutional view is especially scarce; the few examples focusing on the institutionalization barriers within EA management (Dang 2017; Iyamu 2009), which factors influence architectural coordination (Weiss et al. 2013), interoperability challenges (Hjort-Madsen and Gøtze 2004), government pressures (Hjort-Madsen 2007), potential solutions for EA adoption (Dang and Pekkola 2016; Dang et al. 2019), and the stakeholders logics in EA adoption (Dang 2019). The ways in which institutional factors influence different phases of EA adoption remain unknown, as are stakeholders' responses to challenges that emerge within EA adoption process. We argue that analyzing these issues will provide an in-depth understanding of the values, norms, and rules found in different phases of EA adoption and will further explain the challenges in EA initiatives.

Our research question is as follows: *How do institutional pressures influence different phases of EA adoption?* Based on a qualitative case study of two organizations and their key EA stakeholders, our findings contribute to literature by identifying roles of institutional pressures in different phases during the process of EA adoption and how they change overtime. The findings show that cognitive pressures dominate the early stage of EA adoption, while regulative pressures become more important later. We also show how values, norms, and rules appear in different EA-adoption phases. These factors have several practical implications, as highlighting institutional factors will enable practitioners to design strategies and respond to the challenges of EA adoption.

The remainder of this paper is structured as follows. The next section introduces the background to the study before moving on to describe the research methods and context. After summarizing and discussing the study's findings, the paper ends with conclusions, implications, and limitations.

2 Background

2.1 Enterprise Architecture

EA has no universally accepted definition with a wide ranges of scopes, covering from organizational business to technology (Dang and Pekkola 2017). In this paper, we view EA as “an approach for managing the complexity of an organization's structures, business environments, and different information systems, and for facilitating the integration of strategy, personnel, business, data, and IT” (Dang and Pekkola 2017, p.131). Enterprise architecture management (EAM) to mean “the management activities conducted in an organization to install, maintain and purposefully develop an organization's EA” (Lange et al. 2015, p. 1). In that sense, EA project and its activities can be understood to be a part of EAM. EA products are outputs of an EA project, such as strategic plans, standards, and frameworks (Dang 2019). EA approach is understood as methodologies to establish an EA. For example, organizations can use the Open Group Architecture Framework (TOGAF) as an approach to establish their EA from initiation to use (Hylving and Bygstad 2019).

2.2 The Institutional View within EA Research

Information systems (IS) researchers use institutional theory as a lens to study how institutions, organizations, and organizational entities influence one another (Jepperson 1991; Mignerat and Rivard 2009) and how different institutional stages emerge (Mignerat and Rivard 2009). Most studies have focused on organization-level issues, while the few that have considered individuals and groups (Mignerat and Rivard 2009; Weiss et al. 2013).

The use of institutional theory as an analytical lens appears to be rare in EA research (Dang and Pekkola 2016). Those include, for example, Iyamu (2009) identified the internal barriers to the process of EA adoption as being organizational structures, administrative processes, organizational politics, and technical capabilities. Dang and Pekkola (2016) looked at institutionalization in different phases of EA projects, while Hjort-Madsen and Gøtze (2004) studied interoperability challenges at different levels of government. Magnusson and Nilsson (2006) argue that institutional theory can be used to introduce legitimacy and a historical perspective to architectural frameworks. Hjort-Madsen (2007) discussed government pressures for consolidation and value preservation and the political motives that drive EAM development. Dang (2019) studied institutional logics influencing EA adoption, and Hjort-Madsen et al. (2007) investigated the influence of EAM adoption in government organizations. These studies have not considered how institutional pressures change over time, nor how individuals or groups are influenced by

institutional pressures during the process of EA adoption. We try to fill this gap.

Because each stakeholder group exhibits distinct behaviors and activities, they will respond differently to a given action. For that reason, we focus on different stakeholders, including the management team (e.g., senior managers), the project team (e.g., project managers (PMs)), and users. Within this view, organizations, groups, and individuals constitute an internal group, while society and central governments are externals. We argue that both groups are equally important in shaping the stakeholders' activities and behaviors and lead to different responses to new issues. Analyzing the institutional factors can thus help in understanding the roles of values, norms, and rules in the EA-adoption process, from establishing the technology or practice (i.e., EA) to its institutionalization.

2.3 Theoretical Lens

We adopt Mahalingam and Levitt's formulation of an institution for our study: "(neo) institutions are a set of rules, norms, and values operating in a given environment that help generate a regularity of behavior among actors affected by that environment" (2007, p. 523). This formulation acknowledges that organizations may initiate EA with certain expectations but may leave others to do the interpreting and applying. Rules, norms, and values may drive (and therefore explain) the activities and behaviors of stakeholders during the institutionalization of EA (Mahalingam and Levitt 2007).

As institutional theory examines "the processes and mechanisms by which structures, schemas, rules, and routines become established as authoritative guidelines for social behavior." (Scott 2005, p. 408) The theory is often used to study social perspectives in organizations that implement IS projects (Mignerat and Rivard 2009; Orlikowski and Barley 2001). Institutional theory thus offers a lens for analyzing the rules, norms, and values that underlie and legitimize the behaviors and activities of groups and individuals (Berente and Yoo 2012). The majority of studies that have used institutional theory as a lens have focused on the macro level, where the organization is considered to be the smallest type of actor (Berente and Yoo 2012; DiMaggio and Powell 1983). Others, however, have argued that the micro levels of various phenomena (e.g., groups or individuals) are rooted at higher levels (Berente and Yoo 2012; DiMaggio and Powell 1983; Powell and DiMaggio 1991). This notion allows us to focus on individuals and groups and governmental policies.

Three main pressures influence organizational and individual behavior: cognitive (values), normative (norms), and regulative (rules) pressures (Scott 2005). Cognitive pressures relate to institutional culture, such as beliefs or organizational values (DiMaggio and Powell 1983). Normative pressures refer to how an organization's approach to professionalization—for example, work norms or mimetic behaviors—informs its

members' activities (DiMaggio and Powell 1983). Regulative pressures, both formal and informal, include policies and elements in the legal environment that explain how institutions constrain and regulate stakeholder activities and behavior (Mignerat and Rivard 2009), as in the case of local governments ruled by a central government.

When pressures arise, organizations and stakeholders tend to conform in order to achieve legitimacy and to secure resources that are important for their survival (Ribeiro and Scapens 2006; Scott 2005). Yet their responses vary (Oliver 1991) due to different backgrounds, cultures, beliefs, societies, and political environments. Responses are applied differently in EA project activities (for example, in terms of scope, approach, and outcomes), which then steers the projects in different directions. For instance, top managers, project members, and users may initiate different actions by their varying views on a given problem, which creates contradictions and conflicts among stakeholders. Institutional theory thus entails both the assumptions that are taken for granted and the actions that influence and guide decision-makers.

We adopt this perspective as a means of understanding stakeholders' behaviors and activities (Cloutier and Langley 2013; Scott 2005; Oliver 1991; Friedland and Alford 1991) during the adoption process. The use of the institutional view helps in understanding how institutional pressures change over time and how individuals or groups are influenced by institutional pressures during the adoption process.

3 Research Methods and Context

3.1 Research Methods

Our empirical research was conducted from 2015 to 2016. We used an interpretive case study as a research approach (Myers 1997; Walsham 1995). As Myers (1997) and Walsham (1995) have instructed, we first conducted a literature review (Webster and Watson 2002) in order to form the theoretical foundations for the study. The theories were used loosely so that they would not influence the data collection and analysis. The lenses of the theoretical foundations of institutional theory and EA were adopted later and used in the data analysis.

The use of interpretive case studies helps to understand various phenomena within a case's context (Benbasat, Goldstein, and Mead 1987). As Orlikowski and Baroudi (1991, p. 13) note, this approach allows researchers to "understand how members of a social group, through their participation in social processes, enact their particular realities and endow them with meaning, and to show how these meanings, beliefs and intentions of the members help to constitute their social action."

We chose two Vietnamese provinces for our multiple-case study (Stake 2005). They were chosen for two key reasons.

First, multiple cases may be “...similar or dissimilar, redundancy and variety each important. They are chosen because it is believed that understanding them will lead to better understanding, perhaps better theorizing, about a still larger collection of cases” (Stake 2005, p. 446). Second, the cases were different in terms of capabilities, complexity, and experiences with e-government initiatives. For example, the “Omega” case (a pseudonym) used its own resources and procedures, while the “Eta” case was the first province to adopt EA, so it relied on a sponsor, local authorities, and external resources and procedures. In these respects, we considered Omega to be a purpose sample and Eta to be an opportunistic and reputational sample (Miles and Huberman 1994).

3.2 The Cases and their Contexts

Our study focuses on two Vietnamese provinces adopting EA through EA projects. Vietnam has 63 provinces and equivalent municipalities (hereafter provinces). Each province has several departments (e.g., Department of Justice, Department of Information and Communications—DIC) and districts. Each department or district has several divisions (e.g., Division of Information Technology and Division of Planning and Finance of DIC) (Fig. 1).

Vietnam has shown a strong political commitment to promoting electronic government. For instance, during the period 2011–2015, the Vietnamese government’s master plan encouraged state agencies to “use ICT for their administrative reform and business services to improve the effectiveness and efficiency of the public administration system” (Decision No.1605/QD-TTg by the Premier Minister 2010, p. 1). In our cases, EA was thought of as a means of achieving these aims. At the time of this study, however, there were no obligatory laws or policies that the provinces could follow, which resulted in public organizations adopting EA according to their own perceptions. This approach caused variances between the cases.

EA projects in both cases were considered as mega projects. The projects bridged three levels of administrative

structure (Fig. 1). This means that each EA functionality may influence several agencies in all organizational levels. EA projects were established on the administration level. DICs’ were in charge of the project management. Stakeholders participating the projects were collected from Cases’ administration (e.g., senior managers, CIOs), Department or District (CIOs, PMs, IT specialists), and Division (e.g., IT specialists, civil servants). Each stakeholder may represent more than one agency or group. Project activities was thus influenced by internal factors (e.g., individual and agencies within the organizations) and external factors (e.g., sponsor and government policies). We investigate how those factors influence to the adoption process.

3.2.1 Omega EA Project

Omega is a province with little experience on e-government. The EA project was established in 2012, with the main objective of reforming and connecting distinct public services and increasing interoperability between and within organizations. The scope of the EA project covered three levels of the administrative hierarchy (see Fig. 1). Three groups of stakeholders were involved with or influenced by the project activities: senior management, the project team, and users. The EA products included a strategic plan to digitalize services in the Omega agencies and a new model for centralized public services as a single point of delivery for citizens and enterprises and organization employees. Table 1 shows the main activities and timeline for the Omega EA project.

3.2.2 Eta EA Project

Eta is a local e-government leader in Vietnam. Supported by a sponsor’s loan, Eta had embarked on an EA project to reform administrative procedures and public services, reduce the number of information systems, and improve interoperability within and between organizations. Commencing in January 2010, the EA project affected all organizational levels (Fig. 1). The EA products included standards and frameworks for use in various organizations’ IT application strategies. In the absence of explicit guidance for using those frameworks, it became apparent that the program’s outcomes were somewhat limited—for instance, the use of EA products was not reported. Table 2 shows the Eta project’s main activities and timeline.

3.3 Data Collection and Analysis

To gain an in-depth understanding of the topic, we used a qualitative research approach (Myers 1997; Walsham 1995). We conducted face-to-face semi-structured interviews with individuals who worked directly on the EA projects. We recruited new interviewees until we were no longer gaining new

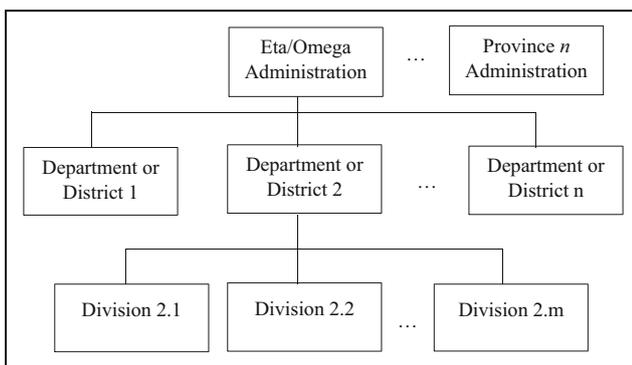


Fig. 1 Organizational structure of the cases

Table 1 Timeline: Omega EA project

Timeline	Phase	Main activities
Sept. 2012 to June 2013	Initiation	A proposal to establish EA functionalities, including a master plan for digitalized services and a new model for public services (e.g., architectures and standardized services and administrative procedures)
June 2013 to Oct. 2015	Implementation	Implement EA functionalities in the organization’s agencies (e.g., central administrations, departments, districts, and divisions)

insights or information. To enhance our contextual knowledge and understanding of the interviewees’ statements, we supplemented the interviews with a range of project documents, reports, news, and presentations.

Our data collection followed a semi-structured interview approach. Interview questions aimed at understanding EA adoption. They were organized into four themes. The exploratory theme aimed to understand the interviewees’ backgrounds and roles, how they comprehended EA, and who had prompted the use of EA. The practice theme aimed to understand EA-adoption processes such as the projects’ activities, events, methods, features, resources, usage, and evaluation. The problems theme aimed to understand the challenges that arise during EA adoption and how they were managed. The final theme aimed to elaborate on emerging issues.

A total of 16 interviews were conducted in 2015 from June to August and four more in 2016 from July to August (interviewees of each case are equal). During both rounds of interviews, the interviewees worked at various levels and positions in the EA projects as senior managers, CIOs, project managers, enterprise architects, IT specialists, and civil servants. In short, we interviewed the stakeholders involved in the adoption process. We assumed that these informants could provide reliable input for the research. We began by interviewing the CIOs to identify key stakeholders, the main project activities, and any relevant secondary sources, which enabled us to draw a project timeline and to specify stakeholders and their roles. The interviews also helped us to divide the project lifecycle into two main phases: initiation and implementation. We then interviewed the other stakeholders. Four additional interviews that were held in 2016 focused on previous findings; they were organized with CIOs and project managers to ensure that our interpretations were correct. All interviews were conducted in Vietnamese, recorded and transcribed; they lasted between 45 and 60 min.

Table 2 Timeline: Eta EA project

Timeline	Phase	Main activities
Jan. 2010 to June 2013	Initiation	Proposal to establish EA functionalities, including common IT architectures, standards, frameworks, and master plans for all organizational levels
June 2013 to Dec. 2013	Implementation	Implement EA functionalities in all agencies, including central administration, departments, districts, and divisions

The transcripts were imported to ATLAS.ti for detailed analysis. Our coding unit was the text segment (no larger than a paragraph and no smaller than a sentence); single text segments could be assigned multiple codes. Relationships, categories, and subcategories were grouped and coded using axial coding (Strauss and Corbin 1998). Throughout the analysis, open and axial coding and interview transcripts were constantly compared. Following the axial coding, we interpreted the data in terms of institutional pressures, with particular regard to stakeholders’ behaviors and activities. During the coding process, we used a triangulation technique by cross-checking between data sources (Stake 2005).

We then extracted and analyzed the data through the theoretical lens to understand (for example) the activities and behaviors related to regulative pressures, although further identification and coding allowed us to classify and refine these codes. The analysis was conducted on the Vietnamese transcripts; only relevant selections were translated into English for illustrative purposes. Table 3 shows an example of the coding. We finished the data analysis with the guidance of Eisenhardt (1989) and compared our findings with those from the literature.

4 Findings

During EA adoption, institutional pressures shape the institutionalization process. The pressures influence the stakeholders’ activities and behaviors. Although the stakeholder responses may seem to be similar, the reactions differ among specific pressures and issues because the stakeholders tend to have dissimilar backgrounds, cultures, and perceptions toward the phenomena. In this context, the use of institutional pressures as a lens helps to understand EA adoption through the stakeholders’ activities and behaviors.

Table 3 Examples of coding: values, norms, and rules

Institutional pressure	Concept	Selected quotation	Phase
Cognitive pressure	Belief or values in an institutional environment	<p>“Some leaders are afraid that when EA is deployed, our roles and benefits will be reduced. That’s why, in some cases, we needed a year or longer to persuade the leader and staff to change their attitudes.” (Enterprise architect, Omega)</p> <p>“The management team perceived EA similarly to other IT projects. The EA project was managed by the ICT department, and those in charge had a strong technical background, which seemed to affect [the project’s] direction.” (CIO, Eta)</p>	Implementation
Normative pressure	Professionalization, work norms, or habits	<p>“They [consultants] brought EA approaches with them from a developed country to us for implementation.” (Senior manager, Eta)</p> <p>“We deployed EA as a means for administrative reform with the help of [the CIO] committee, and [EA] replaced IT application planning in the state agencies.” (CIO, Omega)</p>	Implementation
Regulative pressure	Formal and informal policies or work rules	<p>“At that time, the definitions, scope, scale, level of detail, method, and output of an EA project [from the authorities] were vague. In our EA plan, we weren’t able to focus appropriately on cooperation between the agencies.” (Enterprise architect, Eta)</p> <p>“EA was initiated by the decision of the [management] board, so others had to deploy it within their organizations.” (PM, Omega)</p>	Initiation

4.1 Cognitive Pressures on EA Adoption

While the central government had a master plan and decree for IT applications for state agencies, no regulations or laws were in place to force provinces to adopt EA. EA was generally considered to be a new approach for strategies, business-IT alignment, and planning in organizations. In addition, because agreements on EA products related to standards, frameworks, and products were lacking, the cases adopted EA purely on the basis of their own premises, initial perceptions, and expectations about how EA could help to reform administrative procedures, align business and IT applications, and increase IS interoperability. This indicates the absence of external pressures (i.e., rules), professional practices (i.e., norms) and external institutions in the EA adoption or decision-making. In contrast, cognitive-cultural factors from internal institutions (i.e., values) were significant in both cases. This is because in the initiation phase, the EA adoption is dependent on the stakeholders’ backgrounds, skills, and capabilities. For example, when the stakeholders undertook EA projects, they had difficulties in understanding why EA had been chosen in the first place, instead of other governance models or approaches.

Cognitive-cultural factors emerged in the initiation phase, and influenced the EA adoption. For example, EA was not the Eta IT department’s first choice but had been picked by Eta’s senior managers on the basis of its potential financial support from a sponsor and for helping them to reform business services and models. Eta’s senior managers perceived EA to be similar to a “city plan” that would help management to minimize costs and save time. The senior managers appeared to have no idea about the organizational capabilities and resources required for EA adoption. Further, other stakeholders involved in the EA-adoption process lacked the requisite skills to identify successful and appropriate EA examples elsewhere,

or which model, direction, or method they should use. Some even lacked knowledge about EA. As one enterprise architect stated,

“At that time, we [EA project team] lacked all kinds of clarity [related to EA] about the definition, scope, scale, level of detail, method, and output of an EA project.”

This indicates that cognitive-cultural factors were important in the early stages of EA adoption. To overcome the cognitive-cultural related challenges, the organizations used different approaches to improve or train their stakeholders to be able to adapt better to the situation. For instance, Eta used consultants to assist with the EA proposal; it also sent its employees to courses to gain knowledge about EA, although the challenges—related to dissimilar views, general EA awareness, and expected benefits—appeared to remain. These challenges made it difficult to agree on even the simplest details, which led to severe delays. Omega did not use consultants but used its own IT staff. Because the staff had experience with IT projects but not EA, they focused on IT issues and not on business perspectives. According to a senior manager,

“When we specified the EA requirements [EA functionalities] ... no one in our team had EA experience.... We didn’t understand what EA was—whether it was a human-resource or a financial issue, what the policies were, and so on. We spent a lot of time discussing the topic but found it difficult to reach an agreement.”

This situation had several consequences. For example, it later became clear that the proposed schedules and objectives

were unrealistic and infeasible when the responsibility for proposing EA functionalities fell to the IT department or other agencies without appropriate credibility, as was the case in Eta. In contrast, EA initiation was more feasible and effective when the organization had a multidisciplinary team from different departments, led by a senior manager, as was the case in Omega. It thus seems that in order to improve the efficiency and quality of EA adoption, the adoption should be specified early by senior managers or agencies with strong credibility in terms of budgets, business services, and policies that support cooperation among all affected agencies. As one CIO said,

“One of the main problems [with the EA project] in our organization is the IT department. They’re responsible for [proposing EA functionalities], but they focus too much on IT issues rather than business aspects. This leads to infeasibility in the next phase in terms of such issues as relevance to inter- or intra-agency cooperation, business-services reform, and budget.”

Cognitive-cultural factors also appeared in other forms in the initiation phase of EA adoption; for example, collaboration difficulties were evident both within and between the agencies. In particular, the leaders in the agencies were often unwilling to participate in joint EA projects; instead they preferred to secure their own businesses, services, and resources. They also seemed to fear losing the “lucrative benefits” associated with their positions in the organization or in society. This outlook threatened to confine the scope of the EA project to single agencies, with minimum intervention from others. Alternatively, the organizations might focus solely on IT perspectives during their adoption of EA, as one PM noted:

“We don’t have a law or policy on EA in the state agencies; it’s just one option among many. That means we have problems when working with other agencies, so we just focus on IT rather than on business perspectives.”

The variance in stakeholders’ backgrounds, skills, and capabilities influenced EA adoption during the early stage, and this variance caused difficulties in promoting EA during the initiation phase, since collaboration practices and the scope, scale, and level of detail of EA functionalities first had to be negotiated and defined. As an IT specialist from Omega said,

“Our agencies ... conduct [EA] planning with ... different understandings of the benefits, and they [stakeholders] come from different backgrounds. This makes it difficult to create [common] plans, as we must constantly negotiate with others.”

4.2 Normative Pressures on EA Adoption

Normative pressures are usually influenced by other institutions. This situation became apparent when an organization’s EA approaches were unclear. Our findings suggest that normative factors were not a significant factor during the initiation phase. As a PM from Eta articulated,

“Certain approaches were used in the early stage of EA adoption in different organizations. For example, some used [international] consultants to establish their requirements [for EA functionalities], and some used their own IT department. However, the results were different, even though they used a similar approach. This is because EA can be understood as everything from strategy to planning, depending on the adopters ...”

The norms varied between different organizations. For example, some organizations used EA as an independent component for certain dedicated agencies only, and not for the whole organization. In contrast, sometimes EA was seen to supplement IT programs within organizations. In both situations, the norms did not influence these approaches.

Although organizations can place normative pressures on one another, our findings indicate that such an influence is unclear. This situation can be explained by the fact that EA approaches vary because of a lack of general definitions, agreements, frameworks, and standards. This variance caused the organizations to copy each other when choosing the EA or its approaches. Such mimicking is not adequate, however, because of the complexity of EA. As Omega’s CIO stated,

“We were proposing EA independently from other EA projects [from China, Singapore, and a local organization], because we recognized that there’s no single approach that fits with every organization adopting EA.”

It was also evident that the organizations treated EA as a normal IT project, with a focus on purchasing software and hardware. The organizations neglected the business perspectives of their EA projects. The EA projects also appeared to last longer than the manager’s single term, which put EA project activities at risk, as the new manager may not have cared about the old manager’s projects, including EA. This scenario resulted in organizations dividing their EA projects into several subprojects. As an IT specialist from Omega stated,

“Our EA project is divided into several subprojects, managed by different agencies within the organization. At the same time, they [the leaders in the agencies] were

responsible for a number of other [non-EA] projects, with similar sets of objectives.... This breaks down the unity of EA project.”

4.3 Regulative Pressures on EA Adoption

While regulative pressures were less dominant in the initiation phase of EA adoption, the case organizations had to conform to policies and protocols governing their projects once the adoption process moved on to the implementation phase. For example, implementation activities had to follow project management policies and protocols, and interoperability issues needed agreements from involved agencies. In addition, politicians, sponsors, and other powers put pressure on stakeholders, which led to conflicts between the stakeholders, who consequently reacted differently to the EA project activities. For example, in Eta some of the services connecting the agencies and their IS were not implemented because the stakeholders had followed organizational policies on intra-organizational services.

The organizations usually either followed their own approaches to implementing EA or were heavily influenced by their sponsor; for example, Eta adopted the FEA framework at its sponsors' suggestion. This points out the main differences between the cases: regulative factors appeared Eta clearer than those that in Omega, while cognitive-cultural factors in Eta seemed more complex than those in Omega. In the words of an Eta enterprise architect,

“We had advice and pressure to follow a certain approach [suggested by the sponsor] in a very different environment [in comparison to Eta's environment in terms of political climate, organizational structures, capabilities, and skills]. This created a very complex situation for deploying EA [into Eta].”

Many agencies were involved in the EA implementation. Each agency had its own objectives and powers, so severe difficulties in implementing EA emerged, for example in terms of sharing information with other agencies or having conflicting interests and information asymmetries among the parties. This situation caused the EA adoption to fall behind schedule, hindering cooperation between the parties and reducing the use of EA in practice. In the words of an enterprise architect from Omega,

“Some leaders [at Omega's agencies] were afraid that once EA was implemented into their agencies, their roles and other advantages would be reduced.... This concern was solved when senior managers became involved in

implementation. Then the leaders had to obey [the senior managers'] orders.”

Regulative pressures were also enforced by stakeholders from external institutions, who were typically thought of as experts in EA adoption. However, their involvement did not always have a positive impact on EA adoption. For example, due to a sponsor's request, experts from developed countries were imported to participate in EA implementation in Eta. The experts used their earlier experiences and approaches to implementing EA within Eta. These outside ideas and practices were ineffective since Eta's socio-technical and socio-political environments were not considered. Ultimately, EA project in Eta turned out to be not particularly successful. In the words of Eta's PM,

“We received funding for our EA project [from the sponsor]. We had to deploy EA and establish several groups to comply with their funding policies. If we didn't follow them, we might have lost their support.... However, most of the ideas and proposals from them [the experts] were simply inapplicable to Eta, as they required business-process reforms and changes to all levels of the administrative hierarchy. This was impossible.”

Regulative pressures dominated the implementation phase. However, some events indicate that norms and rules also appeared. For example, due to inefficient tools and methods the quality control of EA products was poor. Consequently EA project teams applied the techniques they were familiar with, and that had been approved and used by their organization. Yet those methods were inappropriate for EA. This made it impossible to estimate EA project activities and their performance and risks.

4.4 Institutional Pressures Roles in each Phase of EA Adoption

The absence of appropriate EA policies and successful EA precedents was evident. EA-adoption activities were thus depended on individual people and their characteristics, i.e. their cognitive-cultural factors. In particular, the characteristics of senior managers and project team members played important roles in the initiation phase in terms of steering the adoption process, defining EA products, and increasing the stakeholders' awareness. Cognitive-cultural factors thus influence the implementation phase, and further the whole project.

Normative factors emerged when other institutions tried to influence stakeholders in their selection of EA functionalities. For example, Eta was influenced by the sponsor through consultants. As a result, Eta mimicked the EA approaches used in

the developed countries while Omega utilized its own approaches. Professional groups influenced the technological choices in Omega.

In relation to regulative pressures, the cases were not subject to any formal rules for EA projects. For that reason, senior managers tailored policies and formalized rules for establishing EA. This resulted in organizational members to consider the rules to be less important during the initiation phase. They however became crucial during the implementation phase when the projects were split into explicit tasks and activities. For example, legal rules for governing public IT investments strongly influenced the implementation phase. Table 4 summarizes institutional factors influencing EA adoption.

5 Discussion

5.1 Cognitive Pressures Determine Project Direction in the Initiation Phase

Our case organizations adopted EA on their own premises and according to their perceptions and expectations about how EA could help them reform administrative procedures, align business and IT applications, and increase IS interoperability. The cases shared a number of features when they chose EA. The EA projects, architectures, approaches, tasks, and products were initiated and influenced by senior managers, and two main groups participated in the very early stage: the management team and the project team. We argue that cognitive factors are more emergent and important than normative and regulative pressures in the early stage of adoption. Particularly important are cognitive-cultural issues related to the managers' understanding and perception of the role of EA in organizations (as in Omega) and the stakeholders' knowledge of EA functionalities (as in Eta).

Regulatory factors, such as legal frameworks and governance practices, can be thought of as a prerequisite for EA projects (Saha 2008). But these items are more prevalent in developed countries with stable governance, sufficient resources, and high levels of IT awareness (Dang 2017; Janssen and Hjort-Madsen 2007). In our cases, frequent changes occurred in governmental structures and governance practices; in addition, legal frameworks were unstable, and necessary resources were lacking. Under the circumstances, senior managers and others in charge of EA adoption steered the EA implementations. For example, while Omega produced both physical and document-based strategic-planning products, Eta's product was solely document based.

Both organizations had little knowledge of the benefits of EA before their decision to adopt EA. They only expected EA to help in reforming administrative procedures and services, to reduce the number of information systems in use, and to improve interoperability. This finding parallels the literature on unclear and intangible EA benefits (Lange et al. 2015; Niemi and Pekkola 2016; Shanks et al. 2018) and emphasizes the importance of cognitive factors in the early stage of EA adoption.

Furthermore, although formal policies had little impact during the initiation phase, informal regulative factors within powerful agencies affected EA projects. For example, financial departments or agencies led by senior managers seemed to be more successful in taking responsibility for EA projects than less powerful agencies. In Eta's situation, the agencies in which EA projects had been assigned to IT departments suffered from a lack of credibility. In the case of Omega, it became clear that the higher the agency's status in the organizational pecking order, the more successful its EA project would likely be. This situation parallels the assignment of responsibility for EA projects to the US Office of Management and Budget (Bellman and Rausch 2004) and to the committee under the president of South Korea (Lee and Kwon 2013). The finding is

Table 4 Cognitive, normative, and regulative factors in EA adoption

	Initiation phase	Implementation phase
Values	<ul style="list-style-type: none"> – Values related to the adoption context (e.g., technology, strategy, planning) and readiness and awareness of stakeholders – Values related to the perception of EA products, and how to assess them 	<ul style="list-style-type: none"> – Values related to the change behavior (e.g., users' responses to EA project activities and products) – Values related to the implementation of the EA approach (e.g., how stakeholders switch from traditional approaches to new ones)
Norms	<ul style="list-style-type: none"> – Norms related to how the organizations should approach and establish EA projects – Norms related to approaches used in other organizations 	Norms related to work practices (e.g., project management practices)
Rules	<ul style="list-style-type: none"> – Rules when deciding to adopt EA initiatives – Rules in agencies that are assigned responsibilities for project activities – Rules on inter- and intra-agency cooperation 	<ul style="list-style-type: none"> – Rules on project protocols (e.g., procedures, reporting, management) – Rules on how EA projects are organized and approved

also aligned with Löhle and Legner's (2014) work on the importance of having explicit goals for EA initiatives. No researchers to date have mentioned when such roles, responsibilities, and goals should be determined. This study thus supplements the literature by indicating the roles of both the stakeholders' backgrounds and informal EA policies during the early stage of adoption.

5.2 Regulative Pressures Dominate EA Implementation

Regulative pressures were found to have emerged during the implementation phase. Similarly to any project within an organization, EA projects also had to follow procedural and financial policies. In both cases, these external pressures affected the entire process of implementation. For example, in addition to governmental policies, Eta was required to follow its sponsor's protocols and instructions in all activities related to EA implementation. Regulative factors thus played an important role for EA adoption in the implementation phase. Although earlier studies have identified the importance of regulative factors (Chatterjee et al. 2002; Liang et al. 2007; Teo and Pian 2003), we have explicitly shown the phase of the adoption process in which regulative factors are influential.

Regulative pressures created several conflicts between external and internal institutions within the two cases—for instance among project members and senior managers. Because the collaborations that were formed within EA projects varied, these conflicts escalated to other institutions (i.e., to other agencies within the organizations). These conflicts extended the schedules in Eta, while in Omega, the conflicts confined the project scope exclusively to IT perspectives. This situation highlights the role of internal formal and informal policies and of the senior managers who handle the conflicts. In Omega, the top managers led the EA projects, which made it easier to resolve inter- and intra-agency issues. In contrast, Eta projects that were led by less important departments (such as the IT department) faced risks in cooperating with other agencies. This scenario arose because different stakeholders had different viewpoints (Isomäki and Liimatainen 2008; Janssen and Hjort-Madsen 2007). We argue that EA should be planned in a way that acknowledges existing organizational structures and policies.

The impact of norms and values was less visible during the implementation phase. This is understandable, as EA implementation is a matter of following administrative acts and orders, technical-compliance guidelines, and different policies, all of which regulate the activities. The situation differs significantly from the initiation phase, where the stakeholders struggled with different views of EA usage and appropriateness as well as lacking instructions and policies.

5.3 How Institutional Pressures Roles Change

Although the literature has pointed out the role of institutional pressures (Bharati et al. 2014; Khalifa and Davison 2006; Krell et al. 2009; Liang et al. 2007; Teo and Pian 2003; Yoon and George 2013; Zheng et al. 2013), the ways in which they influence different phases during the adoption process remain unclear (Mignerat and Rivard 2009; Weiss et al. 2013; Dang 2017). This section illustrates how the institutional factors steer the adoption process and ultimately shape the adoption.

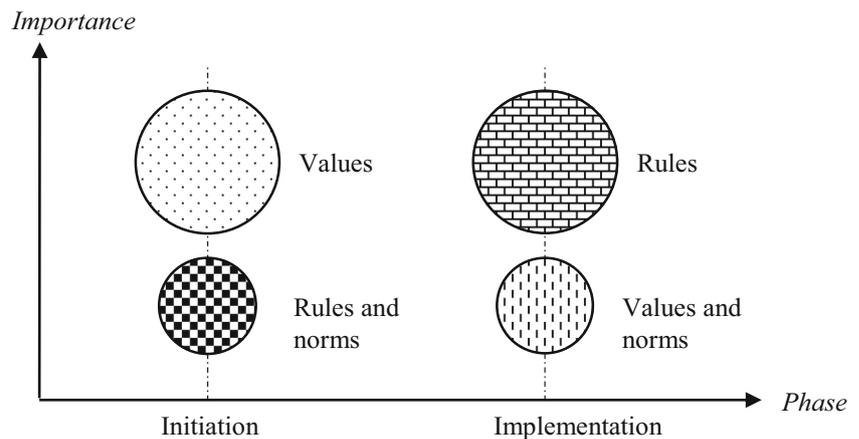
Cognitive factors relate to one's own values and volition. They seem to play significant roles in the initiation phase of EA adoption. This means that the stakeholders' backgrounds and experiences influenced activities towards EA adoption, such as adoption direction, frameworks, and products. Improving these issues requires a willingness to change behaviors and to reconsider personal values, neither of which are easy to do (DiMaggio and Powell 1983; Suchman 1995). In contrast, regulative factors are typically imposed by governments or organizations. They seem to be very important in the implementation phase of EA adoption. Two kinds of regulative factor, related to formal and informal rules, emerged. Formal rules refer to regulatory behaviors within a given society, while informal rules originate from senior managers and power institutions. The informal rules can be replaced by new ones from other settings (Scott 2005). In our cases, all agencies implemented EA according to their own informal rules, including rules for governing project responsibility, cooperation, and project organizations. This indicates the importance of effects of local rules and practices—that is, the organizational culture in a broader sense (Niemi and Pekkola 2016). Relying solely on formal rules is inadequate for EA implementation. This shows that the relative importance of values, norms, and rules changes when the adoption process evolves within different institutions. When the institutions are more involved in the EA implementation, regulative factors become more dominant and cognitive-cultural factors become more complex.

Normative factors, which are typically influenced and enforced by peer groups, were less evident in both initiation and implementation phases. Normative factors are usually poorly articulated and therefore difficult to identify (Hu and Huang 2006; Chandwani and De 2016). Figure 2 illustrates the relative importance of cognitive, normative, and regulative factors in the process of EA adoption. Values are central at the early stage, while rules become dominant during the implementation phase when the stakeholders must follow organizational rules.

6 Conclusions, Implications, and Limitations

In this paper, we have explored how institutional factors influence the process of EA adoption in different phases and how those factors change over time. We have discussed these

Fig. 2 The relative importance of institutional factors in EA adoption



findings earlier; next we will present the contributions, implications, and limitations of our study.

First, the literature has indicated the role of cognitive, normative, and regulative pressures when new information systems are adopted (Bharati et al. 2014; Khalifa and Davison 2006; Krell et al. 2009; Liang et al. 2007; Teo and Pian 2003; Yoon and George 2013; Zheng et al. 2013). But the ways in which these pressures influence the adoption process in its different phases remain unknown, from establishing the technology or practice (i.e., EA in this case) to EA institutionalization. Cognitive pressures appear to dominate during the early phases, while regulative pressures seem to become important during the implementation phase of EA adoption.

Second, although institutional theory is used in the EA literature, the theory is used to study on the barriers of institutionalization (Iyamu 2009), interoperability challenges (Hjort-Madsen and Götze 2004), governmental pressures (Hjort-Madsen, 2007), or institutional logics within EA adoption (Dang 2019). These studies have not revealed how individuals and groups are involved in or are influenced by the pressure. From this perspective, our study offers a rare analysis of individuals and groups in institutions, as suggested by Mignerat and Rivard (2009) and Weiss et al. (2013). Our findings indicate how values, norms, and rules appear and changes in different phases in the process of EA adoption, all of which advances institutionalization in the EA context.

Third, EA studies are primarily focusing on the developed countries contexts (Dang and Pekkola 2017; Simon, Fischbach, and Schoder 2013). Recently, however, EA has become of increasing interest around the world (Dang and Pekkola 2017; Shanks et al. 2018), especially in the developing world (Dang and Pekkola 2017). Because only a few EA studies have focused on developing countries (Dang and Pekkola 2017), we thus contributes to this front. We argue that our findings can be generalized to similar contexts in terms of stakeholders and their values or organizational cultures, administrative hierarchies, income, human capacity, ICT infrastructure, and resources, such as another provinces, ministries,

and line of businesses no matter whether developed or developing country.

The paper also has practical implications. Our highlighting of institutional factors at different phases enables practitioners to design strategies to respond to different adoption challenges. Table 4 may be thought of as a starting point for designing such strategies. Managers should consider how to harmonize and balance their organizational values, norms, and rules between old and new environments, which would benefit practitioners in solving problems that emerge during the adoption process. In contrast, if these issues are not taken into account, then a number of challenges are likely to arise, often leading to the failure of EA adoption. Having a better understanding of EA project activities and institutional pressures will clarify the shaping of activities and behaviors at both the organizational and the individual level, which will help managers to better prepare for EA adoption.

One limitation of this study is that we have addressed only two cases within a single country. Although this is indeed a limitation, understanding the context is also an important consideration (Davison and Martinsons 2016). Consequently, even though we have illuminated stakeholders' behavior and activities in this study, more research is still needed to illustrate the nuances of these phenomena; for example, the relative importance of rules and values may vary between organizations. While our focus on EA adoption also suggests that the results are bound to the EA context, we contend that the institutionalization of EA resembles any socio-technical assemblage. Overall, then, our cases provide a foundation for understanding the adoption of organization-wide practices or technologies. In the future, we hope to combine institutional perspectives with a cross-nation analysis to understand problems in their wider context and to facilitate theoretical and practical development.

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