

Organizational Change and Enterprise Architecture Adoption: A Case Study in the Public Sector



Duong Dang and Samuli Pekkola

Abstract Enterprise architecture (EA) adoption initiates broad changes in organizations and organizational functions. However, the existing literature on how and what factors influence the changes in EA adoption remains limited. Our study aims to fill in this gap. We study how the EA-initiated changes occur and what are the factors influencing it. Our process-oriented perspective, our data from a qualitative case study, and the lens of organizational change illustrate how the changes occur in organizations, what the factors are, and how especially managers and their activities influence the change. We show that the change is both sociotechnical and punctuated, oscillating between different organizational levels.

Keywords Enterprise architecture · Organizational change · Public sector

1 Introduction

Enterprise architecture (EA) adoption refers to how the organizations get introduced and start to use and use EA [1]. It takes place through EA programs, schemes, or projects that develop and operationalize EA features and functionalities into the organization's real-life practices. Many organizations have adopted EA to improve their operations, such as strategic management, decision making, information technology (IT)–business alignment, and IT consolidation. Also, public sectors in several countries, for example in the United States, Netherlands, and Denmark, have implemented laws or master plans to advance EA adoption [1].

Although EA is said to improve organizational operations, EA initiatives are struggling with several challenges, including slow utilization, ineffective adoption, and even failures [2]. To facilitate EA initiatives, an in-depth understanding about EA

D. Dang (✉)
University of Vaasa, 65200 Vaasa, Finland
e-mail: duong.dang@uwasa.fi

S. Pekkola
Tampere University, 33720 Tampere, Finland
e-mail: samuli.pekkola@tuni.fi

adoption and its practices is needed [3, 4]. Like other large-scale implementations [5, 6], EA adoption initiates changes in organizational functions and forms [7, 8]. However, the relationship between EA adoption and organizational change is unclear because both EA adoption processes and organizational change unfold over years [9].

The EA literature mostly focuses on EA, on EA concepts, or its frameworks and success factors [1, 10]. In addition, EA research often concentrates on a specific phase of adoption, such as the design [11], implementation [12], or post-implementation phase (e.g., EA management [EAM] usage [13]). Little emphasis has been placed on the adoption process or the relationships between EA adoption and the organization. As a result, cross-sectional studies taking, for example, a process-oriented perspective spanning from the EA investment decision to its implementation and full legitimization, are missing. We attempt to fill this gap. We aim at answering the following research question: How does the change unravel in organizations when they adopt EA?

We present a qualitative case study on a large EA project in Vietnam, interviewing the EA project's key personnel. We supplement the interview findings with several documents, informal discussions, and observations to deepen our understanding of the relevant political, social, and contextual issues. Organizational change theory is employed as an analytical lens because it provides an appropriate means of examining exogenous and endogenous factors in the adoption process. We analyze the stakeholder activities and behaviors in relation to the EA project's activities and events throughout the project. Our analysis ranges from the macrolevel (sector level) to the microlevel (e.g., organizational level and even individual level) to provide comprehensive understanding about the relation between EA adoption and organizational change [14].

The paper continues with the literature review and theoretical framework section, followed by the research context and methods section. Then, we present our empirical findings, and the paper continues with the discussion. Finally, the paper ends with a concluding section.

2 Related Research and Theoretical Framework

2.1 Conceptual Basics

EA is “an approach to improve the alignment between the organization's business and their information technologies. It attempts to capture the status of the organizations' business architecture, information resources, information systems, and technologies so that the gaps and weaknesses in their processes and infrastructures can be identified, and development directions planned” [1, p. 130]. The term EAM refers to “management activities conducted in an organization to install, maintain

and purposefully develop an organization's EA" [13, p. 412]. In this respect, the EA project and its activities can be understood as being a part of EAM.

EA stakeholders range from users to project members and managers. They produce, use, or facilitate EA artefacts, which include models, principles, strategies, and EA layers (e.g., architectures). EA artefacts can be understood as project products.

2.2 EA Adoption and Organizational Change

EA adoption studies focus on concepts and frameworks, and how EA is used [1, 10]. Some specific phases of EAM are also usually considered [11–13]. They contribute to outcomes [3], benefits, and value [13] in those phases. The literature also takes the IT perspective [12] or the project or organizational level of analysis [13]. We extend this by adopting a process-oriented perspective instead of focusing on some specific phase of EA adoption, and concentrate on macro- (e.g., sector) and microlevels of analysis (e.g., individuals, projects, and the organizational level), from both the business and IT perspectives. Thus, in the spirit of EA, we adopt a holistic view.

EA adoption is argued to help in changing organizations [7, 9]. However, those studies often neglect the issue of how the change actually occurs. One reason for this ignorance is the multidisciplinary characteristics and longitudinal nature of EA adoption [9, 15], which makes the phenomenon difficult to study. The key contributions of EA adoption and organizational change studies are summarized in Table 1.

2.3 Theoretical Lens

There are several factors to be considered when examining change [21]. We adopted [14]'s approach to study change management in public organizations. This approach helps to identify the process, content, leadership, context, and outcomes of change in our context, the public sector. The process of change indicates the interventions and processes that are involved in the change implementation. The content refers to what the change is about, such as the organization's strategies, structures, and systems. The leadership of change explains the leaders' influence on the change. The change context and outcomes describe the settings and results of change.

Table 1 Summary of enterprise architecture (EA) adoption and organizational change literature

Selected reference	Focus; main contributions	Stake-holders	Scope
[16]	Whole EA process; methods for managing EA changes	All stakeholders	Organization, project
[17]	Design of EA; technical framework for analyzed changes in an EA model	EA designers	Project
[18]	Design decision in information systems (IS) change projects; dimensions and characteristics of design decisions in IS change projects	Decision makers	Project
[19]	EA adoption process (preparing for implementation stage); EA success model based on the organizational change framework	Various roles involved in the EA adoption process	National
[20]	EA design (business and information architecture); EA for integration, agility and the ability to change	Various roles involved in EA design	Project

3 Research Context and Methods

3.1 Research Methodology

We conduct a single case study in a province in Vietnam. We call this province *Ceta*. We follow an interpretive research approach, as this will allow us to understand the phenomenon thoroughly in its context [22]. It also allows us to understand internal and external factors, including organizational rules, stakeholders' behavior and activities, and the cultural context. The approach equips us with a comprehensive understanding of the topic in a case organization. Consequently, our focus on the process in EA adoption is studied through an EA project and by considering factors in relation to the organizational change when the organization adopts EA [23].

To support our findings from a single case, we also analyze 16 other provinces in Vietnam with a similar administrative structure as *Ceta*, those provinces adopted EA only after *Ceta*'s EA project and products were legitimated. This is done by analyzing the provinces' EA project documents and other secondary data sources [23].

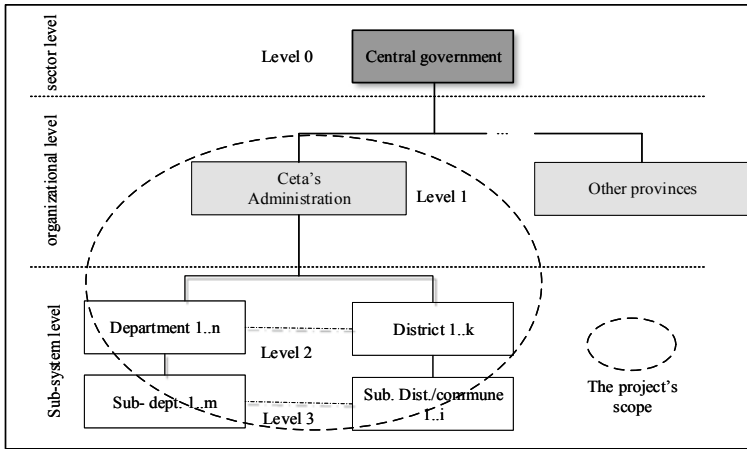


Fig. 1 Administrative structure and scope of Ceta's EA project

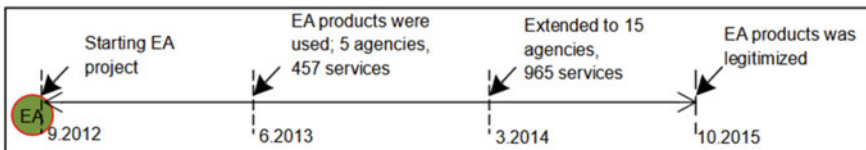


Fig. 2 Timeline of the EA project

3.2 Case Sites and Their Context

Ceta is a Vietnamese province with about 2 million inhabitants. EA was adopted there as one of the first provinces in the country. An EA project was established as a response to the state administration reform, encouraged by a master plan to use information and communication technology (ICT) to promote electronic government (c.f., Decision No. 1605/QD-TTg, 2010). Ceta's EA project covers the whole administrative structure (Fig. 1) [23].

Ceta's EA products include strategy, plans for IT-business alignment, a new model for administrative services (cf., CPS model), and new IT (hardware and software). Figure 2 illustrates the project timeline we followed [23].

3.3 Data Collection and Analysis

We first contacted a senior manager in Ceta to secure top management support and gain access to data collection. We then interviewed the Head of ICT department. He was also the Ceta's chief information officer (CIO) so he understood the project

activities and the stakeholders' roles. Then, we asked him about other stakeholders participating in the project. They were interviewed in a similar manner. Consequently, we used snowball sampling, which continued until no new insights emerged. Ultimately, we interviewed stakeholders who either directly participated in the project or were affected by the project activities. All the interviewees had participated in the project throughout its lifecycle, so they understood the activities, events, and possible consequences [23].

Altogether, eight interviews were conducted in June–August 2015, two in August 2016, and three in July 2017. All the interviews ranged from 45 to 60 min and were audio recorded. In addition, notes were taken during the interviews. After the interviews, we verified the data with the interviewees [23].

The interviews, focusing on the process of EA adoption in relation to organizational change, followed a semi-structured interview protocol based on the literature and prior theory (see the appendix for themes and questions). We used theory in a loose way so that it did not steer the data collection but allowed the interviewees to talk freely about the topic and different issues [22]. This approach ensured appropriate knowledge to us.

Table 2 lists our interviewees and the secondary data sources used to complement the interviews [23]. Especially discussions with people familiar with the EA project helped us to interpret political, social, and contextual issues. Consequently, the triangulation technique was used. Moreover, secondary data from EA projects in 16 provinces were used: six provinces in the North, four provinces in the center of the country, and six southern provinces were included.

Data analysis was begun by transcribing the data and uploading it to ATLAS.ti software to help us in analyzing the unstructured data. The first author initially coded the data (open coding technique). The findings were then discussed among the authors to generate insights and interpretations. The coding process was refined when we decided to focus on the change through EA adoption and the factors influencing the change. As a result, the data were coded thematically following the interpretive research approach.

Table 2 Main data source

Interviewees (job role, no. of interviews)	Selected main secondary sources
CIO, 3	Ceta's documents
Project manager, 2	Project plans
Enterprise architect, 1	Project proposals
Enterprise architect, 1	Deliverables reports
IT specialist, 2	Project reports
IT specialist, 2	Project diaries and internal meetings
Civil servant, 1	Regulations and news in official sites
Civil servant/user, 1	Ceta's informal discussion

Table 3 Example of the coding data

Selected quotation	Category	Theoretical concept
<i>“According to the basic ideas [from the Decision No. 1605/QĐ-TTg, 2010] we [Ceta’s information and communication technology (ICT) department] have proposed solutions based on our skills, experiences [and socio-political conditions, financial status, and IT infrastructures]. The proposal then was chosen and approved by the board manager.” CIO</i>	Leadership of change	<i>Explains the leaders’ influence on the change [14]</i>
<i>“The EA project is an unprecedented project as it helped [Ceta] to successfully reform [their administrative] procedures and the way to provide [public] services. The product of the project was approved by the Prime Minister, which rarely happens [in this country].” CIO</i>	Content of change	<i>Refers to what the change is about, such as the organization’s strategies, structures, and systems [14]</i>

Table 3 illustrates an example of our coding process. During this, we moved between the transcripts, secondary data sources, and theoretical lens to check for inconsistencies between the sources and explanations with the theoretical lens. Finally, we grouped the issues into larger themes (axial coding). Three distinct themes emerged from the case. These were the process, the content of change, and the leadership of change.

4 Findings

To understand the process and content of change in the relation to EA adoption, we analyzed the EA’s timeline, especially the process and content of change in EA adoption. We constructed an EA adoption change model as the change was initiated at the organization level (e.g., EA adoption causing changes in Ceta’s strategy and planning), which then spread out to subsystem level (e.g., the organizations materialize their strategies to establish projects in subsystems level causing physical changes), and finally expanding the change to the sector level (e.g., other provinces adapt Ceta’s model). Each phase of the change has its own content and leaders. For example, at the organizational level, the role of the business department is emphasized while at the subsystem level, the IT department is a key factor when it comes to the leadership of changes.

4.1 Process and Content of Change in EA Adoption

To understand the process and content of change, we examined the EA project timeline. Four main events regarding the organizational change are listed in Table 4.

Change initiated at the organization level. The project was initiated in September 2012. The deputy director of the ICT Department acted as the director of the Project Management Unit. However, project responsibility was quickly transferred to the deputy mayor, making him a project manager that oversees all project activities.

The EA team was granted permission to use all necessary resources in Ceta (e.g., from level 1 to level 3; Fig. 1). For example, the Project Management Unit was allowed to employ people from other state agencies in Ceta and recruit highly skilled people when needed (Decision No. 3152 by Ceta’s mayor).

The lack of common standards and practices caused difficulties and challenges when choosing tools, techniques, and approaches. To cope with them, an external consultant was hired to propose new solutions and conduct feasibility studies. In addition, a business trip to other areas where similar projects had been deployed was organized.

This helped Ceta to facilitate their work better because they were expected to deploy the new model (cf. CPS model) for their services as a part of the EA products. This was a result of the agency leaders participating in the project and supporting the project teams in problem solving. They were also allowed to choose appropriate

Table 4 Changing status and main project activities in Ceta

Timeline	Main activities	Change status
2012.9–2013.6	Standardizing procedures and services, proposing centralized model for services	No operational changes but plans and documents how to do them. Change level: 2
2013.6–2014.3	Reforming and standardizing services; one agency in level 1 and five agencies in level 2 successfully used enterprise architecture (EA) products, including CPS model, and went live on 457 services there	Changes in the central administration (level 1) and five agencies (level 2). Change level: 1 and 2
2014.3–2015.10	Reforming, standardizing services; expanding 15 agencies, and going live on 965 services	Changes in 15 agencies. Change level: 1 and 2
2015.10–	The authority approved the EA products, including CPS model and its services and procedures; Ceta’s approach now became applicable to all state agencies; Ceta’s approach was approved as being effective for services providers, e.g., time to process applications was reduced by 70%	Services model in Ceta have been changed completely; The change was approved by the authority; Other provinces used Ceta as a model for their EA. Change level: 1, 2 and 3

services for experimentation that were standardized later in their agencies. Thus, their work focused on the standardization of services and administrative procedures for internal and external stakeholders. By June 2013, there were no operational changes but only strategies, plans, and documents on how to do them.

The change spread from organizational level to subsystem level. The EA products were then deployed in the agencies by implementing different EA products, including a CPS model. This took place from June 2013 to March 2014. Ceta established four CPS instantiations in four agencies (level 2) and one at the administration center (level 1) and went live on 457 services. This solved many previously faced problems: different services being provided by different agencies, or enforcing the customers to visit numerous agencies several times for accessing the services they wanted. Ceta reformed procedures, aligned business and IT, and established a proxy agency via the CPS model, making single-time visits possible. Austin, a project manager, stated, “This [approach, including the CPS model] not only differs from the old ones, but it also differs from some recent electronic government models [in Vietnam]. For example, in the model of a “one desk government” the customers’ applications are received in the administrative section, and then [the employees] transfer them to other agencies. In contrast, [in our model, we] received and processed applications at CPS by instructing, checking, receiving, processing, deciding and returning them. We eliminated “intermediate” steps that just passed the applications from one agency to another”.

By implementing EA products, the changes took place at the organizational level (second order) and subsystem level (first order). All services were put online, and senior managers and agency leaders were able to manage every step of each application taken by the civil servants. An enterprise architect articulated, “Our management activities completely changed with the EA products (CPS). First, our new slogan is “services provision with highest citizen satisfaction.” This indicates that our staff have to change their attitude, improve their professional skills, and gain training carefully. Second, now citizens can directly assess the person in charge of their applications. Third, top officials are able to know the status of every application at any time. They also know the status of each agency or section so that they can make appropriate decisions or establish solutions”.

The management style changed significantly. Although new processes were appreciated by the citizens, sometimes the agency employees disagreed. They feared losing their jobs as the new model required less manpower. This was further emphasized when the activities related to the citizens’ applications were recorded, and the managers could monitor and manage the processes and progress. The fear was not groundless—the agency leaders moved employees to other sections or even laid them off if their performance and customer satisfaction did not meet the expectations.

EA products received a positive response from the customers and professional groups, as well as visibility in the press. The number of agencies using EA products in Ceta expanded to 15 and the number of services to 965 in just 20 months. Ceta’s EA approach became an example of how to use ICT in state agencies. The project report summarized this as follows, “EA products in central administration [level 1

in Fig. 1] processed 38,890 applications with an on-time-rate being almost 99%. Fourteen agencies [levels 2 and 3 in Fig. 1] processed 110,280 applications and their on-time rate was more than 98% [...] the [average] time to process the applications decreased by 70% in comparison with the previous model. For example, the time to handle the investment certification applications was reduced from 25 working days to 7–10 days, and applications in the place of investment decreased from 40 working days to 9 days”.

The EA adoption changed how the organization provides services and communicates with customers. It also significantly changed the management style, with a move from a distributed approach to centralized, monitored, and controlled operations.

Change expanding to the sector level. The Ministry of Information and Communications (MIC) considered Ceta’s EA practices and products (including the CPS model) as recommendations and suggested them to other provinces in October 2015. This legitimized Ceta’s process and the content of change. This affected not only Ceta but also all provinces with similar administrative structures, political systems, and services in Vietnam. The change could now happen in other provinces. In other words, the change has become a sector change, causing a “revolution” for using ICT as a tool for administrative reform. A part of the success can be explained in that the model combines both business and IT perspectives with the organization’s management structure. It has changed the administrative procedures and services completely. Ceta’s CIO put this, “The EA project is an unprecedented project as it helped [Ceta] to successfully reform [their administrative] procedures and the way to provide [public] services. The product of the project was approved by the prime minister, which rarely happens [in this country]”.

4.2 Leadership of Change in EA Adoption

The central government (level 0, Fig. 1) had a master plan on reform administrative procedures and business services. It suggested that using ICT in the state agencies is one of the key priorities for achieving these aims (cf. Decision No. 1605/QD-TTg, 2010). However, the master plan did not include instructions or formal regulations to adopt EA. As there was no law or policies on EA or its implementation, Ceta chose EA as an approach to respond to the master plan independently from their perspective and objectives. This emphasizes the role of senior managers in choosing the approach for how EA is interpreted and implemented. The lack of defined or agreed frameworks, standards or software leaves a lot of room and responsibility for senior managers for choosing suitable EA approaches. This was voiced by the CIO, “According to the basic ideas [from the Decision No. 1605/QD-TTg] ... we have proposed solutions based on our skills, experiences [and sociopolitical conditions, financial status, and IT infrastructures]. The proposal was then chosen and approved by the top manager”.

Similarly, many local governments (provinces) proposed new IT projects or approaches in response to the master plan. However, they usually mimicked each other and adopted similar approaches for their needs. For example, they purchased single, disconnected software applications for managing electronic documents, upgrading web portals or digitalizing services, as they had done before. In that sense, they took an IT perspective without considering the business perspective.

Like Ceta, some local governments chose EA (16 provinces). They focused on both business and IT issues to reform their services and procedures. These attempts can be seen as responses to the policies from the central governments, as their ultimate aim was to secure resources (e.g., finance, political will). In doing so, they perceived that EA improves citizens' services, increases enterprises' convenience, and makes administrative procedures more effective, efficient and transparent. The CIO stated, "Speeding up the administrative reform and using IT in the agencies through an EA project to transform paper-based services to on-line services reduced the number of times the customers have to visit the agencies for their services". This also emphasizes the role of leadership in adopting EA and deciding its directions and products.

5 Discussion

5.1 *Triggers of Change*

The change can be initiated and triggered by various factors, such as increasing customer satisfaction, enhancing the organizational core, or responding to external pressures [24]. The change may also start with social upheaval, technological change, market forces, or legislative change [25]. Although these factors were not explicit in Ceta, they appeared in some forms of policies.

First, policies influence the organizations when they choose EA as an approach to reforming administrative procedures and services. This was indeed the case in Ceta, where the project proposal referred to two central government policies, as follows: a master program on administrative reform and the master plan on IT applications. However, these policies did not enforce the organizations' use of EA in general or any specific EA framework or approach.

Second, market force did not seem to be the main source of the change. However, later, when Ceta was regarded as an example of successful EA implementation in the country, it was constantly referred to, "One of the objectives [of the EA project] is that Ceta becomes the leading local government [top 10] in using and developing IT applications in operations". (Ceta's project report). This quotation refers to one of the most prominent indexes in Vietnam, the Vietnam ICT Index. It ranks the state agencies by IT infrastructures, IT applications within the agency, online services, human resources, policies for IT applications, and portals/websites. It also provides a basis for benchmarking. The index is regularly followed and reflected in our interviews.

Senior managers and leaders played important roles as forms of regulative pressure, driving and influencing the change in the early stages of the change process. For example, the senior managers chose EA. Their expectations and assumptions gave directions to the EA projects in terms of frameworks and products, emphasizing leadership in EA adoption.

When looking at the content of change, EA adoption took place first at the organizational level, as Ceta standardized and reformed its business model. Ceta then implemented the model in selected agencies. At the same time, different strategies and IT plans were proposed. This triggered the change in the organizational culture from the “ask-given” approach to the “be ready to serve” approach and started to change the stakeholders’ behavior. Civil servants had to be more responsive than before, and their services had to be more professional and transparent. Furthermore, organizational level change, that is, second-order change, triggered the standardization of business services and administrative procedures in the physical system when the agencies deployed the physical model (CPS). In other words, it triggered the first order of changes [24].

5.2 *Process of Change*

From the viewpoint of the process of change, that is, how the content is implemented in organizations, it seems that EA adoption follows incremental change [14], as it is continuous, incremental, and cumulative [14, 24]. The change began with new procedures, top-down driven services, and bottom-up emerging structures that were later legitimized. For example, the first set of 457 services in five agencies in Ceta were legitimized in June 2013. The number of services was later increased to 965 services in 15 agencies in March 2014. This means that the new approach was first tested out and improved in smaller settings and then expanded to broader audiences. Ultimately, more than 98% of the citizens and enterprises were pleased.

New procedures, services, and structures become norms. For example, when the central government approved CPS, EA practices became legitimized and normative. This was a significant step, as now, all state agencies throughout the country perceived they could use Ceta’s approach. As a result, the EA project not only had an impact on a certain organization, but it also influenced the sector in the country. The secondary data from other provinces show that 10 provinces (out of 16) mimicked Ceta’s approach. Thus, Ceta’s EA adoption influenced other organizations and the public sector throughout the country (third order of change).

We illustrate this development in Fig. 3. We mapped the main events of Ceta’s EA adoption with the change process (e.g., time and project phases on the horizontal axis) and the level of change (vertical axis). The change was triggered and started by an organizational level model, where from it got gradually spread out to the subsystem level when the EA initiatives were implemented. This took place in the implementation phase (period 2012–2013), the content of change mainly focusing on strategies and plans. Then, the model was expanded to a broader scope in both organizational

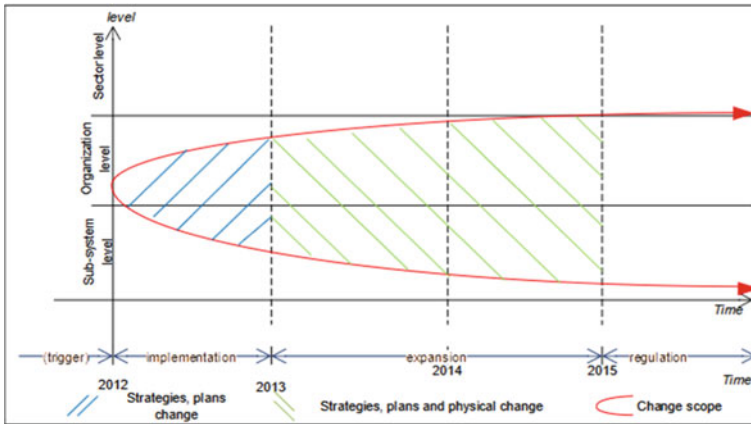


Fig. 3 Changes in EA adoption: process and content of changes

level and subsystem level. In our case, this means that one agency (level 1) and its four agencies (level 2) went live with 457 services, and 15 agencies went live with 965 services. Also, the content of change evolved: now it included strategies, plans, and sets of processes (e.g., CPO model—a new administrative services). Finally, EA expanded to the sector level when the positive signal of EA adoption was approved. In our case, the MIC took Ceta’s model to other provinces within the country in October 2015 and those other provinces were started to implement Ceta’s model.

6 Conclusions

We study the change in organizations when they adopt an EA approach. We emphasized that the change is triggered by senior managers who act under some form of external forces, which in turn, were caused by the broader policies and plans. As with most large-scale change endeavors, EA change begins at the organizational level. Yet, prior literature has argued that the change starts from social upheaval, technology change, market forces, or legislation change [25]. While these factors have their effects, the importance of senior managers is evident. Their role is emphasized in situations where the change is voluntary to the organization, that is, it is driven by the organization causing negative psychology inertia or socio-cognitive inertia [26], in comparison with situations where EA adoption is compulsory [27].

We illustrated that EA adoption and the changes there are complex phenomena. At the early stages of the EA adoption process, the change takes place from the top down, and later, it occurs from the bottom up when new EA features and functionalities are implemented, expanded, and regulated. This means that the change can be seen as a punctuated change in the subsystem levels of the organizations [24]. However, EA-driven change is also a situated sociotechnical change. This finding can also

help understanding changes in other large-scale implementations as in digitalization [28, 29].

In addition to understanding the unravelling of EA enabled change, we contribute to EA literature. Previous EA literature has focused on the organizational level [12], or organizational and project levels [13]. Our analysis ranged from individual and project levels to organizational and sector levels to comprehensively understand EA adoption in relation to organizational change.

This study has practical implications. Our study provides understanding about the real-life organizational EA practices, which are seen as being dominated by normative frameworks (e.g., TOGAF, FEA) describing top-down EA practices, one-way communication, and control of how, why, where, and what should be done [30, 31]. In that sense, our findings benefit managers by highlighting the need for additional views on EA adoption as the current view on EA norms and frameworks might not be applicable. Instead, the managers also need to consider other directions of adoption as shown in Fig. 3, in a flexible way.

A single case study has limitations. This underscores the need for more research in a broader set of cases—in different countries, cultures, and contexts. For example, future research can utilize our findings in analyzing and comparing them to countries where EA is mandatory, such as Finland or the United States. From this perspective, examining and comparing our findings with different models of changes in IS can be a starting point for a broader set of qualitative studies to validate or revise them. Future research can also focus on different angles (e.g., sectional, subsectional changes) or look at stakeholders' roles and behaviors in the EA adoption.

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