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Dang, Dinh Duong and Pekkola, Samuli, "ROOT CAUSES OF ENTERPRISE ARCHITECTURE PROBLEMS IN THE PUBLIC SECTOR" (2016). *PACIS 2016 Proceedings*. 287.

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ROOT CAUSES OF ENTERPRISE ARCHITECTURE PROBLEMS IN THE PUBLIC SECTOR

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Abstract

Enterprise architecture (EA) is a holistic approach that aligns IT resources with business processes and strategies. Thus, EA has been used in the public sector to improve services and service processes. However, when EA programs are initiated, the organization faces several challenges, such as lack of resources or understanding, and radical changes in the organizational structures. In this paper, we study these problems in the public sector context and identify their root causes. We conduct a multiple-case study by deriving qualitative data from three provinces; each has different experiences, backgrounds, and skills. The findings highlight eight generic root causes and several public sector-specific problems. These findings help researchers and practitioners understand and promote EA, and avoid as many challenges as possible as the root causes are known.

Keywords: enterprise architecture, root causes, problems, public sector.

1 INTRODUCTION

Enterprise architecture (EA) is often seen as a solution to help governments decrease operations costs, reduce corruption, and increase transparency, accountability, and better decision making (Alhujran, 2009). Consequently, interest in EA in the public sector is receiving increasing attention (Dang & Pekkola, 2015). Unfortunately, EA is infamous for a low success rate (Dang & Pekkola, 2015; Kotusev et al., 2015; Ojo et al., 2012). However, although studies have investigated the problems in EA programs (Chuang & Loggerenberg, 2013; Hauder et al., 2013; Kim & Everest, 1994), the root causes have not been studied. Thus, in this study, we examine different problems and identify their root causes to help practitioners acknowledge and identify them, reduce EA risks, and ultimately avoid them in EA programs. Researchers will gain a better understanding of the complexity of the EA phenomena.

In this paper, we answer the following research question: “What problems exist in EA in the public sector, and what are their root causes?” A qualitative multiple-case study utilizes interview data from three provinces. The findings indicate that there are eight generic root causes and several public sector-specific EA problems. This notion is the first step to assist researchers and practitioners in identifying risks in EA programs and their implementation, and ultimately avoid them. This would enhance the chances for successful EA programs.

The paper is organized as follows: First, related literature is presented. This section is followed by the research methods and settings. The subsequent sections show the findings and their discussion. The paper ends with a concluding section.

2 BACKGROUND

2.1 Enterprise Architecture

EA, first introduced in 1987 (Zachman, 1987) lacks a universally accepted definition (Niemi & Pekkola, 2015; Rohloff, 2005). However, EA is defined as “the organizing logic for business process and IT capabilities reflecting the integration and standardization requirements of the firm’s operating model” The MIT Center for Information Systems Research (MIT CISR). EA, thus, is a “definition and representation of a high-level view of an enterprise’s business processes and IT systems, their interrelationships, and the extent to which these processes and systems are shared by different parts of the enterprise” (Tamm et al., 2011). In other words, EA provides a comprehensive view of an organization’s business objectives and processes, data resources, information systems, and technologies—and their relationships.

EA is often used to manage the complexity of the organization’s structures and IT and business environments and facilitate the integration of strategy, personnel, business, and IT (Goethals et al., 2006; Kluge et al., 2006). EA utilization has broadened to the public sector (Gujarro, 2007; Hjort-Madsen, 2007; Lemmetti & Pekkola, 2014; Peristeras & Tarabanis, 2000). Because of the scope of EA, a wide range of users, defined as persons who use and are affected by EA products (Niemi & Pekkola, 2015), have been identified (Niemi, 2007). Users include executives, chief information officers (CIOs), project managers, enterprise architects, IT specialists, civil servants, and numerous end users (Armour et al., 1999; Bernard, 2012; Kotusev et al., 2015; Lankhorst et al., 2013; TOGAF, 2011).

2.2 Problems in EA

In the public sector context, EA has been used in more than 20 countries (Ramos & Júnior, 2015). However, utilizing EA is not easy. The literature mentions several problems that organizations have faced while implementing EA programs (Dang & Pekkola, 2016). Seppänen (2009) described that EA programs lack EA governance structures and suffer from inadequate resources, and Kaisler et al. (2005) indicated that limited modelling tools for managing and maintaining are the main problems in EA programs. Janssen and Klievink (2012) stressed the problems related to the organization’s network, people,

process, product, and technology. Isomaki and Liimatainen (2008) described EA problems as an implementation ability and the governance and structure of the state government, while Weerakkody et al. (2007) mentioned the legacy of rigid bureaucracy and a lack of coordination of different information systems. Other scholars have described unclearly defined roles and responsibilities (Lucke, 2010; Levy, 2014; Kim & Everest, 1994), lack of interest among non-information systems (IS) departments, discontinuity of planning, and short-lived commitment from the top (Kim & Everest, 1994), as well as organizational politics, high organizational complexity, outdated EA results, no understanding of benefits, too conceptual a nature, the wrong level of detail, and mismatches with the real information needs of EA stakeholders (Jan & Christine, 2014; Hauder et al., 2013; Chuang & Loggerenberg, 2013).

The list of problems with EA is extensive. Although it is important to diagnose problems, we identify and understand their root causes.

3 RESEARCH METHODS

We conducted a multiple-case study in Vietnam (Stake, 2005) to understand the problems in EA programs. Three provinces (local governments) were studied as they have different capabilities and experiences with e-government initiatives (Table 1).

The first province, or case, is a national e-government leader, ranked second out of 63 provinces (MIC, 2014). The province of about 7 million people has established EA programs with a loan from the World Bank (Nguyen, 2006; WorldBank, 2005). After nine years in 2014, these programs resulted in somewhat limited outcomes—as the objectives were still not achieved (World Bank, 2014). The second province has average experience in e-government from the past five years (MIC, 2014). The province of 1.3 million inhabitants has deployed EA programs since 2010. The third province of about 2 million inhabitants has much less experience in e-government. Their EA program was established in 2012.

These provinces were chosen because they provide better insights as the findings from individual cases can be compared to each other (Myers, 2009). Following Stake (2005), the differences and similarities between the cases are equally important. Second, the provinces have completed EA programs so that experiences in EA programs and problems are available to collect. Third, the provinces allowed us access to data (Myers, 2009).

Table 1. Three provinces as our cases.

	Province A	Province B	Province C
E-government ranking in 2013	2/63	7/63	48/63
E-government ranking group (2009-2013)	Excellent	Good	Fair
Years of EA experience	9	5	3
Number of interviewees	8	6	8
Interviewees	Senior manager, CIO, Project manager, Enterprise architect, IT specialist, EA worker	CIO, Project manager, EA worker, IT specialist, EA worker	CIO, Project manager, Enterprise architect, IT specialist, non-IT civil servant, EA worker

To investigate EA problems in the provinces, we used a qualitative research approach to gain in-depth understanding (Myers, 2009). The data was collected with face-to-face semi-structured interviews from June 2015 to September 2015, with people who worked directly in EA programs. New interviewees were invited until new insights were not gained (Silverman, 1993). Then the sample size was found to be appropriate. The interviews were supplemented by documents, presentations, and newspaper clippings from different state agencies.

A total of 22 participants were interviewed. They worked at various levels and positions in the EA programs in each province. The interviewees included senior management, chief information officers (CIOs), project managers (PMs), enterprise architects, IT specialists, EA workers, and non-IT civil servants. Each interview, conducted in Vietnamese by the first author, who was familiar with the language, context, and culture of the cases, ranged from about 45 minutes to 60 minutes. The interviews were recorded and then transcribed. Numerous interviews, focusing on the same issues, were conducted and compared in order to increase the internal consistency and validity data (Walsham, 2009).

The transcripts were moved to ATLAS.TI software for detailed analysis. The data was analyzed in Vietnamese; only illustrative quotations were translated into English. A coding unit was defined as a text segment no smaller than a sentence and no bigger than a paragraph. We followed Strauss and Corbin’s (1998) technique for better understanding the incidents in these cases. Multiple codes were allowed to be assigned to a single text segment. We analyzed the dataset through three steps: First, we identified problems that emerged during all interviews. All incidents or anecdotes that considered EA problems were recorded. They included, for instance, problems related to laws, policies, and politics. Second, these problems were categorized into sub-categories and named with appropriate labels. Third, all sub-categories were grouped into broader categories, such as problems related to the organization or the EA itself. All problems that did not result from EA programs were excluded. Table 2 provides two examples of how the quotations were coded.

Table 2. Coding example via ATLAS.TI

Quotation	Primary coded (step 1)	Sub-category (step 2)	Broader-category (step 3)
“We do not have a law or a policy on EA programs, but it is just an option in a variety of approaches. This causes problems when we work with other agencies. We decided to focus on IT perspectives rather than business perspectives” (PM, Province A).	Law or policy	Legal rule or regulation	Organization related problems
“The guidance from the central government is inappropriate in our agencies when it comes to practical issues” (IT specialist, Province A).	Unclear guidance		
“They [senior management] said that we must deploy a EA program in our agency. If we [agency] don’t do it, we might lose financial support from the central government. There are political issues in the requirement documentation” (Project manager, Province C).	Pressures from the sponsors	Politics or sponsors	

4 FINDINGS

We identified four groups of problems related to the organization, EA project teams, EA users, and EA itself. Next, these groups are presented.

4.1 Organization-related Problems

4.1.1 Organization Structure

All provinces had challenges with overly complicated structures. They had multiple owners and multiple levels of business services that have an impact on the agencies when choosing appropriate frameworks, methods, and products for the EA. In the words of an EA worker (province B):

In our province, we have a multi-level organization and multiple-owner business services, each having different permissions and capabilities. Thus, we cannot choose FEA [Federal Enterprise

Architecture], TOGAF [The Open Group Architecture Framework], or any other approach. The only notable way to solve the problem is using our own approach.

4.1.2 Legal Rule and/or Regulation

No law or policy enforces the EA programs in the three cases. This means that EA initiatives and programs depend on individual actors and their background, political views, views on EA, and the environment in which they work. Thus, the EA programs focused on single agencies and departments, with minimum interaction with others, as broader understanding or guidance was missing. A project manager (province A) said:

We do not have a law or a policy on EA programs, but it is just an option in a variety of approaches. This causes problems when working with other agencies. We decided to focus on IT perspectives rather than business perspectives.

Moreover, as the central government's guidance for EA was unclear and too general, EA as a concept was evidently misunderstood. This misunderstanding affected EA planning and strategy. An IT specialist (province A) said, "The guidance from the central government is inappropriate in our agencies when it comes to practical issues."

4.1.3 EA Objective

Laws and policy problems affected the objectives of the EA program. When the agencies carried out EA programs, the agencies had problems figuring out the objectives for why the government chose EA and not some other governance model in the first place. Unclear objectives had an obvious negative impact on the EA programs. An EA architect (province B) said, "[Our] objectives for doing EA and using EA products are unclear in the sense that the agencies cannot or are limited to use those products in their business."

4.1.4 Politics and/or Sponsors

Two provinces (A and C) adopted EA programs because the provinces received financial support from the central government or from sponsors. However, EA was not the provinces' first choice. The sponsor strongly influenced the products, plans, and approaches to building EA. A project manager (province C) said:

They [senior management] said that we must deploy EA program in our agency. If we [agency] don't do it, we might lose financial support from the central government. There are political issues in the requirement documentation.

The provinces also seemed to be jumping on the EA bandwagon. They chose EA as other provinces were adapting it. This led to an inactive EA implementation as thorough understanding or motive for EA were missing. This finding parallels Swanson and Ramiller's (2004) observation that the agencies choose innovations because others have chosen them—but in a mindless way. One EA worker (province A) even stated, "The person who does not understand EA at all proposed EA!"

4.1.5 Cooperation between Agencies

Cooperation between agencies was one of the greatest challenges because of the inability to collaborate due to different points of foci, experiences, models, and activities. The agencies were doing different activities in their EA projects. For instance, the agencies did not choose services related to others. The agencies were afraid of increasing complexity and risks when they deployed EA. Instead, the agencies chose services that would have had an impact only within their own organization. "When implementing EA, our agency chose services that affect only to our own business; we did not choose services related to other agencies because it will increase risks" (IT specialist, Province B).

This obviously removed the motivation and agency-/department-level need for cooperation, which could have been needed at the national level.

4.2 EA Programs' Team-related Problems

4.2.1 Formation of the EA Team

One of the problems was responsibility for the EA programs. If the responsibility was on the IT department or on other agencies without appropriate credibility, unrealistic and unfeasible schedules and objectives were evident later. In contrast, if the EA team had members from different departments within the agency and if the team was led by a senior manager, then the EA programs were more productive later. Consequently, to improve EA programs and their efficiency, they should be organized and led by senior management or by the agencies that have strong credibility in terms of budget, business reform, and policies to support cooperation between the agencies. A CIO (province A) said:

One of the main problems in our organization is the IT department. They are responsible for our EA requirements. Yet they focus too much on the IT aspects, not paying enough attention to the business aspects. This leads to unfeasibility, for instance, in terms of relevance to cooperation between and within the agencies, business services reform, and budget.

Composing EA teams incorrectly was also problematic. For example, Province A used consultants from a developed country as members of their EA team. The consultants then used results from their previous projects in another country and applied those results to this province. This had poor results. An EA worker (province A) stated, "Based on their experiences from previous EA projects in [country A], our EA teams proposed five key projects. However, it turned out that three of the five projects were not feasible in our social-technical environment."

4.2.2 Capability and Skills

The EA teams and their abilities and skills significantly affected the EA results. EA expertise, experiences, background, and views on how EA should work and what its role should be were crucial. In particular, as most EA members were from the IT department, they focused on the IT and technical perspective. They also had experience with IT projects but not with EA. Under the circumstances, the EA programs ignored business services and emphasized IT issues. A senior manager (province C) stated:

Nobody in our team had experience in EA. All of us have a background in IT. We do not understand what EA is, whether a human resource, financial issue, what the policies are, and so on. We are spending a lot of time discussing the topic.

Some provinces sent their staff to courses to gain basic knowledge and obtain certificates, such as TO-GAF. Other provinces used consultants and outside experts to help their EA teams. Unfortunately, that combination was usually unsuccessful due to the dissimilar views and the lack of general awareness of EA and its expected benefits. This made it difficult to find consensus among the consultants, experts, and civil servants on even the simplest details, which caused severe delays and wasted time. A senior manager (province C) stated, "When we proposed EA requirements, we strongly depended on the consultants, who actually don't have any understanding of our culture, environment, and business services."

4.2.3 Overemphasized IT Perspective

Many agencies treated EA as an IT project with a focus on purchasing software and hardware. Because this was an easy interpretation for successful EA programs, the managers did not emphasize the business perspective. In province C, EA programs were divided into several sub-projects, which were approved by an agency that was not involved in the EA programs team. That delayed implementation. An IT specialist (province C) stated:

Our EA program is divided into several sub-projects. Some of them are not approved at all, or are approved later than planned. In contrast, they [the managers] approved another project with

the same objectives as it was seen as beneficial for themselves because of social relationships. This breaks down the whole unity of EA programs.

4.2.4 EA Products

The agencies used EA products in various ways. This caused concerns about the EA roles in the agencies. For instance, if EA was used for strategy, identifying the factors that had to be considered, the tools that should be used, and people who need to be communicated became difficult. The agencies also faced difficulties deciding which approach, model, or method should be used for EA planning. In practice, no suitable method was found. A CIO (province B) stated, “We are planning EA independently to other programs. We learned that from the other agencies, and we chose an international consultant to plan the EA because many agencies behave accordingly.”

4.2.5 EA Planning

EA programs influence many agencies. Each agency had its own businesses, services, and resources. This means that the agencies did not plan their inter-organizational activities or EA programs well but focused only on agency-level issues. As a result, budget and resources were wasted, and the quality of the EA products decreased. An IT specialist (province C) stated:

Our over 28 agencies and their over 28 IT units do planning with unequal resources, different understanding about the benefits, and with their own backgrounds. This makes it difficult to plan because we have to constantly negotiate with the other agencies.

4.3 User-related Problems

4.3.1 Users' Capabilities and Skills

EA program users are defined as persons who use and are affected by the EA products. When the agencies completed their EA projects, citizens did not experience any personal benefits. This forced the agencies to spend time training users and advertising their job. These issues cost extra money and time. An IT specialist (province B) observed:

The majority of the inhabitants in our province live in rural areas with low computer literacy. It is difficult to change their behavior when we are deploying public services. We spend time training the users. However, the proportion of users who use the services is normally very low.

4.3.2 Conflicting benefits and willingness to use EA

Many agencies were involved in the EA programs. When the agencies participated in the programs, the agencies needed to share information with other agencies. This was very difficult. This evidently had an impact on the gained and perceived EA benefits, reducing the role of EA in the agencies and reducing financial support for EA. This caused EA programs to fail in term of schedule and finance. Managers' enthusiasm for EA programs seems to be critical. Moreover, it was difficult to collaborate with other agencies as their leaders usually were unwilling to participate in EA programs. The leaders were afraid of losing their “lucrative benefits” associated with their position in the agency or society. An enterprise architect (province C) noted, “In some cases, we needed a year or longer to persuade the leader and staff to change their attitude due to conflicting benefits.”

Agency leaders and civil servants also were occasionally unwilling to use EA products and change their behavior. Instead, they used traditional methods and practices in their duties. However, EA products help organizations to improve the quality of their business services in the form of increasing transparency, reducing time for services, and decreasing corruption. This would consequently reduce the ‘benefits’ of leaders and civil servants. An enterprise architect (province C) stated, “I think that our leaders and staff are afraid that when EA is deployed, their roles and their gained benefits will be reduced.”

4.4 EA Itself as a Problem

4.4.1 EA Fundamentals

It was not clear how EA was related to other management practices and approaches, such as CobiT and ITIL. In addition, whether EA is suitable for everybody remained a mystery.

The interviews revealed that if there had been no efficient tools and methods for controlling the quality of the EA programs, the results would have been limited. As each agency used its own approach to implement the EA, risk identification and assessment were impossible. An EA worker (province B) stated:

TOGAF seems to be too large and needs a business focus, while the FEA approach requires high EA skills and high capabilities in each sub-unit. These are impossible in our organization, even in the whole country. Then, we choose our own approach.

In addition, there was no typical approach for applying EA in the public sector as, for instance, the U.S. government uses EA for planning (Hjort-Madsen, 2007), Singapore for strategy (Saha, 2009), and South Korea as a means of achieve interoperability, standardization, and reuse within agencies' boundaries (Lee et al., 2013). One EA architect (province A) stated:

In that time, we did not have a clear definition, scope, scale, level of details, method and output of the EA program. In our EA plan, we did not focus properly on cooperation between agencies.

Importantly, the agencies failed to identify assessment factors, frameworks, and models because EA was not used commonly in these issues. This led to inefficiency in EA programs. A CIO (province C) stated:

Unfortunately, when we made proposals in the planning phase, we did not have the criteria to assess whether the EA program was successful and what its level of completeness should be. It was very difficult to invent and set quantitative factors so we proposed qualitative factors. That's why our EA program somehow failed in the end.

4.4.2 Shared Understanding of EA

All provinces had problems gaining a shared EA understanding among the stakeholders and other agencies, especially in terms of scope, scale, level of detail of EA products, and the EA outputs. One province (B) that used EA to digitalize several off-line services to online services did not use EA for planning or for strategy because they had other methods. Another agency used EA as a strategy for technical interoperability, because their master plan program conflicted with the strategy. They needed thorough control of different factors as they expected trouble and inefficiency during the implementation phase.

4.5 Summary of Problems

The problems and descriptions are summarized in Table 3.

Table 3. *Identified problems of EA programs in the public sector.*

#	Problem	Description
1	EA basic	In theory and practice, EA has many frameworks, approaches, roles, tools, models, methods, and concepts. Thus, agencies struggling to find appropriate factors need to be considered, such as how to control quality, tools should be applied, and resources.
2	Organization structure	Complex structure of the organization. For instance, agencies have multiple levels and several owners for services.

#	Problem	Description
3	EA Planning	EA teams do not plan EA programs well, such as bonding to single agencies with minimum interaction with others, and have unrealistic and unfeasible schedules (leading to delayed implementation).
4	Willingness to use EA	Leaders and civil servants are not willing to use EA products in their work. Instead, they used traditional products.
5	Overemphasized IT-perspective	EA products focus on IT perspectives, not on business perspectives.
6	Legal rule and/or regulation	No laws, policies, or guidance about EA from the government are too general and not detailed.
7	Politics and/or sponsors	Agencies doing EA due to pressure of politics or sponsors.
8	EA objectives	Objectives of EA programs in agencies are very general, and the objectives are not stated clearly.
9	Forming EA team	The way agencies form EA teams, which are responsible for the EA programs, for example, some agencies responsible for EA programs are IT departments, and some are combined from many departments; organizing EA projects (many projects was managed by others, not EA teams).
10	EA products	EA products are delivered late, inappropriately, or inefficiently, or are not clear.
11	Shared understanding about EA	Stakeholders do not have a common understanding of EA in terms of scope, scale, level of detail of EA products, and EA outputs between consultants, civil servants, and experts.
12	Inactive implementing EA	Organizations implement EA inactively under the pressure of politics or sponsors.
13	Users' capabilities	Users have low computer literacy or lack the appropriate background.
14	Cooperative among agencies	Cooperation between agencies affected by the EA program is minimal for sharing information or benefits.
15	Ability and capability of EA team	Ability, skills, or capability of the EA team for working on tasks in EA programs.
16	Conflicting benefits	Conflict benefits among agencies, leaders, and civil servants.

5 DISCUSSION

5.1 Roots Causes of EA Program Problems in the Public Sector

To identify the root causes of these problems, we used a cause–effect graph that maps a set of causes to a set of effects (consequences). This graph was constructed as follows:

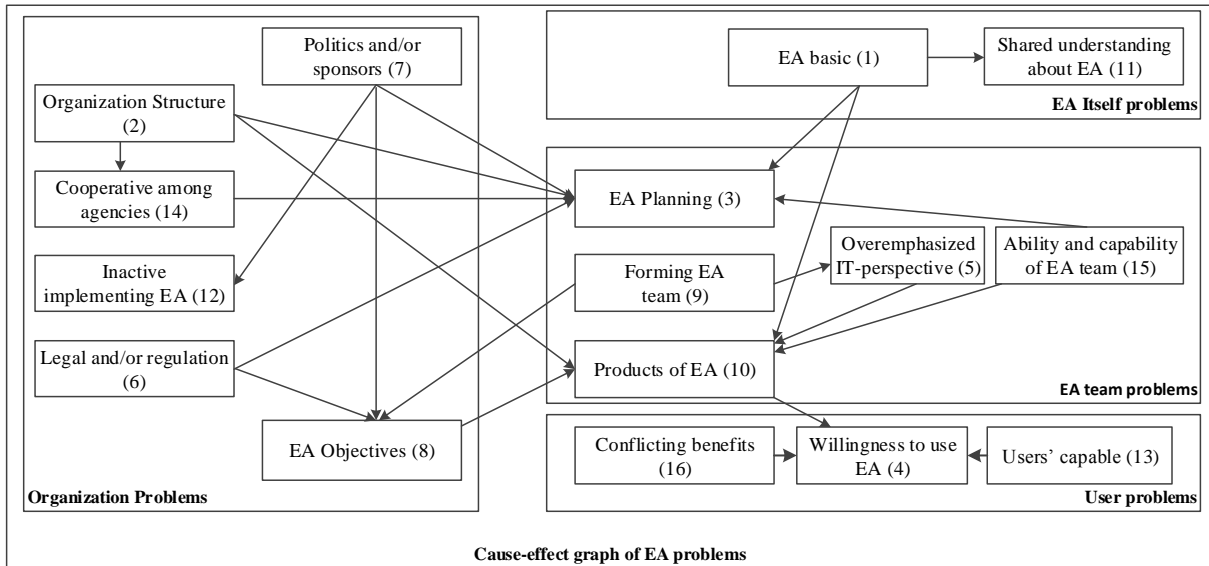


Figure 1. Cause-effect graph of EA programs in public sector.

Step 1: Identify relationships among the problems.

A total of 16 problems were identified (Table 3). Then their relationship were analyzed. For instance, when an EA architect in province A mentioned that “one agency, having multiple levels and owners for each service, does not help choosing an appropriate product,” resulted in a relationship between Organization structure (2) and EA product (10). The transcripts and the relationships were analyzed similarly.

Step 2: Build a cause-effect graph.

From Step 1, if problem A leads to problem B, there is a direct connection between A and B (there is an arrow from A to B). For example, if ‘Politics and/or sponsors’ (7) leads to ‘Inactive implementing EA’ (12), we have an arrow from vertex 7 to vertex 12 (Figure 1).

We recursively repeated this step until no new relational cause-effect emerged. The final cause-effect graph is shown in Figure 1. There are 21 cause-effects relations in 16 problems. The relations are grouped into four categories: organization problems, EA team problems, user problems, and EA itself problems.

Step 3: Identify root causes.

From the cause-effect graph in Step 2, we identified root causes that are defined as follows: problem A is a root cause if there are no problems (out of 16) leading to it. For instance, problem ‘politics and/or sponsor’ (7) is a root cause because no other problem leads to this (in Figure 1). In contrast, ‘politics and/or sponsor’ (7) leads to three consequences, namely, ‘inactive implementing EA’ (12), ‘EA objective’ (8), and ‘EA planning’ (3). We repeated this step and identified the list of root causes in Table 4.

Eight root causes for EA program problems were identified. They included three root causes related to the organization, one to the EA itself, and two to the EA team and the EA users. Dealing with these root causes is a step toward controlling problems in EA programs. The root causes could be useful for practitioners who are preparing to implement EA programs in state agencies.

First, the agencies’ organizational structure negatively affects EA programs. This affects EA products (#10) and EA planning (#3). The public sector usually has complex organizational structures with multiple-level services, which is usually problematic (Isomaki & Liimatainen, 2008; Jan & Christine, 2014). It leads to inefficient or inappropriate EA planning and affects EA programs (Weerakkody et al., 2007). Moreover, multiple business service owners, or each agency having its own business, resources, and services, could lead to difficulties for agencies planning and implementing EA programs.

Table 4. Root causes of EA programs in the public sector

#	Group	Root causes	Consequences
1	Organization	Organization structure (#2)	EA products (#10); EA planning (#3)
2		Legal rule and/or regulation (#6)	EA objectives (#8); EA planning (#3)
3		Politics and/or sponsors (#7)	EA planning (#3); EA objectives (#8); Inactive implementing EA (#12)
4	EA team	Forming EA team (#9)	Overemphasized IT perspective (#5); EA objectives (#8)
5		Ability and capability of EA team (#15)	EA planning (#3); EA products (#10)
6	EA Users	Users' capabilities (#13)	Willingness to use EA (#4)
7		Conflicting benefits (#16)	Willingness to use EA (#4)
8	EA itself	EA basis (#1)	Shared understanding of EA (#11); EA planning (#3); EA products (#10)

Second, ambiguous/no policies or laws seem to be a root cause leading EA programs, bound to single agencies with minimal intervention with other agencies, or focusing solely on the IT perspective. This affects EA programs' objectives. This could be a public sector-specific cause because, unlike the private sector where policies can change accordingly and immediately, public sector decisions are more complex and slower to make (Rose & Saebo, 2010).

Third, the provinces implemented EA in an inactive way because of pressure from politics or sponsors. This clearly affects the Objectives of EA (#8), EA planning (#3), and Inactive implementing EA (#12). This finding was supported by Iyamu (2009), who indicated that organizational politics lead to a lack of trust and cooperation, especially among business, IT units, or stakeholders.

Fourth, the way the agencies form EA program influences EA results. As EA programs usually affect many agencies and many business services, EA cannot be threatened solely as a technical issue; the business perspective is also needed. If those responsible for the EA program were technically oriented (such as the IT department) or do not consider the business aspect (Espinosa et al., 2010; Hauder et al., 2013), problems such as cooperation between agencies and unrealistic and unfeasible schedules and objectives were evident. In contrast, if the organization had a team with members from different departments of the agency, and if the team was led by a senior manager (province B), the EA programs were more productive. Therefore, in order to improve EA programs and their efficiency, they should be organized and led by senior management or by agencies that have strong credibility in terms of budget, business reform, and policies to support cooperation between agencies. This parallels Winter's (2008) work.

Fifth, the EA team and its skills are a key factor that affects EA results. This includes insufficient staff, implementation abilities, and the quality of the team members, as well as their capabilities and experience in EA projects, and not solely IT projects, affect not only to their own work but also other projects and services, and neighboring agencies. Therefore, EA skills and generic project management and skills are emphasized. These issues are also mentioned by Hauder et al. (2013), Chuang and Loggerenberg (2013), Isomaki and Liimatainen (2008), and Kim and Everest (1994).

Sixth, end users who use EA products or are affected by them motivate EA programs. The use of EA products initiates changes in end users' behavior, necessitating time for training. In particular, in contrast with the private sector, public sector organizations faced low management and adaptation skills for a

new environment and event computer illiteracy in some provinces. Thus, the organizations spent a lot of time and budget training users and changing their behavior (province C). Consequently, at the beginning of the EA programs, the programs' efficiency and risks are very difficult to estimate but need to be considered (Janssen & Klievink, 2012).

Seventh, occasionally managers and civil servants were not willing to use EA products and change their behavior accordingly. Instead, they used traditional methods and practices. In line with Kim and Everest (1994) and Tallon and Kraemer (2007), we argue that this is because they did not want to share information with other agencies to increase transparency, reduce service times, and decrease corruption. These changes could consequently reduce the leaders' and civil servants' 'benefits,' demotivating them.

The last group is EA itself and methods. The agencies failed to identify frameworks, models, and assessment factors that need to be considered. The agencies thus interpreted EA in their own ways, associations ranging from taxonomy and methodology to master planning (Ask & Hedström, 2011; Guijarro, 2007; Rohloff, 2005; Niemi & Pekkola, 2015). This also reflects the lack of a common EA definition (Dang & Pekkola, 2015; Lemmetti & Pekkola, 2012). There were no efficient tools and methods to control the quality of EA programs in the provinces; thus, the agencies chose their own methods, which made it difficult, even impossible, to estimate the risks of their choices. In addition, the problem in positioning EA to other management practices and approaches was evident.

5.2 Specific EA Problems in the Public Sector

Many earlier problems were new and identified in the public sector context. However, they somehow appear in other contexts. For example, EA teams' skills is a common issue everywhere EA programs are introduced (Hauder et al., 2013; Kim & Everest, 1994; Chuang & Loggerenberg, 2013). Yet there are also public sector-specific EA problems. They will be discussed next.

First, there were problems related to organizational structure and governance (#2). Compared to the private sector, the public sector has to deal with complex organizational structures and governance models. This was also mentioned by Weerakkody et al. (2007), who indicated that the public sector has faced challenges with the lack of coordination among information systems in agencies and bureaucracy problems. For example, one service is sometimes owned by several agencies. This means that private sector models for governing EA are often unsuitable. Thus, the EA team members, EA objectives, and resources were also affected negatively as the models did not fit the public sector reality. Thus, the EA programs were changed, often unintentionally, negatively in comparison to the initial objectives.

Second, political influence creates problems (#7). EA programs usually cause broad changes in the ways the agencies work. The managers and leaders are often uncertain about the success of the EA. This puts extra pressure on the decision-makers whether to invest in EA programs or set its goals. In our cases, the leaders played it safe, such as focusing on IT perspectives or hardware purchases. That obviously resulted in equally limited EA results. In addition, the organizations were deeply dependent on consultants. Consequently, consultants were easily able to steer the organizations in the 'wrong direction' deliberately, if they do not understand the environment, culture, and organization well enough. This concretized with non-Vietnamese consultants in case A.

Third, there are problems that strictly related to legislation and policies (#6). Isomaki and Liimatainen (2008) mentioned that legislation is one of the problems in EA programs in the public sector. For example, if a private sector organization needs a policy that is related to its multiple departments, such decisions can easily be made quickly. In contrast, the public sector has a long "delay" time, and may even be unable to change. This affects the EA results. Our experiences were similar.

Fourth, users' readiness (#13) to adapt EA products had a strong impact in our cases. Computer illiteracy, low learning ability, and the lack of modern technologies were severe issues. This is partly a public sector-specific issue and partly a developing country-specific issue. All this implies that the users found it hard to change their behavior. As a result, the EA programs spent time and budget training users. This furthermore led the EA program to miss its objectives.

6 CONCLUSION

In this paper, we studied public sector EA program problems and their root causes. The data collected from three Vietnamese cases with different EA experiences, understanding, and backgrounds provides more insights into EA programs. As a result, we have identified eight root causes of EA problems, with several different secondary consequences. Therefore, if the activities are targeted only to the consequences and not the root causes, the problems will keep re-emerging. This analysis, although often paralleled in the existing literature, has not been previously presented.

Our paper thus contributes to research by providing the first versions of root causes and some specific problems with EA programs in the public sector. These eight root causes will help practitioners when they implement EA programs. For researchers, understanding the root causes provides deeper understanding of the complex EA phenomenon, with potential new research avenues, for example, how to avoid different root causes, how to consider them in EA methods and practices, and how to apply different theories (and what those would be) in studying complex organizational settings. Public sector-specific root causes such as political influence, end users' readiness, organizational structures and governance mechanisms, and legislation and policies are examples of such issues that have been studied little in the EA (and IS) literature.

The paper has several limitations. The case study was based on only a single country, its public sector, and three provinces. Therefore, the root causes and individual problems might be different elsewhere. However, as the literature largely parallels our findings, we believe no major changes would occur, no matter whether the root causes are transferred to different contexts or countries. However, as case study research provides only a glimpse to the general phenomena, more research is definitely needed, for example on central governments and other countries.

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