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Banaeianjahromi Negin, Smolander Kari

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Lack of Communication and Collaboration in Enterprise Architecture Development

Negin Banaeianjahromi

School of Business and Management, Lappeenranta University of Technology, Lappeenranta, Finland

Kari Smolander

Department of Computer Science, Aalto University, Espoo, Finland

Correspondence details: Negin Banaeianjahromi, negin.banaeianjahromi@lut.fi, School of Business and management, Lappeenranta University of Technology, P.O. Box 20, 53851 Lappeenranta, Finland

Tel: +358 46 9414496

Abstract

Enterprise architecture (EA) is widely employed to reduce complexity and to improve business–information technology (IT) alignment. Despite the efforts by practitioners and academics in proposing approaches to smoothen EA development, it is not easy to find a fully successful EA. Because EA development is a complex endeavour, it is important to understand the obstacles that practitioners face during EA development. With the grounded theory, we studied how obstacles during EA development emerged from practitioners' point of view in 15 large enterprises. The study identifies lack of communication and collaboration as the core obstacle that can explain many other obstacles. Communication and collaboration were also harmed by other perceived EA development obstacles, including lack of knowledge and support inside organization and issues imposed by external parties, hesitation in training personnel, setting too ambitious goals, constant change of management, (lack of) clarity in EA development process, lack of budget, forcing personnel to adopt EA, lack of motivation, organizational culture, and organizational structure deficiencies. The lack of communication and collaboration caused several undesired effects to organizations, such as being unable to set common goals and achieve a shared understanding, personnel's distrust, endangered EA governance, lack of innovation capability, lost competitive edge, and ineffective EA outputs. The study highlights that organisations should improve their communication and collaboration before embarking on EA to encounter fewer obstacles. We provide four recommendations for practitioners to improve communication and collaboration in EA development.

Keywords: Enterprise architecture, enterprise architecture development, obstacles, communication and collaboration, grounded theory, large enterprises.

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1. Introduction

Enterprise architecture (EA) manages the complexity of an organisation by providing a structured description of an enterprise and its relationships (Niemann 2006; Ross, Weill, and Robertson 2006; Simon, Fischbach, and Schoder 2014; Winter and Fischer 2006; Zachman 1987). Despite being considered a relatively young discipline (Boucharas et al. 2010; Bucher et al. 2006), people from both business and academia have become interested in EA and realised its importance. EA has been acknowledged to improve business and IT alignment, which is recognised to be critical for organisations' success (Alaeddini and Salekfarid 2013; Löhe and Legner 2014; Schmidt and Buxmann 2011; Tamm et al. 2011; Winter and Schelp 2008; Wu and Lu 2007). According to recent surveys and studies, business and IT alignment is the most critical concern among CIOs (Guillemette and Paré 2012; Luftman and Ben-Zvi 2011; McGee 2008). EA has been reported to be used as a communication tool for business and IT alignment (Niemi and Pekkola 2015; Tamm et al. 2011). Organisations are increasingly initiating EA projects to achieve suitable business and IT alignment and EA is receiving more attention from industry as well as from academia due to its potential to gear IT to the needs of business (Wan and Carlsson 2012).

Many studies exist about the benefits of EA, for example reduce IT costs, more effective use of resources, improve agility and innovation, reduce complexity, and improve business and IT alignment (Boucharas et al. 2010; Foorhuis et al. 2010; Niemi 2008; Tamm et al. 2011; Wan et al. 2013; Foorhuis et al. 2016). Several studies addressed the significant role of EA in organisations (Alaeddini and Salekfarid 2013; Kappelman and Zachman 2013), and EA frameworks and methods (Bernus and Noran 2010; Erol, Sausser, and Mansouri 2010; Fatolahi et al. 2007; Hoogervorst 2004; Kilpeläinen 2007; Kim et al. 2006; Lankhorst 2013; Sowa and Zachman 1992; Vargas et al. 2014; Nogueira et al. 2013; Bernaert et al. 2016). Commonly, EA is adopted by organizations to facilitate enterprise integration issues and reduce complexities (Chen, Doumeingts, and Vernadat 2008; Henderson and Venkatraman 1993; Banaeianjahromi and Smolander 2016b), to increase quality and responsiveness to the ever changing environment (Huysmans and Verelst 2013), for better institutionalization (Chung et al. 2009), for better decision making (Jensen, Cline, and Owen 2011), and to increase business performance (Boucharas et al. 2010; Van Steenberghe et al. 2011). Well implemented EA is both stable and flexible which assist an organization to innovate and change (Rouhani et al. 2014).

In the context of enterprise integration, EA can be utilized as a tool to determine the interconnections and technologies used between systems to evaluate the needs and impacts of integration. In our previous study, we identified the issue of inefficient architectural descriptions as a potential challenge in enterprise integration projects (Banaeianjahromi et al. 2016). EA is inefficient when it is not up to date, complete, understandable, nor in detail. Kähkönen, Smolander, and Maglyas (2016), also mention the need of a complete, detailed and up to date EA in order to facilitate integration in the organizations and to ensure that integration is aligned with organizational goals and also to evaluate the integration needs, requirements, and impacts. The issue of inefficient EA not only hinders the integration projects but also puts the organization in chaos as there is no guideline or plan to determine the consequences of actions in the organization. Therefore, it is crucial to have an efficient EA in the organization.

Despite the popularity of EA in the last decade, it is not easy to find a successfully developed EA in an organisation (Iyamu 2009). According to Roeleven's (2010) white paper, 66 percent of EA projects did not fulfil the expectations of the surveyed organisations. Furthermore, the challenges that are faced during EA development are rarely technical but political, project management, and organisational issues (Kaisler, Armour, and Valivullah 2005). Although numerous studies have reported organisational experiences and best practices to develop EA (Hjort-Madsen 2006; Isomäki and Liimatainen 2008; Nakakawa, Bommel, and Proper 2010; Seppänen, Heikkilä, and Liimatainen 2009), the ineffectiveness of EA development is present in many studies (Kähkönen, Smolander, and Maglyas 2016; Bricknall et al. 2006; Ross, Weill, and Robertson 2006).

In practice, EA development projects encounter different challenges, and not all of these projects end with success (Haki, Legner, and Ahlemann 2012; Roeleven 2010; Schmidt and Buxmann 2011; Seppänen, Heikkilä, and Liimatainen 2009). Many studies have addressed the challenges and issues in EA development, but none of these have gone further than proposing taxonomies (Armour and Kaisler 2001; Bricknall et al. 2006; Chuang and van Loggerenberg 2010; Hauder et al. 2013; Isomäki and Liimatainen 2008; Iyamu 2009; Jahani, Reza Seyyed Javadein,

and Abedi Jafari 2010; Kaisler, Armour, and Valivullah 2005; Löhe and Legner 2014; Lucke, Krell, and Lechner 2010; Nikpay et al. 2013; Roth et al. 2013; Saarelainen and Hotti 2011; Seppänen, Heikkilä, and Liimatainen 2009; Valtonen et al. 2011; Wan, Luo, and Luo 2014; Ylimäki 2008). Therefore, there is a need for research to move further than categorising the challenges of EA to a more theoretical direction.

We wanted to increase our understanding of obstacles in EA based on an empirical qualitative approach. Therefore, we investigated the process of EA development in 15 large enterprises using the grounded theory method (GTM). We made inquiries in three rounds through interviews and organisational documents. With this paper, first we aim to explain the EA development obstacles in the studied enterprises. Second, we look for core obstacles that can explain most of the other obstacles as their root cause. Finally, we investigate the causes and effects imposed by the core obstacle to the organizations. Additionally, we suggest recommendations to facilitate the removal of the core obstacle in EA development.

The paper is organised as follows. First, we review existing research on EA and its development obstacles. We then explain our choice of research methodology. Then we present the analyses and interpretations of the data, and we present our findings. In the discussion section, we compare our results to the literature and discuss the implications of the results on practice and research. We also discuss limitations and possible future study paths. Finally, we conclude with the key contributions.

2. Background

2.1. Enterprise architecture

Goethals et al. (2006) referred to enterprises as ‘living things’, meaning that they need to be (re-)architected constantly to achieve their necessary agility, alignment, and integration. Taking all of the architecture of the entire enterprise into consideration, all enterprise entities, such as systems, stakeholders, relationships, dependencies and business strategies, can be architected in an EA effort (Goethals et al. 2006). EA is referred to as a holistic management of information systems in organisational approaches (Ross, Weill, and Robertson 2006; Tamm et al. 2011; Winter and Fischer 2006). It describes how different entities in an organisation, such as systems, processes, organisations and people, work together as a whole to reduce costs and respond to new business opportunities (Morganwalp and Sage 2004; Penttinen and Isomäki 2010; Ross, Weill, and Robertson 2006).

There are different perspectives to EA (Niemann 2006; Ross, Weill, and Robertson 2006; Simon, Fischbach, and Schoder 2014; Winter and Fischer 2006; Zachman 1987) and there is no universally accepted definition of EA (Rohloff 2005; Ross, Weill, and Robertson 2006; Zachman 1987). The Center for Information Systems Research (CISR) defines enterprise architecture as ‘*the organizing logic for business process and IT capabilities reflecting the integration and standardization requirements of the firm’s operating model*’. They consider architecture as ‘*a strategic, rather than technical, exercise*’ (MIT CISR 2016). EA has also been defined as ‘*the blueprint or the organizing logic that binds together aspects of (1) business planning, (2) business operations, (3) process rationalization, and (4) enabling IT infrastructure*’ (Kamoun 2013).

Commonly, EA is considered as a ‘*bridge*’ between strategy and implementation that aligns the business and IT (Hiekkanen et al. 2013). Bacon and Fitzgerald (2001) described the purpose of EA as a framework or method to align business and IT as well as cover both organisational and technical aspects. According to Tamm et al. (2011), EA’s organisational role is positioned between IT and business strategy. Being similar to a strategy, EA aims to describe a long-term and organisation-wide vision of business processes and IT systems in great detail (Tamm et al. 2011). In an EA, the organisation is viewed as a complicated system that need to be broken down into manageable entities to improve the understandability of the organisation’s complexity (Kamoun 2013). EA reduces the complexity of the current state and provides a mechanism for making decisions about the future state of the enterprise (Hiekkanen et al. 2013; Van Der Raadt, Hoorn, and Van Vliet 2005). EA development is a planned process of evolution that is usually triggered by a business strategy shift, mergers and acquisitions, or when the current EA is not sufficient (Postina et al. 2010). EA development provides a long-term view by analysing the current status (As-Is) and determining the target

status (To-Be) of the processes, systems, technologies, and strategies of an organization through a transition plan (Ross, Weill, and Robertson 2006; Winter and Fischer 2006).

EA projects are continuous programmes that must be updated at different periods of time based on the enterprise's needs and changes (Jahani, Reza Seyyed Javadein, and Abedi Jafari 2010). Thus, in this paper, by EA project we mean a continuous project that cannot be done all at once and is developing continuously.

2.2. Enterprise architecture development obstacles

According to Cambridge Dictionary, an obstacle is '*Something that blocks you so that movement, going forward, or action is prevented or made more difficult*'. We define EA obstacles as the factors confronting the EA project with difficulties and loss of resources that cannot be solved easily and therefore they create risks of project failure.

EA frameworks and methodologies assist enterprise architects by providing guidelines through different steps of EA development (Hoogervorst 2004; Lankhorst 2013; Zachman 1987; Medini and Bourey 2012). Many enterprises fail because they only focus on the framework, without considering how to implement and maintain the EA (Bricknall et al. 2006). Practitioners face many challenges that need to be solved in EA development, and in some cases, they face obstacles that cause project termination and failure. Therefore, in order to mitigate these issues, it is crucial to understand the challenges and obstacles that hinder EA development.

Several studies have addressed different EA challenges and obstacles. EA development challenges can be environmental, technical, managerial, or social (Banaeianjahromi and Smolander 2016a). Lucke, Krell, and Lechner (2010) categorise the EA issues into management, semantic problems, insufficient resources, complexity, and representation, while Bricknall et al. (2006) describe EA issues in terms of three categories: management, scope, and content. According to Isomäki and Liimatainen (2008), the three most pivotal challenges of EA are implementation ability and governance, structure of the state government and advancement of interoperability.

Management buy-in is mentioned as a critical factor in EA development to establish the documentation and the processes to keep the EA project ongoing (Bricknall et al. 2006). Insufficient management commitment during EA development is reported as a major issue in the literature (Lucke, Krell, and Lechner 2010; Seppänen, Heikkilä, and Liimatainen 2009; Valtonen et al. 2011; Ylimäki 2008). A lack of shared understanding of EA is another major issue that is frequently reported in the literature (Hjort-Madsen 2006; Iyamu 2009; Saarelainen and Hotti 2011; Seppänen, Heikkilä, and Liimatainen 2009; Ylimäki 2008). The issues of shared understanding and communication are related to each other. According to Saarelainen and Hotti (2011), communication and shared understanding have major roles in group working and decision-making. Communication and common understanding during EA facilitate information exchange between different EA stakeholders (Nikpay et al. 2013). Bricknall et al. (2006) mentioned communication as being an important and necessary component during EA implementation. Hjort-Madsen (2006) pointed out that a successful EA implementation requires constant communication and cooperation across different levels and functions.

Chuang and van Loggerenberg (2010) studied the challenges faced by enterprise architects. They identified five challenges: communication, obtaining buy-in from the stakeholders, ownership, perceptions of the enterprise architect, and organisational politics. In another study, Roth et al. (2013) reported the EA challenges faced by organisations by conducting a survey focussing on EA documentation. They identified 'huge effort of data collection' and 'bad quality of EA model data' as the most reported issues among 140 valid responses. 'Insufficient tool support', 'No management support', and 'low return on investment' were the other important reported challenges.

Jahani, Reza Seyyed Javadein, and Abedi Jafari (2010) listed employing experienced and educated consultants as a success factor of enterprise architecture planning. Armour, Kaisler, and Liu (1999) suggested employing good consultants who can offer expert advice, facilitate meetings, and train the team. However, they did not mention anything about the challenges of employing EA consultants. Also, Lucke, Krell, and Lechner (2010) pointed out 'lack of experienced architects' as an issue in EA development. Nevertheless, they did not mention what they meant by architects: are they companies' trained personnel or consultants from outside? The literature suggests that the most common EA development challenges are not technical issues but human related. Insufficient management support, lack of shared understanding and lack of communication are among the most cited EA development issues. Although

many scholars have identified communication and collaboration as a major issue during EA development, the explanation of why and how lack of communication and collaboration leads to a permanent or temporary EA project failure is incomplete and not grounded in theory (Nikpay et al. 2013; Schmidt and Buxmann 2011; Van der Raadt et al. 2010; Ylimäki 2008; Kang et al. 2010; R. Abraham et al. 2013; Niemietz, De Kinderen, and Constantinidis 2013). According to the literature, most EA development obstacles occur during the development stage of an EA project. Very little attention has been given to the issues raised in the pre-development and post-development stages of EA projects.

3. Research method

We applied the interpretivist paradigm to understand the whole complex phenomenon and selected a qualitative strategy using the grounded theory methodology (GTM) to carry out this study. Glaser and Strauss outlined a research methodology to systematically derive theory from empirical data on social contexts (Glaser and Strauss 1967). In this study, GTM helped us to make sense of the obstacles that organisations faced during their EA development projects. In GTM, the systematic procedure of data collection and analysis is the major source of its effectiveness, which allows it to ground the created theory in reality (Corbin and Strauss 1990). We collected and analysed the data iteratively by investigating the obstacles perceived from each organisation at a time. To analyse our data, we used Strauss and Corbin's coding approach, which includes open, axial and selective coding. Coding represents 'the analytic processes through which data are fractured, conceptualised, and integrated to form theory' (Strauss and Corbin 1998).

One of the major strengths of GTM is that it has an 'open-minded' but not 'empty headed' attitude toward the empirical data to let empirical observations and theoretical insights influence the research interest (Goldkuhl and Cronholm 2010; McGhee, Marland, and Atkinson 2007). As we went forward in our research, the research questions developed according to our observations and insights, which we could note from the memos that we wrote during the research to keep track of our thoughts.

3.1.Data collection

We collected the data in three rounds. In the first round of interviews, we employed snowball sampling (Corbin and Strauss 2008) to gather data from three organisations (Cases K, M, and P) in May and June 2014. In total, nine experts were interviewed, with the average duration of the interviews being 1 hour and 15 minutes. The interviewed companies were large, with sizes from 1,000 to 30,000 employees. In the second round, we gathered data from 14 organisations (Cases A to N) with purposeful sampling (Patton 2005) in the period from May to July 2015. In total, 20 experts were interviewed, with the average duration of the interviews being 1 hour and 10 minutes. The interviewed companies were large, with sizes from 600 to 35,000 employees. All of these organisations had finished at least one round of EA development, and some of them were in the stage of updating their EA.

During the first round of interviews, we collected interviewees' feedback on the definition of EA, the utilization of EA in their work, the influence of EA in their company, Enterprise Integration (EI) challenges, and any concerns regarding EA development and maintenance. The aim of the first round of the interviews was to get a better understanding of the position of EA in the organizations and to identify any challenges regarding EA and EI. We deemed semi-structured interviews with open-ended questions to be suitable for data collection. This way, the interviewer could ensure that all of the pre-planned themes were covered and the interviewees could think about and reflect on the topics as well as bring their experience and perceptions to the discussion (Lange and Mendling 2011). When required, more detailed questions were asked based on the interviewees' responses.

For the second round of data collection, we initiated our purposeful sampling in the beginning of May 2015 and sent an email to an EA specialist group with 335 members to request qualified members of the group to assist us with interviews. We received 38 replies from the group members who were ready to do the interviews. Then, we telephoned them, explained the purpose of the interview and asked for more information about their background and their experience with EA development projects. From these 38 responses, we selected the experts who were intensely involved with an EA development projects in a large organisation. In total, we interviewed 20 experts including chief executive officers (CEO), chief information officers (CIOs), project managers, IT managers, and heads of related

departments. All of the interviews took place in the interviewees' workplaces. The main questions addressed the obstacles, missions, and goals of the EA project in different EA development stages as well as the results and outcomes of the project. Table 1 presents the information about the interviewed organisations.

For the third round of data collection, we sent emails to the interviewees and asked for their EA documents. Out of 14 organisations from the second round of the data collection, five organisations (Cases A, G, I, K and L) sent us documents regarding their EA development project. In total, we analysed nine documents (329 pages). Furthermore, during the analysis, we contacted some of the interviewees to get more information or clarification on an issue or topic that they had had mentioned during the interviews.

Table 1 Case organisations and interviewees information

Cases	Industry	No. of employees	No. of interviews	Roles of interviewees
1st Round				
P	Global manufacturing enterprise	30,000	6	Business-IT negotiator IT manager of business area Manager of E-business and integration Head of E-business and integration Business support manager of a business area Director of business process development
K	Automotive industry	1570	2	CIO Head of IT department
M	Automotive industry	1,600	1	Head of systems analysis and design
2nd Round				
A	Governmental organisation	1,500	1	CIO
B	Banking industry	800	1	CIO
C	Consulting industry	2,000	1	Project manager
D	Governmental organisation	20,000	1	IT manager
E	Cement industry	720	1	CIO
F	Consulting industry	600	1	Project manager
G	Governmental organisation	10,000	3	CIO Head of systems analysis and design Head of business process development
H	Automotive industry	9,700	3	CEO R&D director Head of business process development
I	Automotive industry	35,000	1	CIO
J	Automotive industry	11,000	2	CIO Head of R&D
K	Automotive industry	1,570	1	CIO
L	Banking industry	1,000	2	Head of software development IT manager
M	Automotive industry	1,600	1	Head of systems analyse & design
N	Governmental organisation	1,860	1	IT manager

3.1.1. Case descriptions

We collected data from 15 large organizations.

Case A: is a governmental organization with several branches in different cities. The interviewee was the CIO of the head branch of the organization with the educational background in business administration. In total the organization has 30 branches and 1500 employees. Their main goal to develop EA was to achieve organizational integration not

only in the system level but also in processes and strategies. EA development was outsourced to an EA consultant company.

Case B: provides services to banks. Case B is a large organization with 800 employees in several branches. They developed EA to improve integration and standardization in their organization. The interviewee was the CIO of the organization and he had experience in the field of IT. B wanted to increase the level of maturity in their organization. They developed EA internally with minor help from external consultants.

Case C: provides IT consulting services to companies. Case C has about 2000 employees in different branches around the country. The interviewee was the one of the project managers of the organization and involved in the EA development project of the organization. The interviewee has experience in software development. Case C developed EA internally. Their goal was to reduce costs and improve integration within their organization.

Case D: is a governmental organization with several branches in different cities. In total Case D has 20,000 employees. The interviewee was the IT manager of one of the branches. The interviewee had experience in the field of IT. Case D outsourced their EA development. Their goal was to integrate business processes and information systems.

Case E: is in the cement industry with 720 employees. The interviewee was the CIO of the organization with IT experience. They developed EA internally. The goal was to reduce costs and improve decision making in the organization.

Case F: is a consulting organization with 600 employees. The interviewee was one of the project managers of the organization. The interviewee has experience in IT and business. They outsourced their EA development. Their goal was to provide information systems integration, have detailed and up to date documentation, improve business processes, and increase the maturity of the organization.

Case G: is a governmental organization with 10,000 employees. The interviewees were CIO with experience in IT, head of system analysis and design with experience in software engineering, and head of business process development with experience in business and industrial management. They outsourced their EA development. Their goal was to provide information systems integration, increase maturity of the organization, reduce costs, and improve business processes.

Case H: is in automotive industry with 9,700 employees. The interviewees were the CEO of the organization with industrial management experience, R&D director with experience in innovation management, and head of business process design with experience in IT and business. They developed EA internally with getting minor help from an external consultant. Their goal was to provide information systems integration and reduce costs.

Case I: is in automotive industry with 35,000 employees. The interviewee was the CIO of the organization with experience in software development. EA was developed partly by EA consultant in the past but then they continued to develop EA internally. Their goal was to provide information systems integration and reduce costs.

Case J: is in automotive industry with 11,000 employees. The interviewees were the CIO of the organization with experience in industrial management and IT and the head of R&D with experience in IT. They developed their EA internally. Their goal was to provide information systems integration, reduce costs, and provide faster production.

Case K: is in automotive industry with 1,570 employees. The interviewees were the CIO of the organization with experience in IT and business and the head of IT department with experience in software development. They developed their EA internally. Their goal was to provide information systems integration and reduce costs.

Case L: is in banking industry with 1,000 employees. The interviewees were the head of software development with experience in software development and IT manager with experience in IT and business. They outsourced their EA development to an EA consulting company. Their goal was to provide information systems integration and have a detailed up to date documentation.

Case M: is in automotive industry with 1,600 employees. The interviewee was the head of systems analysis and design with experience in software engineering and business. They developed EA internally. Their goal was to improve business processes and provide information systems integration.

Case N: is a governmental organization with 1,800 employees. The interviewee was the IT manager of the organization with experience in IT. They outsourced their EA development. Their goal was to provide information systems integration and reduce costs.

Case P: is a global manufacturing enterprise with 30,000 employees. We interviewed six persons from this organization. They all had experience in IT and business. They developed their EA internally.

3.2.Data analysis

We analysed the data by adopting the interpretivist paradigm (Easterbrook et al. 2008). All the interviews were transcribed to text format and then analysed with the qualitative data analysis tool Atlas.ti. Also the organisational documents were imported to Atlas.ti for analysis. Based on ‘open coding’, ‘axial coding’ and ‘selective coding’ principles from the grounded theory method (Strauss and Corbin 1998), we analysed our dataset as we collected them. Open coding is defined as ‘the analytic process through which concepts and categories are identified and their properties and dimensions are discovered in data’ (Strauss and Corbin 1998). The key activities of this phase are naming, comparing, and memo writing (Locke 2001). Axial coding is ‘the process of relating the categories to their subcategories. It is termed “axial” because the coding occurs around the axis of a category, linking the category at the level of properties and dimensions’ (Strauss and Corbin 1990). The final step of the analysis process was selective coding. Determining the central category that all other major categories are related to is a part of selective coding (Strauss and Corbin 1998). Figure 1 presents the process of data analysis in this study.

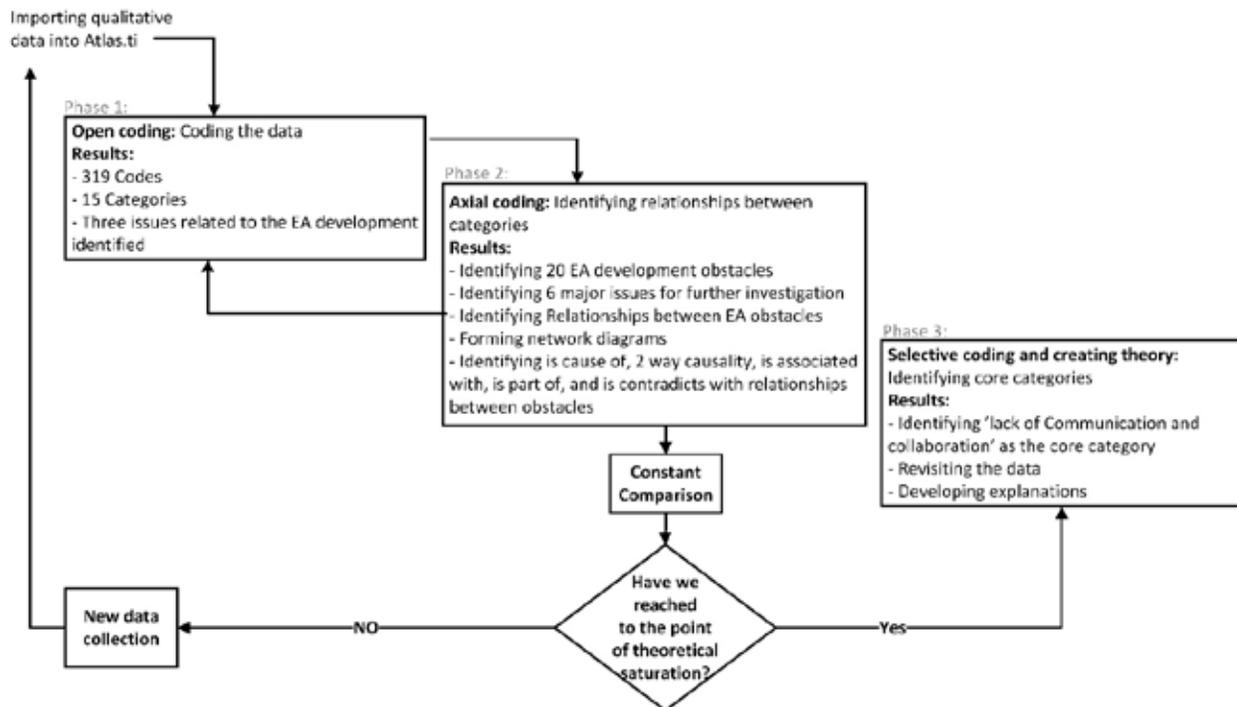


Fig 1 Phases of data analysis

3.2.1.Phase 1 and 2– open coding and axial coding

In the open coding, we read all of the interview transcripts and conceptually labelled words, sentences, and paragraphs through constant comparison (Strauss and Corbin 1998). ‘Budget’, ‘teamwork’, ‘organization and consultant

relationship', 'EA updates' and 'infrastructure' are the examples of open codes that we created. For example, we assigned the code 'training personnel' to the following interview quotation: 'When you lose your trained human resource, it is harmful for the organisation because the organisation is losing its knowledge and potential' –Case B, CIO. Then, we grouped the conceptually similar ones to form categories and subcategories using theoretical comparison (Strauss and Corbin 1998). We also used the interview questions and themes to lead us in conceptually categorising the data.

We also provided a categorisation level to increase the understandability of the codes during the coding process. For example, we identified 'hesitation in training personnel' as a pre-development EA obstacle, which we coded as 'EA::obstacle::hesitation in training personnel'. During the open coding, we constantly compared the codes and merged similar codes. For instance, 'confusion in government' and 'political changes of the country', were merged into one category: 'EA::obstacle::government-related political issues'.

Open coding and axial coding processes happened in parallel. During the axial coding, we dug into the data to identify the relationships, such as the conditions, cause-and-effect relationship, and interactions, between the categories and subcategories. For instance, we noted that confusion in government is associated with the political changes of the country that has a direct impact on the management of governmental organisations, which results in constant change of management.

According to Bowen (2008), it is challenging for qualitative researchers to recognise the theoretical saturation point. This is a milestone that should be met in a grounded theory study to prove that the data categories are well established and validated (Bowen 2008; J. M. Corbin and Strauss 1990). Corbin and Strauss (2008) explains saturation as the situation 'when no new categories or relevant themes are emerging' (p.148). We believe that we reached the point of data saturation or theoretical saturation, as new data did not add new insights and we faced data replication and redundancy. According to Pandit (1996), theoretical saturation has been met when the marginal value of new data is minimal. For instance, during the second round of interviews, we noticed that codes in the data started to repeat after the 12th interview. We reached the point of theoretical saturation as (1) no new and relevant data created any new categories; (2) the properties and dimensions of the EA obstacles were being assigned to the already established categories, and no new categories were added; and (3) the patterns in data were repeated and the relationship among categories were well established (Duchscher and Morgan 2004; Morse 1995). We ended up with 319 codes and 15 categories in the initial phase of analysis. Appendix III presents the categories and their descriptions as well as examples of codes in each category and their relationships to other categories.

After open and axial coding of the first round of interviews, we identified three EA obstacles:

- (1) Lack of collaboration in different forms, such as lack of collaboration between other personnel and architects, and lack of collaboration between members of a team.
- (2) Lack of management support to prioritize the EA development and to assign enough budget and resources
- (3) Personnel resistance to change due to several reasons, such as lack of knowledge, lack of trust, and fear of losing jobs

Interestingly, while the organisations knew about the issues of collaboration, resistance and support in their organizations, they still started the EA development and hoped that these issues will be eliminated after EA development. However, this did not happen, because these issues constantly hindered the quality of EA. Based on these observations, obstacles such as personnel resistance to change, lack of collaboration, and lack of management support, which had already appeared before EA development, seemed to continue during and after EA development when they were not addressed properly. So, besides further investigation of EA obstacles we also got interested in understanding how obstacles appeared in different EA development stages (pre-development, development, post-development).

3.2.1.1. Investigating the EA obstacles

We continued the process of data collection and analysis and moved to the second round of data collection. This included the identification of the relationships between EA obstacles and related concepts. We investigated especially

how the mentioned three EA obstacles that we identified initially have emerged and what are the causes and effects of these obstacles in an EA development project. With regard to axial and selective coding (Corbin and Strauss 2014), we wanted to understand the possible relationships between the identified obstacles to identify the core category. We made a table (Appendix II) that presents all of the identified obstacles and their relationships (Is cause of, Is associated with, Contradicts, Is part of, and Two-way causality) with other obstacles. Using Atlas.ti we constructed network diagrams to illustrate the relationship between the codes. Figure 2 presents the network diagram of all the identified EA obstacles and their relationships.

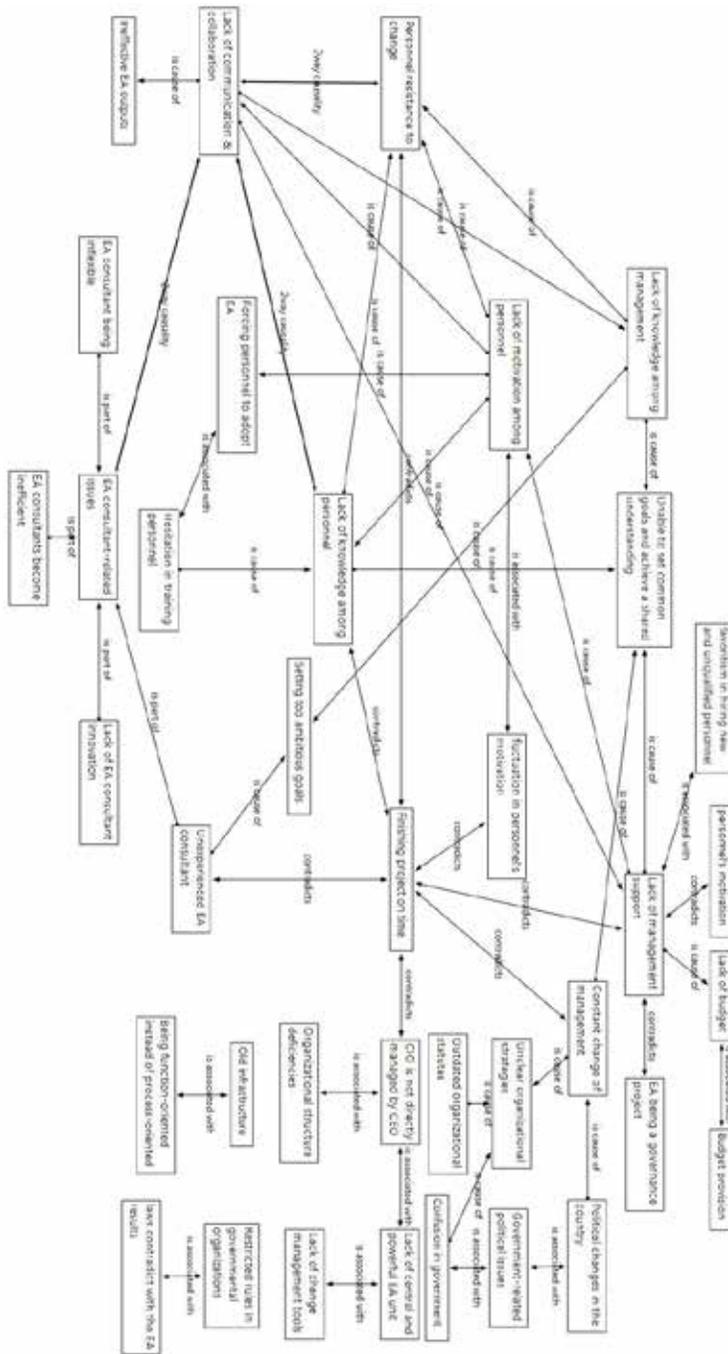


Fig 2 Network diagram of the identified obstacles and their relationships

We identified five types of relationships between the elements of interest in the data. For example, we used the ‘is part of’ relationship when denoting that several obstacles—‘EA consultant being inflexible’, ‘EA consultant being inefficient’, ‘Lack of EA consultant innovation’, and ‘Inexperienced EA consultant’—were parts of a higher-level category named ‘EA consultant-related issues’. ‘Is cause of’ is another type of relationship. For example, ‘political changes in the country’ is a cause of ‘constant change of management’. Another identified type of relationship is referred to as ‘is associated with’. For example, ‘Forcing personnel to adopt EA’ and ‘Hesitation in training personnel’ are associated with each other. ‘Contradicts’ is another type of relationship. For instance, we identified several obstacles during EA development that prevented the project from being finished on time, like constant change of management, lack of management support and lack of knowledge among personnel.

Besides identifying the EA development obstacles, we also wanted to see how the obstacles appeared in different stages of EA development. We employed semi-structured and theme-based interview questions that focused on obstacles observed during pre-development, development, and post-development in EA projects.

We defined EA obstacles as factors that confront the EA project, slowing progress or diminishing resources. Such problems cannot be solved easily and may potentially cause project failure.

The interview questions were based on three EA development stages, and we used these stages to conceptualize the identified obstacles. Appendix IV presents the identified obstacles in EA development assigned to the three stages, which we define for this study as follows:

- 1) **Pre-development:** the stage in which the organisation is in the process of deciding to implement EA, form an EA team, select the EA consultant and set the mission and vision of the EA project.
- 2) **Development:** this stage consists of analysing the current situation of the organisation, planning the transition stage to reach to the target situation and proposing the necessary projects to reach the target situation.
- 3) **Post-development:** the stage in which the organisation starts the projects defined in the previous stage to develop the EA outputs. Also, it is in post-development stage that the EA updates occur.

From our analysis, we identified six obstacles that occurred more often across the stages than others. These obstacles are:

- (1) Lack of communication and collaboration
- (2) Lack of management support
- (3) Lack of knowledge among management
- (4) Lack of motivation among personnel
- (5) Lack of knowledge among personnel
- (6) Personnel resistance to change
- (7) EA consultant-related issues
- (8) Government-related political issues

Appendix IV shows how the obstacles appeared in different stages of EA development. To simplify the network diagram presented in Figure 2, we decided to move to a higher level of abstraction (Table 2).

Table 2 Providing higher level of abstraction

Higher level of abstraction	Most frequently repeated obstacles
Lack of support inside the organization	Lack of management support
	Lack of motivation among personnel
	Personnel resistance to change
Lack of knowledge inside the organization	Lack of knowledge among personnel
	Lack of knowledge among management
Issues imposed by external parties	EA consultant-related issues
	Government-related political issues
Lack of communication and collaboration	Lack of communication and collaboration

For each of the above four obstacles we drew diagrams to present their emergence with the most relevant obstacles related to them. The diagrams are presented in Appendix V Figures V1, V2, V3, and V4. In these figures the circles represent the higher level of abstraction for the most frequently repeated obstacles and the rectangle boxes are the obstacles related to the most frequently repeated obstacles. The arrows shows Is cause of, Is part of, and Two-way causality relationships identified using both Figure 2 and Appendix II.

3.2.2. Identifying the core category

In the third phase of analysis we identified the core category for selective coding. We used the diagrams presented in Appendix V Figures V1, V2, V3, and V4 that illustrate the main EA development issues: (1) Lack of support inside organizations, (2) Lack of knowledge inside organizations, (3) Issues imposed by external parties, and (4) Lack of communication and collaboration.

These diagrams show how lack of communication and collaboration was present in all four diagrams. Therefore, we considered lack of communication and collaboration as the core obstacle (Figure 3). At this point of the research we asked the following research questions:

- (1) What are the causes that hindered communication and collaboration in EA development projects?
- (2) What are the effects of the lack of communication and collaboration in EA development projects?

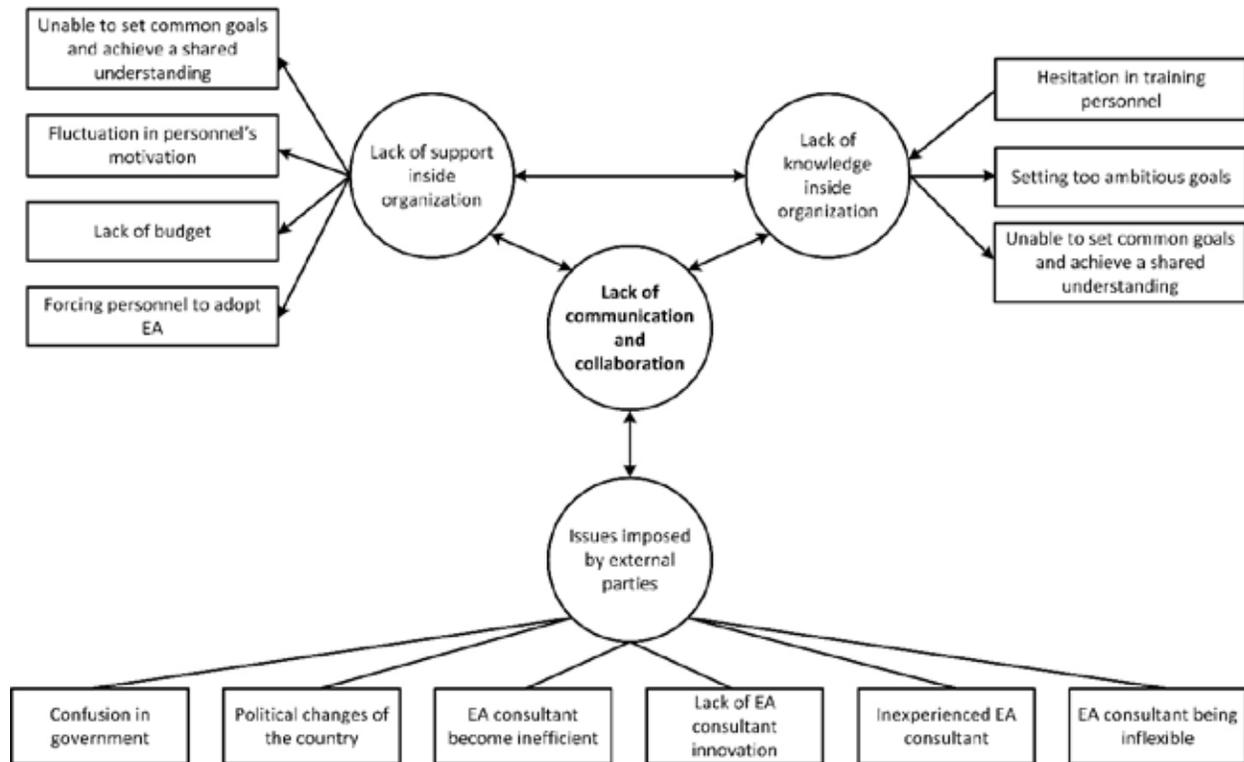


Fig 3 The emergence of core category

3.2.3. Determining the causes and effects of lack of communication and collaboration

We identified lack of communication and collaboration as the core category and explained the relationships of other major issues with this category. We could explain the emerging theory by revisiting the data from the core category perspective. We noticed that lack of communication and collaboration is the obstacle that can explain other obstacles.

Besides the three general obstacles (lack of knowledge inside the organization, lack of support inside the organization and issues imposed by external parties), we aimed to understand more specific causes and effects that are related to these three general obstacles. Figure 4 illustrates the causes and effects of lack of communication and collaboration in EA development projects. Besides lack of knowledge and support inside organization and issues imposed by the external parties, we identified 11 causes (white boxes) and 6 effects (grey boxes) of lack of communication and collaboration in EA development. Most of the obstacles presented in Figure 4 were already identified during axial coding. In selective coding we were able to reveal more causes and effects of lack of communication and collaboration in EA development, ‘Organizational culture’ and ‘clarity in EA development process’ as causes and ‘Personnel’s trust’ and ‘organization loses its competitive edge’ as effects. We were also able to determine the relationships between causes and effects, how they affect each other and how the effects reflect to the EA development effort. We also changed the code names to more abstract ones. For example, ‘lack of motivation among personnel’ was renamed to ‘lack of motivation’.

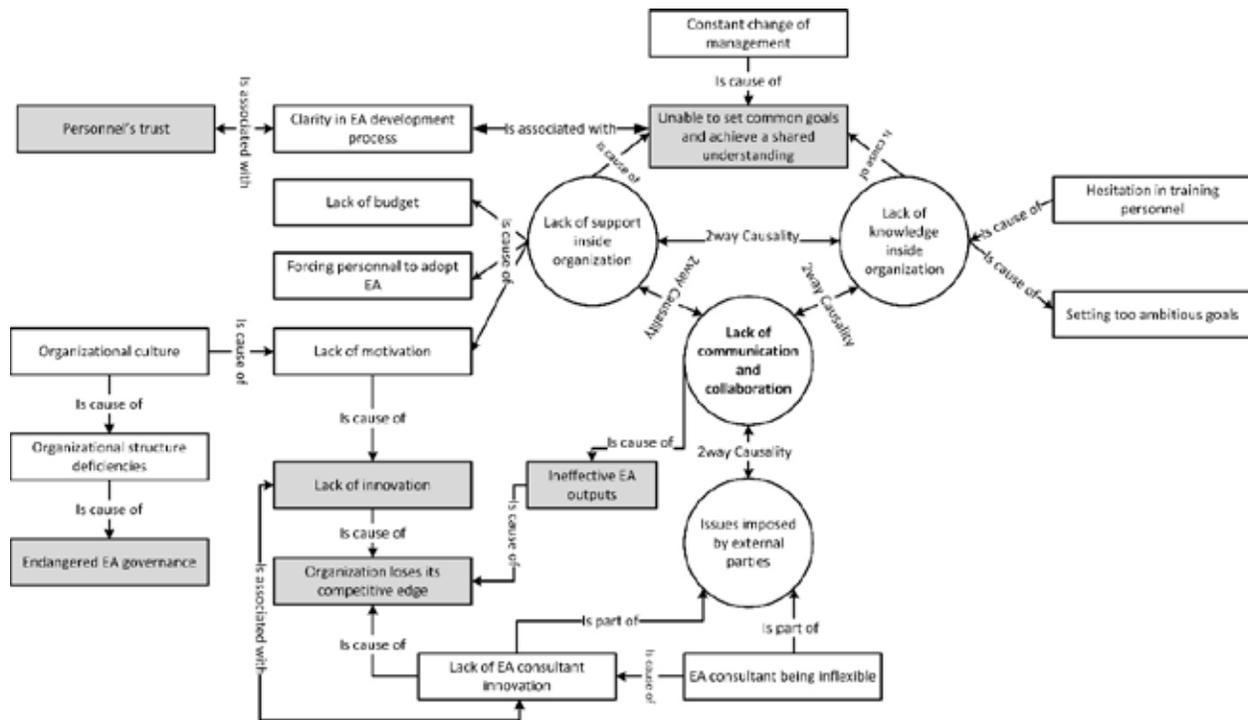


Fig 4 Causes and effects of lack of communication and collaboration

4. Findings

In this section, we explain our findings from the research phases. We also explain the line of thought that we followed in order to find the core obstacle in EA development and construct our theory. First, we will describe the three major obstacles that hinder communication and collaboration in EA development: Lack of knowledge inside organization, lack of support inside organization, and issues imposed by external parties. Then we will also explain our observations of the organizational documents and, finally, we will present our theoretical conclusion of the causes and effects of lack of communication and collaboration in EA development.

4.1. Lack of knowledge and support inside organization

Knowledge and support inside organization are EA two connected concepts; being supportive is because of having enough knowledge and lack of knowledge causes unsupportiveness. Thus, we decided to describe these two issues in one section. We identified lack of knowledge inside organization and lack of support inside organizations as two of the four major EA development obstacles. Figures V1 and V2 in Appendix V present the obstacles related to the lack of

knowledge and lack of support inside organization. We understood that lack of knowledge and support could be among personnel as well as managers. Some examples of these issues are discussed in the follow.

In Case E the CIO pointed out that, because of the lack of management knowledge, the EA development project did not have enough support from the management. Similarly, the CIO of Case G mentioned that, *'because high-level managers' education background usually is in human sciences, they don't have any knowledge of EA [...] and they don't understand the benefits of EA'*. Thus, they did not support the project. The Head of Systems Analysis and Design of Case M and the CIO of Case K mentioned that, because of the constant change of management, the organisations were faced with difficulties in developing the EA as the new management did not approve the continuation of the previous management's approach. So, the EA projects did not get enough support from the management. The severity of this was mentioned by the CIO of Case K: *'I remember that we were arguing the about 6 months with the CEO to convince him to do the EA. There was no other option, EA had to be developed [...] we had a lot of discussions with the CEO to assure him that we could not continue doing our routine work if we wanted to reach to our goals. We needed his approval and support; that was our biggest obstacle'*. The CIO of Case E explained the constant change of management as a *'terrifying situation for EA development, as managers with different strategies and priorities constantly came and went'*. Furthermore, the CIO of Case B mentioned that, usually, *'the high-level managers do not have enough IT-related knowledge to understand the necessity of developing EA'*. This situation hindered the EA project in Case B in all the stages of development.

Regarding the personnel-resistance-to-change issue, the Business Support Manager of Case P mentioned, *'You are keen to like what you are used to and you are not always very open to change'*. Furthermore, the Manager of E-business and Integration of Case P also mentioned, *'Sometimes that is kind of hard for the people to understand and to change the way they are used to working'*; it is not *'roses and sunshine all the time'* as they encountered human issues in the background. Also in Case K, when the personnel were told that the organisation was going to develop EA and their tasks might change, they resisted the changes by not collaborating with the EA developers. As was pointed out by the Head of the IT Department of Case K, *'everyone understands the changes that are caused by EA development, but they are not knowledgeable enough to understand how these changes will improve the maturity of the organisation, [...] and maybe this is partly because they are forced to adopt EA and consequently they show resistance to changes'*.

High-level management support seems to play a major role during EA development. The IT Manager of Case K mentioned, *'one of our biggest challenges was to convince the high-level manager that developing EA would be beneficial for the organisation, [...] even though the high manager says that EA is beneficial, but in practice the manager does not fully support the project'*. The high-level manager was against EA development, but the CIO and IT Manager of the organisation tried hard to convince him and get his approval to start the EA project. However, as they went on with the project, the manager showed less interest in the EA project, and at some point the EA development even stopped as the high-level management refused to assign more resources to continue the project.

The CIO of Case A mentioned personnel resistance to change as an obstacle in the pre-development stage, and he pointed out that the organisation addressed this issue by taking actions such as educating their personnel, conducting seminars and info sessions and involving personnel in the EA development progress report meetings. Furthermore, the CIO of Case G mentioned that, *'During EA development, most of the personnel were concerned about losing their jobs. We told them don't be concerned, developing EA just means correcting our views and models; it does not mean that someone else will get your job and you will lose your job. But still, we could see the resistance'*.

The CIO of Case B mentioned that they started the EA project without considering personnel resistance to change as an issue. They thought that developing EA was something that only managers should be concerned with, and so they did not involve the personnel in any of the decision-making sessions or meetings regarding EA development. They assumed that the personnel would adapt to the changes that the EA would bring to the organisation without asking questions. So they started to develop the EA without providing any training or offering information sessions on how EA can improve jobs while keeping them secure. But later, in the development and post-development stages, they noticed that the personnel did not collaborate as planned and sometimes even gave *'wrong information'* to the architecture team. Later, in the post-development stage, there was personnel dissatisfaction regarding the changes that EA had brought to their jobs.

'Lack of motivation among personnel' was another obstacle that hindered EA projects during the development and post-development stages. In order to keep personnel motivated and collaborating with the EA project, the human resource department should work efficiently to educate them beforehand about EA and its influence on their jobs and assure them of their job security. Failing to do so brings difficulties during the EA development and post-development stages. For instance, in Case B the personnel were forced to adopt EA without the management asking their opinion or involving them more in the project. Thus, they lost their motivation to adapt to the new procedures brought by EA development. In Case K the personnel lost motivation as they realised that the high-level management was not very supportive of the EA project, and hence they did not like to get involved in it.

4.2. Issues imposed by external parties

In Cases A, F, G, I, J, L and M, 'government-related political issues' appeared in all stages of development. This issue is beyond the scope of the organisations' authorities, and it sometimes hindered the process of EA development, especially in governmental organisations. This issue cannot be solved easily by the organisations themselves (Banaeianjahromi and Smolander 2016a).

'Confusion in government' was mentioned as a common obstacle in governmental organizations. Both of the CIOs from Cases A and E mentioned that 'the inappropriate definition of business in the government' and 'confusion in the government regarding the long term goals' affected their EA development in the initial stages. Also 'political changes of the country' were mentioned by Cases G and J. They imposed difficulties to the organizations, for example when the government changes. In this situation, *'the government changes, the cabinet will change, the industry minister will change. Therefore, [the organization's] boss will change'*. Thus, it is so likely that the project will be terminated in the middle.

Another obstacle that was mentioned in the two stages of development and post-development was 'EA consultant-related issues', which was mentioned in Cases A, B, G, I, L and N. For the organisations that outsourced their EA development, one of the activities in the pre-development stage was to select the best EA consultant based on their budget and the consultant's reputation. So, in the pre-development stage, organisations usually did not have any problems with the EA consultants, since the consultant companies showed their bright side and made promises to win the tender. The EA consultant of Case G was inexperienced with amateur members. This situation faced the EA project with difficulties as it took *'much longer than expected'* to finish and *'almost failed'*.

According to the CIO of Case A, 'Lack of innovation in consultant's team' is another EA development obstacle. The interviewee mentioned that *'consultant team just wants to draw a diagram and to show that they have known and modelled processes'* without bringing any innovation to the job, which results in consultant being inflexible in their job. Further, the interviewee mentioned that sometimes EA consultants become inefficient in a way that *'instead of consulting they were taking orders and acted like our employees'*. EA development in this situation brought no innovation to the organization.

'Restricted rules in governmental organisations' was also repeated in both the development and post-development stages. The organisations faced rules imposed by the government that restricted their freedom in EA development, such as rule involving changes in organisational hierarchies and roles. In governmental organisations (Cases G and J), this obstacle was mentioned as being more influential. According to the Head of System Analysis and Design of Case G EA development in a governmental organization is more difficult than in private organizations because of 'restricted rules and laws in governmental organizations'. In governmental organizations *'there are managers, ministers, and president who impose rules and restrictions on the organization'*. Case J faced with a situation of laws contradicting with the EA results. As a result of EA they realized that sales management in one of their divisions should be removed. However, the laws of the county made this impossible.

4.3. Lack of communication and collaboration

'Lack of communication and collaboration' has both direct and indirect relationships with most of the other obstacles. This obstacle repeated in all three development stages in most of the interviewed cases. In the following, we will describe how the obstacle 'Lack of communication and collaboration' functioned on a case-by-case basis.

Case A's organization outsourced their EA development to an EA consulting company. The lack of communication was clear between the high-level management and the personnel, and the little communication that existed was characterised as formal. The personnel did not want to make a bad impression on the management because of the fear of losing their jobs. Consequently, they did not make their opinions clear to the management. This lack of communication caused personnel not to have enough knowledge about the ongoing projects in the organisation, and this probably resulted in resistance to change. Furthermore, the CIO of Case A mentioned that *'managers do not pay attention to EA when it is needed; they prefer to do their everyday routine tasks'*. The CIO pointed out that, when high-level managers did not show support for the EA project, the *'personnel's performance decreased and they lost motivation'*. It was also mentioned that, when developing the EA, the *'personnel should have reached a level of maturity and knowledge that they could collaborate with the EA consultant and could provide accurate and correct information about the processes'*. However, they were faced with the *'immaturity of the personnel'*, which caused delays in the data gathering and interview sessions, making these processes take *'longer than what was expected'*.

The CIO of Case A also mentioned that EA consultants sometimes did not collaborate efficiently as they were supposed to do. The CIO of Case A pointed out, *'Sometimes we contract with an EA consulting company, but in the middle of the work we see that, instead of consulting, they are taking orders and acting like our employees'*. It seemed that the EA consultant had an established structure and that they were only acting based on that. *'They have a framework and they just want to perform it and leave'*. The consultant's *'flexibility, agility, and innovation'*, which are determining factors in a successful EA project, did not exist. According to the CIO of Case A, *'the [EA consultant] must be innovative to efficiently integrate processes and create harmony and integration in architecture'*.

Case B's organization did not outsource the EA development project. However, they sometimes had an outside consultant for various tasks. One of their biggest challenges was *'ineffective use of human resources during EA development'*. As the CIO of Case B mentioned, they hired the wrong people for the new positions created as a part of the EA development and failed to produce results. We also noticed an issue with communication and collaboration, as the interviewee mentioned that the *'personnel do not need to know about the EA project; [...] they should only adopt EA in their job'*. However, this attitude did not succeed, as the personnel resisted changes and were unsatisfied with the EA results. The CIO of Case B believed that the root of the organisation's problem lay in their organisational structure, as they did not have *'an official central and powerful EA unit in [their] organisational structure that was responsible for business processes design and re-engineering and monitoring these tasks to check the performance and ensure the quality'*.

Case C's organization developed the EA internally without any consulting help. Having an old infrastructure, establishing communication between different information systems and departments was challenging in the beginning of the EA development project. The Project Manager of Case C mentioned that, because *'employees are attached to their desk, they think that if the processes improve they might lose their jobs'*. The Project Manager continued: *'If the personnel do not get enough knowledge about EA development and how EA will benefit them, they will resist adopting the EA and endanger the project'*. Furthermore, the interviewee mentioned that *'teamwork'* was an issue in his organisation and that the personnel did not communicate or collaborate effectively during EA development. Due to the lack of communication and collaboration in Case C, *'the outputs provided by the EA team were not usable for the system developer's team. [...] EA outputs were so abstract and not up to date that [they] had to interview the personnel again to get more details that bothered both personnel and managers'*.

Case D's organization outsourced their EA development. Similar to Case C, this organisation also faced the issue of old infrastructure in the beginning of the EA development. The IT Manager of Case D mentioned that, due to the lack of communication and collaboration, different divisions did not know about the processes that were happening in other divisions, and this caused problems in initiating a big project like EA development in which everyone in the organisation should be involved. Furthermore, the interviewee pointed out that the systems were not integrated and that the communication between systems sometimes had to be done manually, and the risks of data manipulation and cheating were high.

Case E's organization developed EA internally without consultants' help. Besides the unsupportiveness of the management, the personnel of Case E did not have enough EA knowledge, and the EA team and personnel could not communicate efficiently. When Case E started the EA project, they were *'assuming that the personnel of each unit*

was working with valid data, meaning that they knew where the data came from and exactly how they should process the data. But they were wrong, because most of the personnel had no idea about the origin of their data, which was caused by the lack of communication and collaboration between different units and personnel. Additionally, the constant change of management was another obstacle that was mentioned by the interviewee as being *terrifying* during the EA development project, *‘as managers with different strategies and priorities constantly came and went’*.

Case G’s organization outsourced their EA development to a consulting company. The Head of Systems Analysis and Design in Case G pointed out that the *‘academic background of the high-level managers is in social sciences’*; therefore, they did not have any knowledge of EA, IT or industry, and they could not understand the results or benefits of EA. The high-level managers did not have enough IT knowledge, and *‘convincing them of the usefulness of adopting EA’* for the organisation was difficult. Furthermore, the CIO of Case G mentioned that *‘it is crucial that the CIO is directly under the CEO in order to get more support, especially for the big projects like EA development’*. Afraid of losing their jobs, the personnel sometimes *‘jeopardised’* the EA development project by *‘hiding the truth or giving wrong information to the EA consultant’*. According to the Head of Business Process Development of Case G, the personnel did not always understand what the consultants were asking from them, and the answers they provided were sometimes unreliable or false. When errors were detected, sometimes *‘the whole thing had to be redone’*. Furthermore, the CIO of Case G mentioned that sometimes, because of lack of resources, EA development was considered to be a *‘luxury project’*, and the management lost interest in allocating a budget to continue the project.

The Head of Systems Analysis and Design of Case G also mentioned that, at first, the consultant had a professional team that knew what they were doing. However, *‘in the middle of the project, suddenly the EA consultant team changed to an inexperienced team; [...] collaboration and coordination became difficult, the project faced almost certain failure and the consultant company hardly managed to finish the project’*. Furthermore, the CIO of Case G mentioned that *‘our contract with the [consulting company] was to develop EA in 9 months, but it took one and half years [...] because [the consulting company] was not employing experienced persons to do the job’*.

Case J’s organization developed EA internally without getting help from EA consultants. The CIO of Case J believed that outsourcing had its *difficulties* and that it would have taken too much time for the consulting company to become familiar with their business. The CIO of Case J mentioned, *‘We know our organisation and this was our trump card’*. Although they knew their organisation and business, they did not have the necessary EA knowledge. They formed a group internally and studied EA development. The CIO of Case J also mentioned that their organization had the issue of constant change in high management due to the economic crisis. The CIO of Case J mentioned that new management usually meant new management principles: *‘Therefore, a change in management highly affects a project like EA that takes several years to develop in a large enterprise, and it needs constant updates and improvements’*.

As in Case G, the personnel of Case J also sometimes gave false information to the EA team because they were afraid of losing their jobs. Additionally, Case J recently merged with other organisations, and they still were not able to unify their organisation. Organizations involved in the merger were also acting competitively toward each other. This situation made the EA development harder as the merged organisations did not like to collaborate or communicate with each other.

Case K’s organization developed EA internally without any external consultancy. According to the CIO of Case K, *‘getting the CEO’s approval to start the EA development project was the biggest obstacle’*. As the CEO did not have any EA knowledge, he did not want to get involved or spend resources on the EA project. The CIO of Case K mentioned, *‘I remember that we were arguing for about 6 months with the CEO to convince him to do the EA; there was no other option, EA must be developed. [...] We had a lot of discussions with the CEO to assure him that we could not continue doing our routine work. If we wanted to reach to our goals, we needed his approval and support. That was our biggest obstacle’*. Because of the CEO’s lack of knowledge about EA, he was not eager to collaborate during the project or provide the required resources. Thus, the communication and collaboration between the mid-level managers and the CEO was not at a desirable level during EA development. Lack of personnel motivation was another issue during the EA development project, as the CIO of Case K mentioned: *‘Sometimes the employee is in a good spirits and the project progresses very well, but sometimes the employee is not motivated, and then even continuing the project seems difficult’* The results of the EA project included project proposals in order to reach the target

situation, and according to the CIO of Case K, they did not benefit from all of the EA results because they did not have enough knowledge or innovation to carry out the proposed projects.

Case L's organization outsourced their EA development to a consulting company. According to the IT Manager of Case L, they had a small IT team, and the IT department was weak. The team did not have much EA knowledge: *'they had heard about EA and now they wanted to have it without knowing what it was'*. In this situation, communication and collaboration between the organisation's personnel and the EA consultant team was difficult, as they could not understand each other. Furthermore, as the management of the organisation changed constantly during the EA development project, new managers were not supportive of the project.

Several problems hindered the communication between the EA consultant and the company in the middle of the project. According to the IT Manager of Case L, one of the problems was that *'the organisation couldn't pay [the consultant's] wages on time, and it affected the EA project. [...] The consultant's performance reduced'*. Furthermore, in the middle of the EA project, the company and the EA consultants were *'arguing about some issues that affected their communication, and the company did not like to cooperate with the EA consultant'*. Also, on the consultant's side, some people left the team, which practically halted the EA project.

Case M's organization developed EA internally without external consultants. Some of the IT personnel received EA education. According to the Head of Systems Analysis and Design of Case M, *'managers do not really know what EA is, they just say that they must have it, but in practice they do not support the project'*. Furthermore, Case M's management changed several times during EA development, and some of the managers were against developing EA because of their lack of knowledge about EA and also the budget. Case M did not develop all of the EA results because the management changed constantly and, sometimes, a project terminated in the middle because the new manager did not want the project to continue. The Head of Systems Analysis and Design of Case M mentioned that, for *'the survival of projects such as EA development, which involves the whole organisation and takes more time to finish, it is crucial to choose someone from inside of the organisation who knows about the business and background of the organisation as a manager'*.

The Head of Systems Analysis and Design of Case M also mentioned that, although the personnel of each unit knew what was going on in their units, they did not know *'the effect that a change would have on other units; [they] could not align [themselves] with each other'*. This was because of a lack of communication and collaboration between different units. In this situation, developing EA was a tough task as there was a lack of knowledge of the effects and interdependencies between the units.

4.4. Causes and effects of lack of communication and collaboration in EA development

In this section, we explain about the causes and effects of lack of communication and collaboration in EA development that presented in Figure 4. During selective coding we identified six additional items that hinder communication and collaboration in EA development.

The organizational culture turned out to be an issue that influence communication and collaboration in EA development. In Cases B and G personnel got used to old procedures and therefore they did not like to change their habits and they resisted to change and jeopardized the EA project by giving wrong information to the EA team. Moreover, different cultures in different departments and divisions caused communication and collaboration issues. For example the CIO of Case J mentioned that *'[...] the organizational culture in [division x] was very different from the culture of [division y]. During EA development different culture of divisions caused difficulties as personnel in [division y] did not believe in the positive changes that EA development brings [...]'*. Furthermore, the CIO of Case J mentioned that *division y* still resists to the changes that are happening as the result of EA development, *'[...] because EA has reduced their independency in decision making and they were not motivated at all to collaborate with us'*. The difference in organizational culture between divisions in Case J was obvious as *division y* was merged with the organization few years ago.

Case I started five years ago to develop EA with the help of an EA consultant from another country but due to several organizational and political reasons their collaboration failed and later they continued to develop EA internally. The CIO of Case I pointed out that *'[...] although our collaboration with the foreign EA consultant was unsuccessful but the positive point of this effort was that our organizational culture changed and the road to develop EA in future was facilitated as we succeeded at that time to reach to a common point between different units that we need EA to be developed'*. Case I's initial unsuccessful EA development attempt affected the organizational culture and triggered their motivation to continue EA development internally.

Being clear about the EA development process is one of the requirements of EA development that most organizations stated in the pre-development but gradually this clarity faded away in the development phase. For example, Case B started to develop EA without explaining to the personnel about what is EA and how it will affect their jobs and how they are going to develop it. Consequently Case B was not able to gain their personnel's trust which results in personnel dissatisfaction. Also in Case A we understood the issue of clarity during their EA development caused by EA consultant. The interviewee mentioned that *'sometimes it seemed that the EA consultant did not want us to know how they are progressing or what steps they are taking to develop EA [...] because they wanted us to be dependent on them in future [...]'*. In such a situation the personnel lost their trust and collaboration with the EA consultant became difficult.

Losing personnel's trust is one of the effects of lack of communication and collaboration in EA development. Clarity and trust are associated with each other. According to the CIO of Case K *'It is important to be clear about the steps that we are going to take during EA development and being able to explain it to the personnel so that personnel can accept changes easier. If personnel does not understand why he/she has to answer to the detail questions about his/her job, the employee will feel threatened and not collaborate well'*. Thus, Case K arranged several meetings and educational seminars to make sure that employees understand the positive effects of EA on their jobs and everyone has a common understanding of EA. Same thing also happened in Case J. They conducted several seminars, and meetings before starting EA development for their personnel to explain to them about EA development in their organization and gain their trust to facilitate their resistance to change. In Case G the personnel was worried about losing their jobs as they did not trust their managers who tried to ensure them about their job security. The personnel tried to jeopardize the EA development project by giving wrong information to the EA team. Furthermore, we also realized that when management shows its support towards EA development project it will influence the personnel's trust.

To remain competitive is one of the EA development goals. Before initiating EA development in Case J, the company studied how their competitors have developed EA and what were their results and how EA could benefit the organization. Through benchmarking and best practices they tried to imitate the big successful companies in the same industry. In Case A the issue of lack of innovation in EA consultant's team was an obstacle (explained in sections 4.2 and 4.3). Case L wanted to remain competitive and be among the best in their industry. They decided to develop EA to improve their business process, bring innovation to the organization and compete with their competitors. However, due to the constant change of management and lack of management support in Case L, people lost their motivation to collaborate with the project and consequently no innovation occurred in the organization and the organization lost its competitive edge as time passed.

Ineffective EA outputs also hinders the organization's competitiveness. For example in Case M the result of EA development was not effective for the organization because the documents produced by the EA team were not understandable by developers. This situation hindered the organization's competitiveness as they were not able to continually improve their business. For example, when a new integration project initiated in the organization, the integration team was not able to properly identify the project requirements. One of the reasons was that documents which were produced as part of the EA development outcome were not understandable and utilizable by the integration team. This situation caused the integration project to take more time than what was planned and increased the risk of customers' dissatisfaction.

The EA governance was endangered in Case B as their organizational structure had deficiencies. Case B did not have a central powerful EA unit defined in their organizational structure. There was no governance on their business process design and re-engineering to check and monitor their performance and quality. Similarly, in Case G there was no unit

defined in their organization that would have been responsible for EA governance and therefore EA was not effective in the organization. We understood that EA must be defined on the highest level of the organization management in order to be effective and successful.

4.5. Findings from organizational documents

Identifying ‘Lack of communication and collaboration’ as the core obstacle during EA development projects, we contacted the interviewees via email to seek more information. In this third round of data collection, we sent an email to the interviewees requesting their EA documents in order to look for new information about anything related to communication and collaboration. Out of 14 organisations from second round of data collection, five organisations (Cases A, G, I, K and L) answered, and we received nine documents (329 pages) regarding the EA development projects. Using the open coding technique (Strauss and Corbin 1998), we analysed the organisational documents, specifically looking for indications of communication and collaboration during EA development.

The documents showed that an architect plays a major role in EA development and maintenance. The organisations considered architects to be persons who should be able to predict an organisation’s needs, resources and priorities before anyone else. The documents also suggested that architects should coordinate between the business and the IT team. Thus, architects play a major role in establishing communication and providing coordination between the business and the IT team.

The documents suggested that one of the major goals of the EA in the organisations was to improve collaboration and communication. However, having communication and collaboration problems before starting EA development seemed to lead to several obstacles in the EA development process itself. The documents provided by Case A expressed this issue explicitly and showed that 35% of their problems were rooted in organisational and communication issues, such as resistance to change, deficiency in organisational structure, constant change in policies from upstream, lack of communication and collaboration between departments and lack of standardization in project plans.

4.6. Summary of findings

Table 3 summarizes the steps that we took in this study and the results that we obtained. In the first round we focused on the enterprise integration issues and asked some general questions about EA development in those organizations. We identified lack of communication and collaboration as a major issue in EA development. This finding led us to the next phase of data collection focusing on the obstacles in EA development based on three development stages.

In the second round we focused on EA obstacles in different EA development stages. We understood that the obstacles remain through EA development stages if they are not addressed properly in the initial stage of development. We followed the relationships between different obstacles and identified lack of communication and collaboration as the core obstacle that can explain most of the other obstacles. We revisited the data and investigated the causes and effects of lack of communication and collaboration in EA development. The research process and its findings are summarized in Table 3.

Table 3 Overview of research process and findings

Data analysis/collection	Focus of the study	Results
Data collection and analysis from first round of interviews	Focused more on enterprise integration issues and asked general questions about EA in the organizations	- Lack of collaboration as a major issue in EA development - The obstacles remain even after EA development
Data collection and analysis from second round of interviews	Focused on EA obstacles in different development stages to understand the reasons behind the inefficiency of architectural descriptions	- Identifying obstacles in different EA development stages - EA obstacles remain through EA development stages if they are not addressed properly in the initial stage of development - Understanding the relationships between EA obstacles - Determining lack of communication and collaboration as the core obstacle that can explain other obstacles

<ul style="list-style-type: none"> - Revisiting the data (first and second round of interviews) - Data collection and analysis from organizational documents 	<p>Focus on communication and collaboration during EA development</p>	<ul style="list-style-type: none"> - Revealing organizational culture and clarity in EA development process as additional causes of lack of communication and collaboration in EA development. - Revealing ‘personnel’s distrust’ and ‘organization loses its competitive edge’ as other effects of lack of communication and collaboration in EA development. - Improving communication and collaboration as one of the main goals of EA development - Enterprise architect has a significant role in enhancing communication and collaboration during EA development
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5. Discussion

This study contributes to the field of EA research and practice. Our work focused on the obstacles that practitioners experienced during EA development. Our contribution provides an empirical foundation for EA development obstacles and emphasises the importance of communication and collaboration. A lack of communication and collaboration may also explain other EA obstacles. Thus, organisations should solve their communication and collaboration issues before embarking on EA development initiatives. Lack of knowledge and support inside organization as well as issues imposed by external parties are three general obstacles that hinder communication and collaboration in EA development. Furthermore, organizational culture, personnel’s motivation, and clarity in EA development process are among several causes of lack of communication and collaboration. Personnel’s (dis)trust, endangered EA governance, lack of innovation, organization losing its competitive edge, ineffective EA outputs, and unable to set common goals and achieve a shared understanding are the effects of lack of communication and collaboration in an EA development project.

5.1. Relation to earlier research

Communication and collaboration have always been challenging in organisations. Yuhashi and Iijima (2010) define communication as ‘*the interactive processes employed by human beings in order to communicate their psychological content (including knowledge, emotions and will) between one another, using symbols such as body language, words, text, images, and so on, as mediational means*’. Collaboration can be defined as ‘*an activity that leads to an emergent result, which takes place alongside an act of communication within a group that has a mutually beneficial relationship*’ (Yuhashi and Iijima 2010). Collaboration is also referred to as lasting relationships and a strong commitment to a common goal (Kvan 2000). According to Yuhashi and Ijima (2009), communication precedes collaboration, or as Evans and Wolf (2005) mention, communication creates an organisation in which it is easy to produce collaboration.

It is believed that ‘*Communication calls organisation into being*’ (Bisel 2009a). According to Bisel (2009a), ‘*organisations are not fixed and stable but are rather called into being by interacting and sensemaking persons who attempts to coordinate their behaviours to accomplish goals*’, meaning that organisations function through members’ communication and sensemaking. Furthermore, empirical observations indicate that poor workplace talk causes inefficiencies, errors, and an inability to interact (Bisel 2009b). Among organisational communication scholars, the above explanations are called the communicative constitution of organisations (CCO) theory (Bisel 2009a) . This theory emphasizes the importance of communication in organisations.

Our findings share commonalities with the earlier findings (Armour and Kaisler 2001; Kaisler, Armour, and Valivullah 2005; Bricknall et al. 2006; Hjort-Madsen 2006; Kappelman and Zachman 2013) that highlighted the importance of communication and collaboration in EA development. Armour and Kaisler (2001) and Kaisler, Armour, and Valivullah (2005) mention communication networks as one of the main components that architects require in order to communicate with others and with systems, and failing to establish this communication is a challenge in an EA effort. Bricknall et al. (2006) also mention communication as an important and necessary component in EA implementation. A successful EA implementation requires constant communication and cooperation across different levels and functions in an organization (Hjort-Madsen 2006). The importance of communication is also emphasized by Kappelman and Zachman (2013), who concluded that ‘*the enterprises that survive and thrive in the next few*

generation will consist of people able to communicate efficiently and effectively in order to quickly achieve a shared vision[...]'.

The impact of cultural diversity on the effectiveness of EA has been studied by Faller and De Kinderen (2014). Their study indicated that communication defects are an important intermediary factor between an organisational subculture and the EA function's effectiveness. This complies with our finding that organizational culture is one of the causes of a lack of communication and collaboration in EA development. In their previous study, Niemietz, De Kinderen, and Constantinidis (2013) identified three levels of communication defects in EA-guided enterprise transformations: lack of communication, inappropriate communication and over-communication (Niemietz, De Kinderen, and Constantinidis 2013). Furthermore, a lack of EA effectiveness is partly because of the problematic interaction between architects and other stakeholders. Establishing shared understanding among diverse organisational communities during EA-driven enterprise transformation enables and supports collaborative efforts (Abraham, Aier, and Winter 2015; Bisel and Barge 2010; Nicolini, Mengis, and Swan 2012; Stensaker, Falkenberg, and Grønhaug 2008). Based on our findings, lack of common understanding among EA stakeholders can be associated with their trust and dissatisfaction in EA development, which are the effects of lack of communication and collaboration. According to Abraham et al. (2013), communication is a key success factor in coordinating collaborative efforts during EA-driven enterprise transformation.

Löhe and Legner (2014) studied EA implementation challenges to develop a design theory for overcoming the implementation challenges in EA. They identified a number of EA implementation challenges, including old and low-quality documents, low usage of existing EA artefacts, a lack of EA acceptance in the organisation and coordination problems. However, as they focused only on the information technology (IT)-driven EA perspective, their design theory may not be able address EA development challenges beyond the four challenges they identified. In another study about issues that organisations face while documenting EA, Roth et al. (2013) studied the key EA challenges that organisations face during EA development. Besides the 'bad quality of EA model data' as one of the key challenges, other challenges that they found comply with our list of obstacles. For instance, data collection, insufficient tool support and no management support have similarities with our findings.

Based on a literature review Lucke, Krell and Lechner (2010) studied the critical issues in enterprise architecting and created a list of EA challenges. Our findings can be considered an extension of this list. Similarly, we found insufficient management commitment, a lack of communication and collaboration, difficulty in establishing a common understanding, a lack of experienced architects, complexity, a rapidly changing environment, a lack of knowledge and insufficient tool support to be obstacles in EA development.

Jahani, Reza Seyyed Javadein and Abedi Jafari (2010) studied effective factors in evaluating EA readiness, and they included a list of EA obstacles that complies with our findings. They concluded that because EA is a continuous and permanent programme in organisations, it is crucial that organisations be aware of their weaknesses before embarking on EA. This aligns with our findings. We also posited that organisations should address their communication and collaboration issues before starting EA projects. Van der Raadt et al. (2010) studied the relationship between EA effectiveness and stakeholder satisfaction with a case study. Their findings align with ours, that active participation and communication between EA stakeholders is one of the main critical success factors for EA.

Based on empirical data and literature, Ylimäki (2008) proposed a list of critical factors for EA. She referred to communication as an important means of gaining commitment to an EA effort. This complies with our finding that management support and personnel's commitment and trust is a result of good communication and collaboration in the organisation. Similarly, Chuang and van Loggerenberg (2010) studied the challenges in enterprise architecting using qualitative data. They considered communication issues to be one of the biggest challenges. They further divided communication during EA development into internal communication and communication with stakeholders.

Our findings share commonalities with the findings of Nakakawa, Bommel and Proper (2010), who studied the challenges of involving stakeholders when creating EA. Considering collaboration to be a core thread in EA development, Nakakawa, Bommel and Proper (2010) studied factors that hinder effective collaboration. Time, organisation politics, a lack of communication, a lack of common understanding, a lack of architecture governance, a lack of the architect's knowledge, a constrained project budget and a lack of documentation are factors hindering

collaboration. Successful EA development requires planning, training and communication along with other elements, and training should be carried out not only during development but also in the EA initiatives (Bricknall et al. 2006). This aligns with our findings, which emphasised the importance of communication and collaboration and of training EA stakeholders before EA development begins.

In this paper, we have divided the EA development process into the three stages of pre-development, development and post-development. Based on our definitions of these three development stages the majority of earlier research on EA development obstacles focused only on the development stage of the process (Chuang and van Loggerenberg 2010; Hauder et al. 2013, 2013; Löhe and Legner 2014; Nakakawa, Bommel, and Proper 2010; Nikpay et al. 2013; Seppänen, Heikkilä, and Liimatainen 2009; Van der Raadt et al. 2010; Ylimäki 2008), along with a few studies on the pre-development stage (Jahani, Reza Seyyed Javadein, and Abedi Jafari 2010; Lucke, Krell, and Lechner 2010). In this study, we extended the body of knowledge by also identifying pre-development and post-development EA obstacles and increased the understanding of EA obstacles in the three stages of development.

Comparing our findings with the previous research in this area we understood that:

- (1) Organizational culture influences personnel's motivation in EA development.
- (2) Clarifying the EA development process to the personnel will result in their trust and collaboration.
- (3) Instability of the organization, which is caused by constant change of management and their lack of support causes the personnel to lose their motivation to collaborate with the EA project. Consequently, the organization faces with lack of innovation and loses its competitive edge.
- (4) EA must be defined on the highest level in the organization in order to be successful and effective.
- (5) It is crucial that organizations address their communication and collaboration issues before initiating EA development, because obstacles, such as lack of communication and collaboration will remain through all the development stages and constantly hinder the project.

5.2.Recommendations to improve communication and collaboration in EA development

This section provides recommendations for practitioners to improve communication and collaboration in EA development. The current way of communication and collaboration should be reconsidered before initiating an EA development project, since the major part of EA development is about communication and collaboration between different stakeholders. However, some of the obstacles, such as organizational culture or the issues that are caused by government cannot be easily addressed.

Be clear and precise about EA development process to increase personnel's trust. One of the reasons that employees resist to collaborate with the EA project is because they feel threatened and insecure about their job and the reassurances by managers are not sufficient. Lack of personnel's knowledge about EA is also a major reason for the resistance to collaborate. Employees may be told that EA will improve their job and they have to collaborate with the EA team. However, based on our findings things do not progress as expected. Sometimes personnel gave wrong information to the EA team intentionally because they were thinking that if they give all the information about their tasks and jobs they will lose their job. Improve personnel's knowledge in educational seminars and courses could add trust and reduce resistance. It is important that the EA team can clarify the EA development processes and steps, benefits, and effects for each employee before initiating EA. Each employee should understand the benefits that he/she will get from EA development and what are the challenges of not adopting EA.

Motivate personnel to communicate and collaborate in order to bring innovation to the EA development. Organisations should be able to motivate and encourage their personnel to become more cooperative with the project and EA consultants. According to Boster, Liu and Thomas (2000), motivation is a big part of an EA effort. Individuals and organisations will not adopt changes unless they are encouraged. A strong leader can increase personnel's motivation through communication and collaboration. Employees will become motivated to embrace an EA project when they see that their manager is supportive of and involved in it. Also, if personnel have enough knowledge about

the process of EA development and how EA can positively influence their jobs, they will become motivated to collaborate as part of the project as well.

EA must be placed on the highest level of the organization. To become successful in EA development, EA must be positioned on the highest level of organization. The decisions related to the EA should be directly come from the high-level management of the organization, with the full support of the management. EA should not be defined only as a part of IT or business departments. Issues related to the EA development should be discussed directly with the high-level management without any mediators.

EA team should consist of not only EA experts but also non-EA expert people from other departments. If EA is developed only by EA experts, it may be difficult to understand by the other people in the organization who are not experts in the models and documents produced by EA experts. For instance, in one of our cases after the EA expert team developed EA, the result was not very useful, because the IT people could not understand the documentation. It is not necessary to use a specific well-known methodology in EA development to be successful. It is important to use descriptions that are understandable by the majority of the organization. It could be useful to have at least one people from each department of the organization in the EA team.

5.3.Limitations

This study has limitations. One of the limitations is the limited number of individuals interviewed. The study would be more reliable if we had more cases. Another limitation is that the cases from the second and third rounds of data collection were selected from one country, and some of the mentioned obstacles may not apply to another country. Obstacles such as the government-related political issues and restricted rules in governmental organisations might not appear as obstacles in other countries' large organisations. Another limitation of this study is the limited number of gathered organizational documents. We got only nine EA-related documents from five out of 17 organizations. Therefore, we were not able to double-check the interviewees' statements with what had actually been documented during their EA development. The documents that we received from the five organizations (Cases A, G, I, K and L) revealed more information and increased our understanding about the process of EA development in those cases. For example, in Cases A, G and L that outsourced their EA development, the documents revealed how EA was developed from the EA consultant perspective.

Moreover, we investigated only large enterprises. Meanwhile, EA development obstacles in medium-sized or small organisations may not be the same, as these organisations are less complex. Furthermore, all of the interviewees were from the management levels of their organisations. Having other stakeholders' perspectives, such as those of EA consultants and personnel, could clarify and explain some issues. Therefore, the generalisation of these results should be made with caution.

6. Conclusions and future research

In this study, we identified EA development obstacles in 15 organisations. We investigated the obstacles that kept appearing in the different stages of EA development: pre-development, development and post-development. By looking at cause-effect relationships and dividing EA development into the three stages of pre-development, development and post-development, we further analysed the obstacles and their repetitions. We pointed out that lack of communication and collaboration is the core obstacle that could explain other obstacles. Lack of knowledge inside organization, lack of support inside organization and issues imposed by the external parties were identified as the general obstacles that can be both causes and effects to the lack of communication and collaboration. Further investigation of causes and effects of lack of communication and collaboration revealed organizational culture as an important issue in communication and collaboration during EA development. Organizational culture effects people's motivation to persuade them to communicate and collaborate actively. Clarity in the process of EA development will improve common understanding in the organization, which may consequently increase trust and satisfaction among employees and motivate them to communicate and collaborate better in EA development.

To reduce issues in EA development, organisations should at least address their existing communication and collaboration problems before starting EA development. An architect plays a major role in facilitating communication

and collaboration in an EA development project. We provided four recommendations to facilitate communication and collaboration in EA development. Being clear and precise about the EA development process will increase personnel's trust and satisfaction. Organizations should be able to motivate personnel to communicate and collaborate in order to bring innovation to the EA development. EA must be placed on the highest level of organization and the decisions related to the EA must be discussed and approved by the highest level of organization, meaning that EA should have the high management support and attention all the time. EA development team should consist of EA experts as well as non-EA experts across the departments of an organization.

Our findings partly converge with the existing literature but also increase the understanding of the obstacles that practitioners face in EA development. The recommendations made in this paper can help practitioners in facilitating communication and collaboration in EA development. The findings of this study not only contribute to the field of EA but also can be useful in the context of complex information systems projects in large enterprises. In turn, this study advances the theoretical and empirical understanding of EA development obstacles. This benefits both academia and industry by providing an accurate and pragmatic perspective on EA development.

In the future, we will expand the scope of this study to get other stakeholders' perspectives as well. We will specifically focus on communication and collaboration among the different stakeholder groups involved in EA development. Also, as enterprise integration is one of the most desired goals of EA development, it is important to study the role of integration in relation to EA development. Further research is required to provide a better answer to the question how to mitigate the effects of lack of communication and collaboration in EA development. Also the question of how to improve communication and collaboration in EA development deserves a further inquiry.

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Appendix I

Interview questions:

1st round of interviews (May and June 2014):

Can you tell us about your job?

1. What is your job position/title?

Integration questions

1. IT architecture: Can you briefly summarise the most important
 - a. internal and
 - b. external systems the Enterprise Resource Planning (ERP) system is integrated with?
2. Can you tell us about the key technologies and standards that are used in integration?
3. When developing the ERP system, how do you determine when to integrate the ERP system with another system?
4. Who states the requirements for integration (think about the roles of the business and IT departments of your organisation, the role of the vendor and the role of external consultants)?
5. Integration projects: Can you identify different types of integration projects—for example, when integrating the ERP system with
 - a. another internal system?
 - b. an external system?
6. Who are involved in integration projects (business, IT, vendor, consultants)? Can you tell us especially about the vendor's role?
7. Can you think of any common challenges that are always present in integration projects?
8. Let's say you realise that the ERP system has to be integrated with an external system of the supply chain. What kind of approach is used? How do things progress after the decision to integrate has been made?
9. How do you measure the success of an integration project?

EA questions

1. What is EA, in your opinion?
2. Who are involved in the creation/development of EA in your organisation? Do you have your own full-time architecture team?
3. Are you involved with EA in your work? How is EA related to your work?
4. Can you tell us about the history of EA development in your organisation? (From when did you realise the need for EA in your company, or has it always been there?)
5. What standard methodologies and frameworks do you use in EA development (such as The Open Group Architecture Framework [TOGAF], Zachman...)? (Regarding readymade practices, are they useful at all, and if not, why?)
 - a. Why did you choose to use this specific framework?
 - b. Have you customised the framework, or have you used it as it is?
6. What are the challenges you have faced during EA development? (EA is often considered a difficult thing; why do you think it is difficult to create and manage EA?)
7. Can you describe how EA is used or how it can be used in your organisation? In which situations is EA needed?
8. When you are making investments, is EA considered in the decision-making process (for example, when you think about the current Business-to-Business [B2B] project)?
9. Is your EA meeting your expectations? Does it match the needs of your company?
10. How about managing knowledge about EA? Is this knowledge always documented? How do you train people on EA?

Concluding questions

1. Can you name other persons whom we should interview based on the topics we have been discussing?
2. Can we interview you again next year?

2nd round of interviews (May to July 2015):

General questions

1. What is your current position?
2. How long have you been working at this company?
3. How many people are working at your company?
4. How many people are working in the IT department of your company?
5. Do you have a permanent IT team at your company, or do vendors from outside of the company meet your IT needs?
 - a. With which companies do you have contracts, and what do they do for you?

EA questions

1. What is EA, in your opinion?
2. Do you employ EA in your daily work? How?
3. Please tell us the story behind EA development at your company?
 - a. When did you realise your need for EA (reasons for developing EA)?
4. Who makes decision regarding EA at your organisation?
5. Have you provided any education for your personnel regarding EA?
 - a. In which development stage are you, and who has received training?

EA team

1. How many people are employed on the EA team at your organisation?
2. In general, what are the EA team's responsibilities at your organisation?
3. How does the EA team at your organisation take action on a project?
4. When does the EA team usually engage in projects at your organisation?

Pre-implementation stage

1. What actions did you take before starting your EA project? How did you make you organisation ready to adopt EA?
2. What were your primary goals for EA development?
3. What were the challenges you faced during this stage?

Development stage

1. How did you implement EA (insourcing or outsourcing)?
 - a. How did you choose your consultant?
 - b. How satisfied are you with your EA consultant?
 - c. How is the cooperation between your EA consultant and IT personnel? Is it satisfactory?
 - d. Do you have any problems with your EA consultant?
2. What standard methodologies and frameworks do you use in EA development (such as TOGAF, Zachman...)?
 - a. How did you choose to use this specific framework?
 - b. Have you customised the framework or used it as it is?
3. How long did it take to implement EA at your organisation?
4. Has the EA had any influence on your company's investments? How?

5. What are the challenges you faced during EA development?

EA results

1. What results have you gotten from EA development? What are the outcomes of this development?
2. How have these results been determined?
3. To what extent are you satisfied with the results obtained from the implementation of EA?
 - a. If you are not satisfied with the results of your EA, what are the reasons for this dissatisfaction?
4. In your opinion, what are the challenges in the results obtained from EA development?
5. How many of your initial goals were fulfilled?

Post-implementation stage

1. Does your organisation have any programme for reviewing and updating its EA?
 - a. Has it been performed yet?
 - b. How often does your organisation update its EA?
 - c. How important is the EA update? What challenges are faced in updating EA?
2. If you had the chance to redo the EA development at your organisation, what might you do differently, and why?
3. What were the challenges you faced after EA implementation?
 - a. What solutions did you adopt to eliminate these challenges?
4. How do you evaluate the EA's success and effects at your organisation?
5. In your opinion, what is the role of EA in enterprise integration?

Final questions

1. Is there anything else you would like to mention regarding this topic?
2. Can you name other persons whom we should interview based on the topics we have been discussing?
3. Can we interview you again in the future?

Appendix II

Identified obstacles and their relationships with one another.

Identified obstacle	Is Cause of	2way Causality	Is associated with	Is Part of	Contradicts with
Confusion in government	-Unclear organisational strategies		-Government-related political issues		
Government-related political issues			-Political changes in the country -Confusion in government		
Unclear organisational strategies					
Inexperienced EA consultants	-Setting too ambitious goals			-EA consultant-related issues	-Finishing the project on time
Outdated organisational statutes	-Unclear organisational strategies				
Political changes in the country	-Constant change of management		-Government-related political issues		

Restricted rules in governmental organisations			-Laws contradict with the EA results		
EA consultant's becoming inefficient				-EA consultant-related issues	
EA consultant's being inflexible				-EA consultant-related issues	
Lack of EA consultant innovation				-EA consultant-related issues	
EA consultant-related issues		-Lack of communication and collaboration			
Laws' contradicting the EA results			-Restricted rules in governmental organisations		
Organisational-structure deficiencies			-CIO is not directly managed by CEO		
Being function oriented instead of process oriented			-Old infrastructure		
Old infrastructure			-Being function oriented instead of process oriented		
Lack of change-management tools			-Lack of central and powerful EA unit		
Ineffective EA outputs					
Lack of knowledge among management	-Personnel resistance to change -Unable to set common goal and achieve shared understanding -Setting too ambitious goals				
Lack of management support	-Lack of motivation among personnel -Unable to set common goal and achieve shared understanding -Lack of budget		-Favouritism in hiring new and unqualified personnel		-EA's being a governance project -Finishing the project on time -Personnel's motivation
CIO is not directly managed by CEO			-Organisational-structure deficiencies		-Finishing the project on time
Setting too ambitious goals					
Unable to set common goal and achieve shared understanding					
Favouritism in hiring new and unqualified personnel			-Lack of management support		
Constant change of management	-Unable to set common goal and achieve shared understanding				-Finishing the project on time

Lack of budget			-Budget provision		
Lack of central and powerful EA unit			-Lack of change management tools -Organizational structure deficiencies		
Personnel resistance to change		-Lack of communication and collaboration			-Finishing the project on time
Lack of knowledge among personnel	-Unable to set common goal and achieve shared understanding -Personnel resistance to change	-Lack of communication and collaboration			-Finishing the project on time
Fluctuation in personnel's motivation			-Lack of motivation among personnel		-Finishing the project on time
Lack of communication and cooperation	-Lack of knowledge among management -Lack of management support -Ineffective EA outputs	-Personnel resistance to change -EA consultant–related issues -Lack of knowledge among personnel			
Hesitation in training personnel	-Lack of knowledge among personnel		-Forcing personnel to adopt EA		
Forcing personnel to adopt EA			-Hesitation in training personnel		
Lack of motivation among personnel	-Personnel resistance to change -Lack of communication and collaboration -Forcing personnel to adopt EA -Lack of knowledge among personnel		-Fluctuation in personnel's motivation		

Appendix III

Codes, categories, and their relationships created as the result of open coding and axial coding.

Category	Description	Example of codes	Relationships to other categories
EA::team	Individuals who are part of EA development team	- Highly knowledgeable persons - Advisors during integration project - Consists of IT and business people - Virtual EA team - Consists of people from different departments	- Carries out the EA development process - Maintains the EA
EA::goals	Includes the primary goal and expectations of the organizations from EA	- Cost reduction - Establishing a new department to manage the organizational processes - Putting all the enterprise entities in their right places	- Is determined by the organization - Is done in the pre-development stage

		<ul style="list-style-type: none"> - Forecasting the market needs - Finishing project on time - Gaining higher level of maturity - Having a detailed documentation about organizational processes - Improving business processes - To remain competitive among competitors - Improve communication - EA governance 	
EA::obstacle	Consists of different obstacles that observed during EA development that classified into pre-development, development, and post-development	<ul style="list-style-type: none"> - Change of management - Change resistance - Inadequate budget - Lack of monitoring equipment - Lack of cooperation - Consultant inflexibility - Inexperienced consultant - Lack of knowledge - Invalid data - Old infrastructure - Unrealistic goals - Lack of team work - Unclear organizational strategy - CIO is not directly managed by CEO - Personnel's training 	- Can have relationship with any of the codes and categories
EA::benefits	Includes benefits that organizations gained through EA development	<ul style="list-style-type: none"> - Filled the gap between CIO and CEO - Reduced redundancy - Reduced costs - Customers' satisfaction - Less error in managerial decisions - Increased agility - Improved business processes - Help in finding the right solutions - Improve organizational competitive advantage 	- Can have relationship with any of the codes and categories
EA::CriticalFactors	Factors or actions that is considered critical during EA development	<ul style="list-style-type: none"> - CEO directly track the development process - Being innovative - Being realistic - CEO has IT knowledge - Receiving consultancy from successful experienced people in EA development - Team work - Separating business IT and organizational IT - Regular updates of EA - Selecting motivated persons for EA team - High level management support - Previous experience on EA - Gaining personnel's trust 	- Can have relationship with any of the codes and categories
EA::development	The process of EA development from pre-development to post-development stage	<ul style="list-style-type: none"> - Pre-development: <ul style="list-style-type: none"> - Being clear about the development process - Development: <ul style="list-style-type: none"> - Organizational culture - Post-development: <ul style="list-style-type: none"> -EA updates 	- Aimed to develop EA and facilitate EI

EA::regrets	Things that practitioners might had done differently if they had the opportunity to go back in time	<ul style="list-style-type: none"> - More realistic goals - More strict on timetable - More experienced consultant - Pilot test before making contract with the consultant company - More accurate plans - More accurate data 	<ul style="list-style-type: none"> - Is determined by the EA team and managers - Is associated with EA obstacles
EA::consultants	The EA consulting company that provides consultancy or develops EA for the organization	<ul style="list-style-type: none"> - Outsourcing EA development - Getting consultant - Educating personnel - Communication and collaboration - Previous experience 	<ul style="list-style-type: none"> - Is associated with the EA project
EI::benefits	Consists of benefits that are gained through integration	<ul style="list-style-type: none"> - Reduce complexity - Reduce redundancy - Reduce costs - Improve communication 	<ul style="list-style-type: none"> - Can have relationship with any of the codes and categories
EI::obstacle	Consists of different obstacles that practitioners faced during an integration project	<ul style="list-style-type: none"> - Inexperienced consultant - Lack of budget - Lack of corporation - Systems incompatibility - Different interests of stakeholders - Wrong architecture - Lack of architectural descriptions - Change resistance - Change of management - Lack of knowledge - Lack of management support 	<ul style="list-style-type: none"> - Can have relationship with any of the codes and categories - Is associated with the
EI::CriticalFactors	Factors or actions that is considered critical during an integration project	<ul style="list-style-type: none"> - Accurate planning - Assigning enough budget - Testing before deploying - Experienced consultant - Enough knowledge - Manager's support and knowledge 	<ul style="list-style-type: none"> - Can have relationship with any of the codes and categories
EI::consultants	The consulting company that provides consultancy or solutions for integration projects	<ul style="list-style-type: none"> - Previous experience - Flexibility - Availability 	<ul style="list-style-type: none"> - Is associated with integration project - Is part of external parties
EI::goals	Includes the primary goal and expectations of the organizations from integration project	<ul style="list-style-type: none"> - Cost reduction - Customers' satisfaction - Facilitating business processes - Remain competitive - Improve collaboration 	<ul style="list-style-type: none"> - Is determined by the organization
EnterpriseSystems	Enterprise systems existing in organizations, such as ERP, CRM, sales, and logistics.	<ul style="list-style-type: none"> - Internal - External - Messaging 	<ul style="list-style-type: none"> - Is part of organization
ExternalParties	Partners, suppliers, customers, and other external parties of the organizations.	<ul style="list-style-type: none"> - Consultants - Customers - Agencies - Shareholders - Government - Suppliers - Vendors 	<ul style="list-style-type: none"> - Is associated with the organization

Appendix IV

Identified obstacles in EA development categorised based on cases and the development stages. Numbers in the table refer to the three development stages. 1: Pre-development, 2: Development and 3: Post-development.

Obstacle/Case	A	B	C	D	E	F	G	H	I	J	K	L	M	N
Government-related political issues	1 2 3					2 3	1 2 3		1 2 3	1 2 3		1 2 3	1 2 3	
Outdated organisational statutes	1													
Lack of knowledge among management	1 2 3	1 2 3			1 2 3	1 2 3	1 2 3				1 2		1 2 3	
Lack of management support	1 2 3				1 2 3	1 2 3	1 2 3				1	1 2 3	1 2 3	
Unable to set common goals and achieve a shared understanding	1		1					1			1	1	1	
Unclear organisational strategies	1													
Personnel resistance to change	1	2 3		1 2 3			1 2 3	1 2 3						1 2 3
Lack of knowledge among personnel	1 2	1 2 3			1 2 3		1 2 3			1 2	1	1 2 3	1 2	
Lack of communication and collaboration	1 2 3	1 2 3	1 2 3	1 2 3			1 2 3			1 2 3	1 2 3	1 2 3	1 2 3	
EA consultant-related issues	2 3						2 3		2 3			2 3		2 3
Organizational structure deficiencies	1 2 3	3			1		3							
Lack of motivation among personnel	2 3	2 3												
Inappropriate budget provision		2 3				2 3	2 3							
Lack of central and powerful EA unit		3					3							
Hesitation in training personnel		1												
Old infrastructure			1	1					1			1		1
Ineffective EA outputs			3								3		3	

Constant change of management			3		1 2 3	2 3	2 3			1 2 3	1 2 3	1 2 3	1 2 3	
Setting goals that are too ambitious						1						1	1	
Restricted rules in governmental organisations							2 3			2 3				

Appendix V

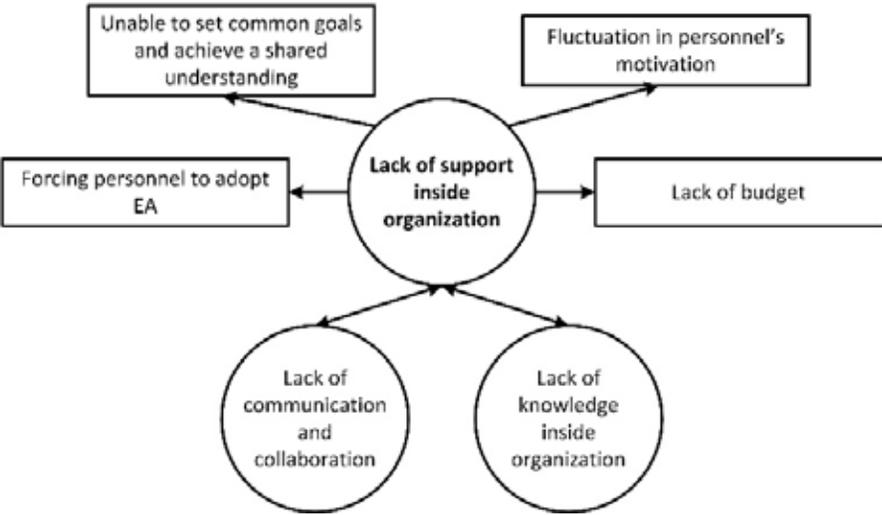


Fig V 1 Lack of support inside organization

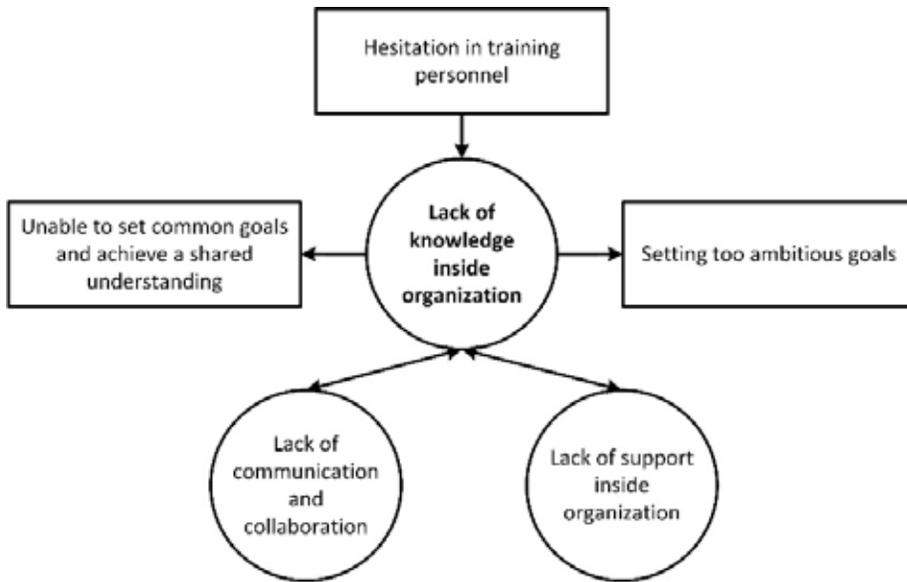


Fig V 2 Lack of knowledge inside organizations

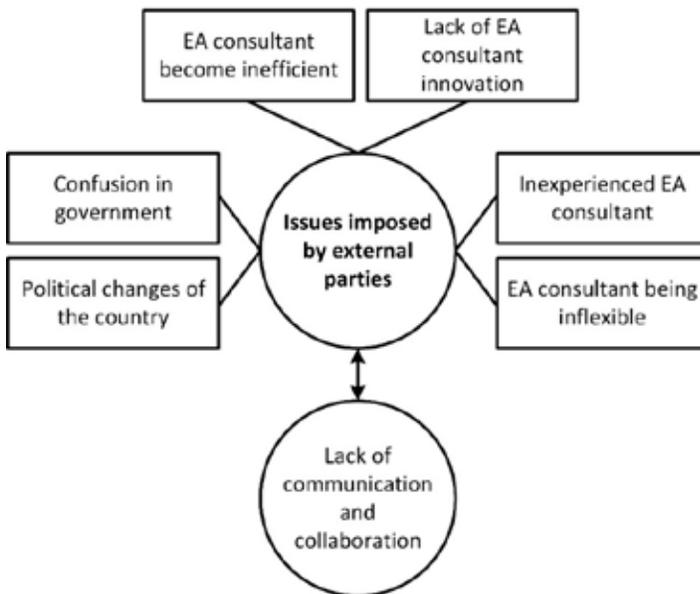


Fig V 3 Issues imposed by external parties

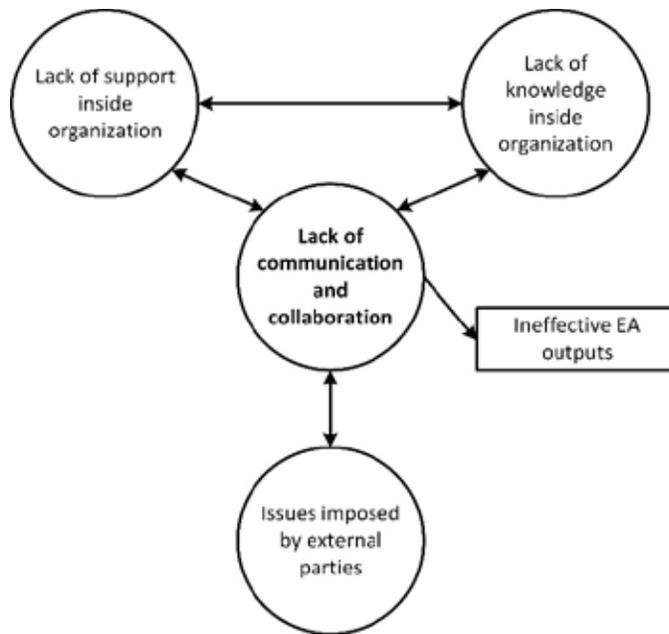


Fig V 4 Lack of communication and collaboration

Negin Banaeianjahromi is currently a PhD candidate at Lappeenranta University of Technology, Finland. She has a Master (2013) degree in Computer Science from Lappeenranta University of Technology. Her current research interests include social and organizational issues of Enterprise Architecture and Enterprise Integration development.

Kari Smolander is Professor of Software Engineering in Department of Computer Science, Aalto University and in School of Business and Management, Lappeenranta University of Technology, Finland. He has a PhD (2003) in Computer Science from Lappeenranta University of Technology and a Licentiate (1993) and Master (1988) degree from University of Jyväskylä, Finland. He has more than 140 refereed research papers in international journals and conferences. His current research interests include change in software and systems development practices and software development organizations.