Lost in Translation: Enterprise Architecture in e-Government Projects

Martin Lukáš*, Miloš Ulman**

*Czech University of Life Sciences Prague, Faculty of Economics and Management, Department of Information Technologies, Kamýcká 129, 165 00 Praha 6 - Suchdol, Czech Republic, lukas@pef.czu.cz
**Czech University of Life Sciences Prague, Faculty of Economics and Management, Department of Information Technologies, Kamýcká 129, 165 00 Praha 6 - Suchdol, Czech Republic, ulman@pef.czu.cz

Abstract: e-Government projects in public administration are inherently complex and prone to delays and failures. Enterprise architecture (EA) is increasingly used as a method of practice to tackle the organization complexity and offers a common communication platform between various EA stakeholders. However, the attempts to translate EA terminology to audience who uses English as the second language (ESL) often result in misunderstandings and ambiguity. We present preliminary results of a survey among various stakeholders, ESL speakers, who are using ArchiMate, an EA modeling language, in e-Government projects. We found that using an EA standard created in English speaking environment and then translated or mixed with original language version creates issues with understanding among ESL speakers. Although, the agreement on meaning and usage of elements at the pragmatic level was prevailing, experts disagreed more often on the elements use at the semantic level. We suggest selecting a minimum viable set of elements and examples of their use for EA projects in the given domain in order to reduce ambiguity.

1. Introduction

e-Government projects in public administration are inherently complex and prone to delays and failures. Many public agencies promote enterprise architecture (EA) as a method of managing organizational complexity (Hiekkanen et al., 2013; Lankhorst, 2017) and more efficient implementation of e-Government and ICT projects (Tamm, Seddon, Shanks, & Reynolds, 2011). Besides being a time-consuming exercise, the common pitfall of EA creation is bias owing to expert's subjective perception of the organization goals, strategy and operations (Perez-Castillo, Ruiz-Gonzalez, Genero, & Piattini, 2019). The problem is then multiplied by a lack of mutual understanding between subject matter experts and a number of other involved stakeholders namely

project portolio managers, and enterprise architects who are often hired as external consultants. The misunderstandings stem from a gap between perception and communication about real world objects (Gustas & Gustiené, 2004). Additionally, the threat of ambiguity and misunderstanding rapidly increases when the enterprise architects translate the EA terminology from English to another language in an attempt to convey the message to other stakeholders who use English as the second language (ESL). Surprisingly, this topic is underresearched in the literature.

The more complex the area for which the enterprise architecture should be developed, the bigger the gap, and also the bigger ambiguity of perception and interpretation of real word objects can grow. This is especially intensified in public administration with its complex, multifaceted and rule-based nature (Hiekkanen et al., 2013). The subject matter experts in public administration are mostly struggling with a lack of systematic and architecture approaches while portfolio project managers and enterprise architects lack deep knowledge of the public administration domain. A deficit of communication and collaboration then results in unwanted project and program delays and running off the scope and budget. We assume that the gaps in conception between experts working on large e-Government projects can be closed by using the visual and easy understandable elements. These elements might stimulate willingness, mutual cooperation and knowledge sharing among teams (Banaeianjahromi & Smolander, 2019).

The objective of our research is to focus on closing the gap in the way of thinking of subject matter experts and portfolio project managers as well as enterprise architects in the public sector. We use the ArchiMate modeling language to develop a high-level view of the enterprise architecture for the State Land Office of the Czech Republic. The purpose of the proposed enterprise architecture is to align e-Government initiative with the agency's efficient ICT operation and development. Based on the collected data we formulate following research questions:

- RQ 1: What is the common understanding of enterprise architecture between ESL experts in e-Government projects?
- RQ 2: How can the enterprise architecture elements assist with closing the gap in understanding between ESL experts in e-Government projects?

This paper presents an overview of literature on the enterprise architecture levels and its creation, and ArchiMate modeling language. Then we describe our research methods, present preliminary findings of the survey and the proposal of EA for the public agency. Finally, we discuss the implications of the findings and outline future research.

2. Literature Review

Enterprise architecture (EA) is a practice method for describing and managing an organization's structure, infrastructure and processes in order to reduce the complexity of doing so. Enterprise architecture core purpose is to describe altogether business, IT and evolution of an organization, i.e. essentials that are more stable than particular information systems or software (Lankhorst, 2017). The process of EA creation and management starts with description of the current state and future state, then development of a transition plan and its implementation (Kotusev, 2017). EA creation is realized at three levels: (1) the pragmatic level that concentrates on a strategic description of a long-

term intention or a vision of the enterprise (the "why"); (2) semantic level that describes static and dynamic structures of business processes across organization and technical system boundaries; and (3) syntactic level which defines implementation details needed for the data processing in a specific application or software component. (Abraham, Aier, & Winter, 2015; Gustas & Gustiené, 2004). Shared understanding of all stakeholders involved in the EA creation process is a precondition for success (Abraham et al., 2015).

The Open Group ArchiMate standard provides an independent modeling language that aids enterprise architecture (Open Group, 2019). ArchiMate provides graphical representation for all three EA creation levels formulated by Gustas & Gustiené (2004). The strategic aspects are covered in motivation and strategic layers, static and dynamic structures of business processes are included in the business layer, implementation details are part of the application and technology layers, while the transition from a current to future state is described by the implementation layer. The standard is supposed to model the enterprise architecture but also to serve as a communication tool between various EA stakeholders. Due to the subjective bias each stakeholder often comes up with his or her own interpretation of ArchiMate graphical elements (Perez-Castillo et al., 2019) which hinders the modeling effort (Chiprianov, Kermarrec, Rouvrais, & Simonin, 2014) and undermines the ArchiMate intended purpose. Therefore, the agreement between the experts on the definition of what each element means in a specific area of public administration, especially in order to deliver projects and programs in expected quality, is critically important (Brožek, Merunka, & Merunková, 2010).

3. Methodology

In order to indicate the level of EA elements understanding among ESL speakers we formed a convenient sample of subject matter experts, portfolio project managers and IT experts working on e-Government projects in the Czech Republic. We administered a survey via email including a short explanatory letter and then followed up over the phone. As this is an ongoing research, we further present only preliminary results drawn from **9** responses.

The instrument consisted of 19 questions divided in four sections: demographics, enterprise architecture practices, understanding of architecture elements, and their usage. We asked whether the expert and his organization use English or Czech or a combination of both when speaking about and using EA elements. The answers could inform about potential causes of ambiguity. In the section about the architecture elements, we presented two motivation layer elements (stakeholder, driver), three strategy level elements (course of action, capability), two business layer elements (business service, business role) and two implementation layer elements (work package and deliverable). This allowed us to learn about the perceived understanding of the elements. In the practical usage section, respondents answered how they use various elements in different scenarios within the public administration domain. This would allow us to compare the answers with the previous section and measure the gaps between perceived semantics and actual use.

In order to demonstrate how enterprise architecture elements can assist with closing the gap in understanding between various experts, we proposed a high-level enterprise architecture view for the State Land Office of the Czech Republic, a recently established Czech government agency. The

first author of this paper has been involved as a consultant in the agency EA development project. The enterprise architecture serves as a common communication framework for experts with the aim to support achieving both operational and developmental goals of the agency.

4. Results

The results presented in this section are preliminary as the survey is still ongoing. The respondent demographics is described in Table 1.

Table 1: Basic Demographics of the Sample (N=9), Source: Own Work

Industry	Freq.
Banking	1
Energy	2
Public administration	5
Automotive	1
Employees	
Less than 250	**2**
250-500	**1**
500-1500	**3**
More than 1500	**3**
Position	
Enterprise Architect	**3**
IT Architect	**3**
Project Portfolio Manager	**1**
Chief Ministerial Officer	**1**
Business Process Consultant	**1**

While being ESL speakers, more than 55 % of the respondents used combination of both Czech and English and 45 % used only Czech or English in the EA communication within the team. However, the communication with the client occurred in all three ways equally by one third. For each element, four possible answers were offered; and we measured the frequency of equal answers. The respondents in majority understood the elements meaning equally except for the Course of Action where answers altered between 'direction' (5), 'approach' (2) and 'procedure' (2) (Table 2).

While the respondents were quite confident in indicating the EA elements meaning, the answers about the practical usage of the elements were more diverse. The Resource and Goal elements usage

were presented as multiple-choice items, and the other three (Business Service, Business Role and Deliverable) were described as illustrative cases with options to agree or disagree. The most uniform answers were given to the Goal element which all respondents marked as 'goal' (9) but also as 'ambition' (4) or 'path' (1). The least uniformity recorded answers to the item Deliverable where only two respondents answered about the meaning and five agreed upon its use in a practical example. Business Service and Business Role were understood and used almost equally with the least discrepancies. On the contrary, the use of the Resource element was perceived as 'workers' (7), or 'machines or vehicles' (7), or 'energy' (4) (Table 2).

*Table 2: Understanding and Use of the EA Elements (N=9), Source: Own Work*

Layer / Element	Understanding (freq.)	Use (freq.)
Motivation		
Stakeholder	8	-
Driver	8	-
Goal	-	9
Strategic		
Capability	8	-
Course of Action	5	-
Resource	-	7
Business		
Business Service	8	7
Business Role	6	6
Implementation		
Work package	6	-
Deliverable	2	5

4.1.   A Case Study of the State Land Office of the Czech Republic

The State Land Office of the Czech Republic has been established by the Act on the State Land Office in 2013 in order to administer state property. The agency has replaced former land authorities and has been given competences to manage and transfer agricultural land, consolidate land, settle restitution and property claims, and privatize state property (SLO, 2019). The management of the Office decided to actively apply the enterprise architecture principles in order to fulfill the long-term e-Government initiative promoted by a nation-wide Strategy of Coordinated and Complex Digitization of the Czech Republic 2018+ (Ministry of Interior, 2018).

The objective of the agency is to improve efficiency of the ICT management both for meeting the operational and developmental objectives. This should be done by creating the enterprise architecture that would allow to continuously analyze the current state, identify and close the gaps by implementing projects. To meet the set objective, the agency launched the enterprise architecture initiative and invited consultants to create a high-level schema describing objectives, capabilities and ambitions (Figure 1). The first author of this paper created the schema of the agency EA initiative.

Figure 17: The State Land Office Enterprise Architecture Initiative, Source: Own Work.
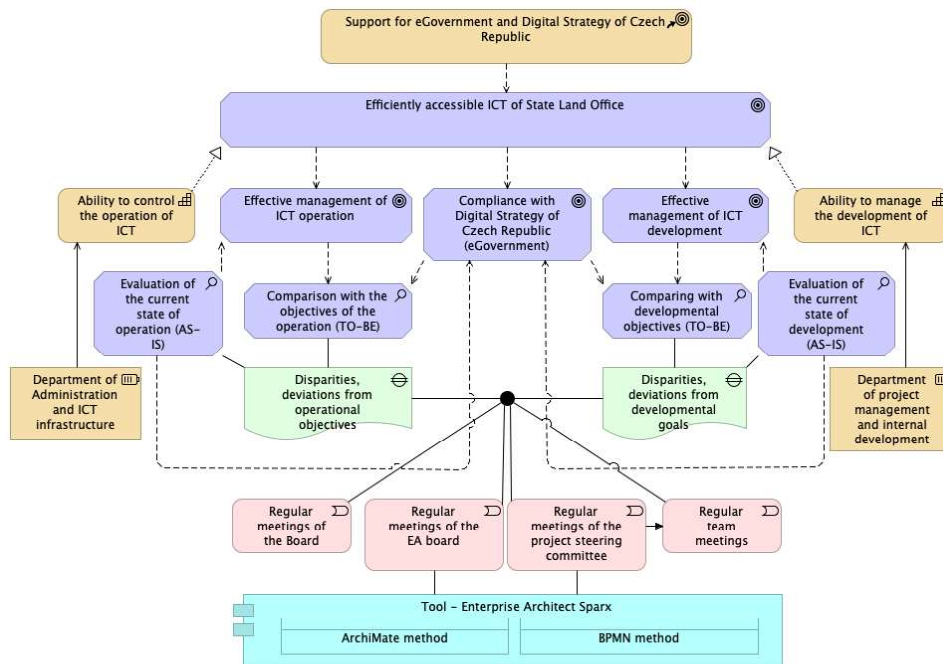
The State Land Office strategic goal is to support the ambitions of e-Government and the Digital Strategy of the Czech Republic and, at the same time, to make its own ICT efficient and accessible. This goal breaks down to a number of partial goals: effective management of ICT operation, effective management of ICT development, and compliance with the Digital Strategy of Czech Republic. Each of the partial goals are assessed from the current state and future state viewpoints. It means that a continual and repeatable evaluation of the current state of ICT operations at the Department of Administration and ICT infrastructure and development at the Department of project management and internal development must be ongoing in order to effectively innovate ICT operations and improve ICT developments. The gaps between the current and future state should be discussed, consulted and mitigated through meetings at all managerial levels, i.e. board meetings, EA board meetings, project steering committee meetings, team meetings and also subject matter expert meetings. SPARX is an enterprise architecture tool adopted by the agency. The enterprise architecture framework depicted on Figure 1 proposes a single enterprise architecture communication platform reflecting all strategic aspects and requirements enforced by the Digital Strategy of Czech Republic and also has potential to reduce the misunderstandings about the nation-wide e-Government goals as well as the ambiguity of perception of enterprise architecture elements.

5. Discussion

Although results of the survey are not yet conclusive, we can observe that the motivation and strategic layer that describe "the why" of an organization are less ambiguous than the business layers that represent the semantic aspect of the enterprise architecture. Particularly, the implementation layer seems to be challenging both for the meaning perception and the usage of the elements. The ambiguity of elements meaning across EA layers has been reported in a number of EA projects and initiatives particularly in the public sector (Banaeianjahromi & Smolander, 2019). One of the factors causing the ambiguity is the mixed usage of English and another language versions of EA standards in communication between EA and other experts, ESL speakers. Apart from the lost meaning due to translations, the misperceptions of elements may be a root cause of the mixed use of various elements which further hampers smooth and flawless communication (Gustas & Gustiené, 2004). Despite being non-conclusive and unfinished, our survey findings were similar.

We argue that although the holistic approach of the ArchiMate language was used in the proposed EA, the target audience perceived the ArchiMate elements and their graphical symbols differently which would result in further problems in the enterprise architecture management and consequent projects (Hiekkanen et al., 2013; Perez-Castillo et al., 2019). Each element might have at least more than one essential interpretation in the real world, while each person might use a particular element in a different context which adds to the ambiguity. By gathering more empirical evidence both from Czech and other language speakers, we would be able to prove or disapprove whether the EA elements can clearly contribute to less ambiguity, better communication and efficient ICT management in public organizations in ESL environments. Consistent with other research (Brožek et al., 2010), we argue that instead of assuming that ArchiMate is a language that allows to communicate the enterprise architecture in an unambiguous way, it should be rather used to unify the meanings of elements and their projections onto real world objects.

6. Conclusion

The views of the various stakeholders involved in enterprise architecture creation in public administration are different due to language barriers, diverse domain knowledge and EA experience. Therefore, EA modeling language such as ArchiMate is often used in contradiction to its original purpose to express, analyze and model structures that are important for an organization. This ambiguity can be mitigated by reducing the freedom of expression of the language and providing use cases of ArchiMate elements application in e-Government projects.

By completing the survey and result analysis, we shall be able to make several contributions. First, we found that using a standard created in English speaking environment impedes understanding among ESL audience. This is a practical implication for all stakeholders working on an EA project especially in public sector. Due to a small sample consisting of Czech speakers only the findings cannot be yet generalized to all ESL speakers. Second, as ArchiMate has become the most used EA modelling language with many types of elements it has also broadened the gap between their meaning and usage. This in practice will require to devise a minimum viable set of elements and examples of their use that could be used in the given domain for EA projects in order

to reduce ambiguity. As the research on ambiguity in EA projects due to language barriers is scarce, we aim to gather a large sample of EA professionals both from public and private sector and continue are investigation.

References

Abraham, R., Aier, S., & Winter, R. (2015). Crossing the Line: Overcoming Knowledge Boundaries in Enterprise Transformation. Business & Information Systems Engineering. Wiesbaden: Springer Fachmedien Wiesbaden. https://doi.org/10.1007/s12599-014-0361-1

Banaeianjahromi, N., & Smolander, K. (2019). Lack of Communication and Collaboration in Enterprise Architecture Development. Information Systems Frontiers, 21(4), 877–908. https://doi.org/10.1007/s10796-017-9779-6

Brožek, J., Merunka, V., & Merunková, I. (2010). Organization Modeling and Simulation Using BORM Approach BT - Enterprise and Organizational Modeling and Simulation. In J. Barjis (Ed.) (pp. 27–40). Berlin, Heidelberg: Springer Berlin Heidelberg.

Chiprianov, V., Kermarrec, Y., Rouvrais, S., & Simonin, J. (2014). Extending enterprise architecture modeling languages for domain specificity and collaboration: application to telecommunication service design. Software and Systems Modeling, 13(3), 963–974. https://doi.org/http://dx.doi.org/10.1007/s10270-012-0298-0

Gustas, R., & Gustiené, P. (2004). Towards the Enterprise Engineering Approach for Information System Modelling Across Organisational and Technical Boundaries. Enterprise Information Systems V. Dordrecht: Springer Netherlands. https://doi.org/10.1007/1-4020-2673-0_24

Hiekkanen, K., Korhonen, J. J., Collin, J., Patricio, E., Helenius, M., & Mykkänen, J. (2013). Architects' Perceptions on EA Use -- An Empirical Study. In 2013 IEEE 15th Conference on Business Informatics (pp. 292–297). https://doi.org/10.1109/CBI.2013.48

Kotusev, S. (2017). Conceptual model of enterprise architecture management. International Journal of Cooperative Information Systems, 26(03), 1–36. https://doi.org/10.1142/S0218843017300017

Lankhorst, M. (2017). Enterprise Architecture at Work: Modelling, Communication and Analysis (The Enterprise Engineering Series). (J. L. G. Dietz, E. Proper, & J. Tribolet, Eds.) (Fourth Edi). Berlin: Springer-Verlag GmbH Germany.

Ministry of Interior. (2018). Government Council for the Information Society. Retrieved March 20, 2020, from https://www.mvcr.cz/clanek/rada-vlady-pro-informacni-spolecnost.aspx?q=Y2hudW09Ng%3D%3D

Open Group. (2019). ArchiMate® 3.1 Specification: The Open Group Standard. Van Haren Publishing.

Perez-Castillo, R., Ruiz-Gonzalez, F., Genero, M., & Piattini, M. (2019). A systematic mapping study on enterprise architecture mining. Enterprise Information Systems. Taylor & Francis. https://doi.org/10.1080/17517575.2019.1590859

SLO. (2019). State Land Office. Retrieved March 20, 2020, from https://www.spucr.cz

Tamm, T., Seddon, P. B., Shanks, G., & Reynolds, P. (2011). How does enterprise architecture add value to organisations? Communications of the Association for Information Systems, 28(1), 10.

About the Authors

Martin Lukáš

Martin Lukáš, Ph.D. works as a Program Manager in several public agencies and energy sector organizations. As an Adjunct Professor, he is teaching Enterprise Architecture at the Faculty of Economics and Management, Czech University of Life Sciences Prague. His research focuses on information management in public administration, enterprise architecture and business processes.

Miloš Ulman

Miloš Ulman, Ph.D. works as an Assistant Professor at the Faculty of Economics and Management, Czech University of Life Sciences. His research topics are e-governance, information systems ethics, and big data in decision making.