

Driving the Adoption of Enterprise Architecture Inside Small Companies

Lessons Learnt from a Long Term Case Study

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Abstract: Including Enterprise Architecture (EA) as part of an organisation's processes is an important milestone in reaching higher maturity levels because it will drive the a long term alignment of IT and business dimensions. This paper explores some important questions related to the introduction of EA inside very small enterprises or entities (VSE), referring to the very common situation where the IT department has limited resources even possibly in a larger organisation. We provide a number of elements of answers on how EA can successfully be deployed in VSE based on a study of approaches already developed by others complemented by our extensive experience in helping such kind of companies to improve their IT practices and adopt EA. The paper is illustrated on a multi-year case study. It has also a special focus on the ISO29110 standard directed towards VSE and possible ways to evolve it to take EA into account in more advanced maturity profiles under preparation.

1 INTRODUCTION

Enterprise Architecture (EA) is a discipline aiming to proactively and holistically respond to disruptive forces encountered by enterprises. It relies on the identification and analysis of the execution of change toward the desired business vision and outcomes. (Gartner, 2013). According to (Lankhorst, 2005), it is a coherent whole of principles, methods, and models that are used in the design and realization of an enterprises organizational structure, business processes, information systems, and infrastructure.

Although the benefits and adoption in large companies is well established, the situation is quite different for smaller organisations due to the overall maturity level and the complexity involved in using the current EA approaches compared to the available manpower (Bhagwat and Sharma, 2007). Still, it is recognised that EA can bring several benefits in helping companies of smaller size such as more clearly defining a vision of their business architecture and competitive strategy, assessing how well their IT processes and infrastructure are supporting them, and easing the communication across management and operation (Buchalcevova, 2011)(Bernaert et al., 2013).

From an economic point of view it is important to address such a target because micro and small enterprises represent the vast majority of enterprises across the world. According to the latest figures published

by OECD (Organisation for Economic Co-operation and Development), in the Europe of 27, about 90 percent of the enterprises have less than 20 people. It is about 75 percent in the US (OECD, 2013). Larger organisation will also be impacted because they often heavily rely on products developed by small companies. Another point is that even large companies often include smaller entities which maybe in charge of specific project portfolio, possibly in a multinational context. In this paper we will use the term of Very Small Entity (VSE) which was coined by the ISO29110 standard and which refers to an enterprise, an organization, a department or a project having up to 25 people (ISO, 2011).

The purpose of this paper is to bring some practical elements of answers to some important important questions related to the best way to introduce and to foster the adoption of Enterprise Architecture inside VSE. Our approach is based on the validation of a number of suggested approaches, guidelines, patterns, and other kinds of practices reported by in the literature for this type of target. Our validation relies on consultancy work carried out with Belgian enterprises over the past years. More specifically we will take as running example the case of a Newborn and Child Care organisation. We will envision different dimensions like the WHAT (effectiveness of practices) and the WHOM (role, motivation, communication among people). Thanks to this long lasting

collaboration (more than 7 years), we are also able to take into account the progressive growth in maturity of the organisation and to report some interesting findings about WHEN it is interesting to consider the introduction of new practices, especially combining the Enterprise Architecture with a Software Process Improvement (SPI).

Our main observations are formulated under the form of some lessons learnt that have a double purpose: (1) help people engaged in the same process with or within VSE and (2) provide useful guidelines that can further drive the elaboration of more structured recommendations or even standards. Especially, we carried out our work with the ISO29110 standard as reference framework for VSE from the start (even before it was adopted).

The remainder of this paper is structured as follows: Section 2 reviews relevant literature work about the current use of EA among VSE. Section 3 details our case study. Section 4 draws the main lessons learnt from our case and puts them in the light of the previous literature work. Finally section 5 draws some conclusions and presents some perspectives.

2 SURVEY ON EA ADOPTION WITHIN VSE

This survey is structured based on the key following questions:

- what are the key requirements for a successful EA adoption by VSE?
- among the large number of framework, are there some that are better suited for their use by VSE?
- how to assess the current maturity level with respect to EA?

2.1 EA Adoption Success Factor

An extensive survey performed by (Bernaert et al., 2013) highlighted the following limitation factors and how to address them:

- day-to-day view: enable SMEs to work in a time efficient manner on strategic issues
- limited IT knowledge and technical skills: keep the approach simple
- lack of resource: do not require assistance of expert
- lack of knowledge management: enable sharing of descriptions

- lack of management commitment: get CEO involved in the approach

The author also defines 3 actions leading to enhanced adoption based on the Technology Adoption Model (TAM) from (Davis, 1989):

- Increase the Perceived Usefulness: it is related to performance/productivity/effectiveness aspect. Practical implementation should be provided (like case studies, tutorials, ...) as well as feedback to help developing EA techniques that bring more advantages for SMEs
- Increase the Perceived Ease of Use: it is related to the ease to learn/control/understand/interact/use. Techniques to lower time spent to carry out EA tasks should be sought after (like templates, efficient tools,...).
- From Actual to Perceived Efficacy: based on implementation, feedback is used to adapt EA implementation and successful practices are spread across the organisation.

2.2 Best Framework for SME

Numerous EA frameworks and methods are available on the market. Among those, the TOGAF Standard is the most frequently used framework in general. According to (Cameron and Mcmillan, 2013), it stands at 82.2% followed by Zachman (52.7%), Gartner (26%), FEAF (21.2%), and DoDAF (16.4%). However the major trend (54 %) is to use an hybrid framework as no single framework can address all the needs of a particular organization.

About the fitness for use by SME, there is a lack of literature on this topic also reported by (Alm and WiBotzki, 2013). The leading method TOGAF (The Open Group, 2009) has also a number of positive characteristics for the adoption for SME: the full material is freely available through the Open Group, it has a simple metamodel, good semantics with 4 levels of abstraction (Business, Application, Data, and Technology). It also comes with a methodology called ADM (Architecture Development Model). The drawback is that it can be quite complex and time consuming to use. However a recent survey reported in (Alm and WiBotzki, 2013) showed that SME are increasingly willing to pay such a cost given the payback in a increasingly dynamic and competitive business environment. This cost can also be kept under control by weighting some phase. However it is not advised to completely omit some phases.

2.3 EA Maturity Assessment

A number of assessment methods are available to help in assess a the maturity level of a company in applying EA. A simple and easy framework is the Cornwell Dashboard (Bailey, 2007). It is based on a Zachmann dashboard (Zachman, 2003) which categorises models in terms of their audience (business, system,...) against EA dimensions (data, functions, people,...) Each aspect can then be ranked in that matrix.

A number of available assessment frameworks are inspired of the 5 CMMI levels: (1) not defined/informal/ad hoc, (2) repeatable, (3) defined, (4) managed and (5) optimised. Some examples are the TOGAF maturity framework(The Open Group, 2009) and the NASCIO EA Maturity Model(NASCIO, 2003). Such frameworks give progressive objectives for each level and to get to the next level. However, like CMMI, they might be overkill for VSE.

Finally let us also mention the ISO29110 standard addressing the "Systems and Software Life Cycle Profiles and Guidelines for Very Small Entities" (ISO, 2011) which is freely available. As opposed to CMMI, it takes a progressive approach based on a set of profiles that range from an entry profile to the most advanced profile. The entry profile consists of the simplest set of development practices, covering software implementation and project management activities. This is followed by the basic, intermediate and advance profiles that progressively cover a growing set of activities that can handle more complex situations involving a larger range of risks. The standard also includes dedicated guidelines for VSEs that are complemented by deployment packages to ease their adoption. Specific aspects should be covered by the intermediate profile (e.g. portfolio management) and the advanced profile (e.g. IT strategy definition). ISO29110 provides a very good assessment potential coming with practical recommendations which ease a Software Improvement Process. Such an approach was pointed as a very good ground to introduce Enterprise Architecture (Buchalcevova, 2011).

3 CASE STUDY: A BELGIAN NEWBORN AND CHILD CARE ORGANISATION

This section highlights some relevant aspects of the case study performed from 2007 to 2014 in a Belgian NewBorn and Child Care Organisation (ONE, 1919). We first present some background information about the organisation and the challenges it had to face dur-

ing those years before detailing the major steps in introducing enterprise architecture practices. Note that figures and some text presented in this section is borrowed from the organisation website and enterprise repository with the permission of the CIO and with some adaptations (translation and project renaming).

3.1 Background on the Organisation

ONE is a public institution that develops birth and childhood policies. Its main missions (unchanged since its creation in 1919) can be summarised as follow:

- to support children's development within their family and social environment; to advise and support pregnant women, parents and families medically and socially in order to ensure the global wellbeing of their children. Most services offered by ONE are free.
- to organise (that is, to control and sometimes to finance) day care centres for children outside of the home environment. ONE's role is to ensure that these structures operate correctly and provide quality care for children.

ONE is organised in three layers ensuring both a complete geographical coverage with a close level of proximity with families and a good management structure:

- a central management located in Brussels grouping all the strategic (top management) and support function (finance, IT, training)
- decentralised operational management located in 6 "subregions" which coordinate the day-to-day field work, they rely on two key roles: administrative referent and team coordinators (about 30).
- field teams (about 80) composed of nurses (about 850) working together with hired doctors (about 1000). Each team is in charge of a small geographic location (e.g. a small city, a district of a bigger city)

ONE IT department can be considered as a VSE inside a bigger organisation: it is composed of 15 people. It is mostly relying on the externalisation of the development work through analysts (3) and projects managers (3). The other major activity is to ensure the good operation of the whole IT infrastructure: servers, clients stations and all deployed applications both on server and client sides. This is ensured by support and exploitation managers (6) and only one internal developer. The whole department is coordinated by the CIO and the IT architect.

3.2 IT Challenges and Move to EA

From 2005, the IT department was faced with the renewal of a number of aging applications and the need for larger IT support both in terms of number of processes to support. More recently the need for deeper IT penetration also emerged (i.e. down to the third layer of Figure ?? using mobile systems). Those challenges resulted in a series of large IT projects which required to improve not only IT project development practices but also stressed the need for Enterprise Architecture. Table 1 summarises the main steps taken.

Table 1: Retrospective time line.

Year	Project	Improvement
2008	School care	Systematic project follow-up
2009	Subsidies Management	Preliminary process modelling (MagicDraw)
2010	GPS	Process cartography with guidelines, ARIS Repository
2011	Renewal of subsidies management	Modelling of subsidies processes and infrastructure
2012	IT for coordinator/nurses	Modelling of field processes and infrastructure
2013	Mobility hardware	Unified analysis process and alignment with EA process

The path followed combined both Software Process Improvement (SPI) and Enterprise Architecture (EA) by people having regular meetings together. This team was not only composed of IT experts but also from trained people acting as relay inside specific department of the organisation. A key role is also the internal auditor which has an in dept knowledge of the processes (how well they are defined, they perform, who master them,...). The GPS is a large effort to gather the organisation structure, processes, IT applications and underlying IT infrastructure. This work was made clearly visible on the intranet with a statement of the goals and a FAQ.

In the rest of this section we detail main achievement making the connection between SPI and EA.

3.3 Document Templates and Models

A key step was the definition of high quality standard template for the requirements engineering phase and especially for capturing the as-is and to-be business processes. The modelling was supported by the ARIS platform (SoftwareAG, 1992). Business processes were modelled using Event Process Chains (EPC) ensuring a good way to decompose the processes. They also ensured a good level of completeness and consistency. Some automatic generation could be used. However it was not practical enough to be generalised

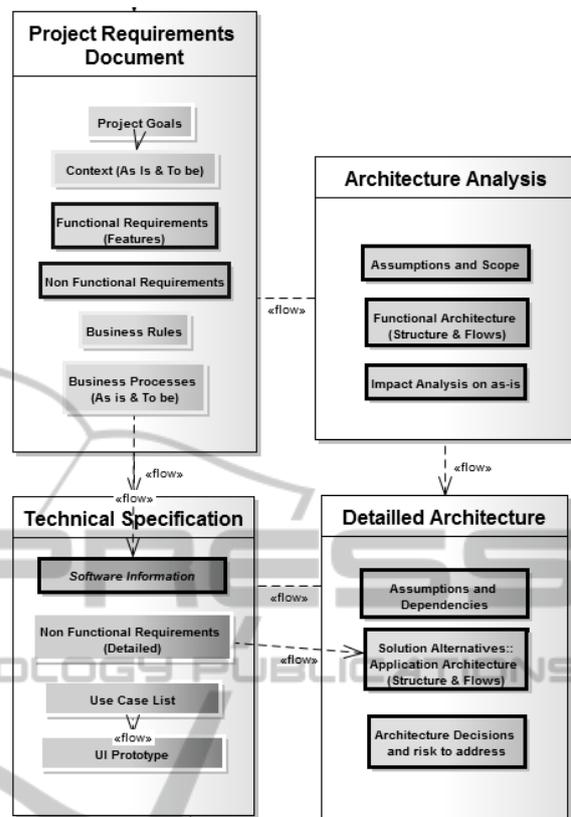


Figure 1: Document Templates and Guidelines.

so it required additional work to integrate diagrams inside a specification document. Figure 1 illustrates the relation between models and templates across the whole analysis phase.

3.4 Enterprise Architecture Framework

The starting point for introducing an enterprise framework was closely related with the selection of supporting tool: the ARIS toolset (SoftwareAG, 1992). ARIS come with a methodology depicted as a house composed of organisation, data, control and function elements which can be used in compliance with TOGAF. As the tool was far too rich, only a subset of diagrams were selected together with guidelines on how to use them. The TOGAF Architecture Description Method (ADM) was not used systematically. However most phases were covered, especially with a strong emphasis on the requirements as described before. Business, Information System and Technical Architecture were also detailed in dedicated parts of the repository. Migration, governance and change management were only addressed in document form and not captured in the tool repository. Figure 2 shows how the defined enterprise framework is aligned with

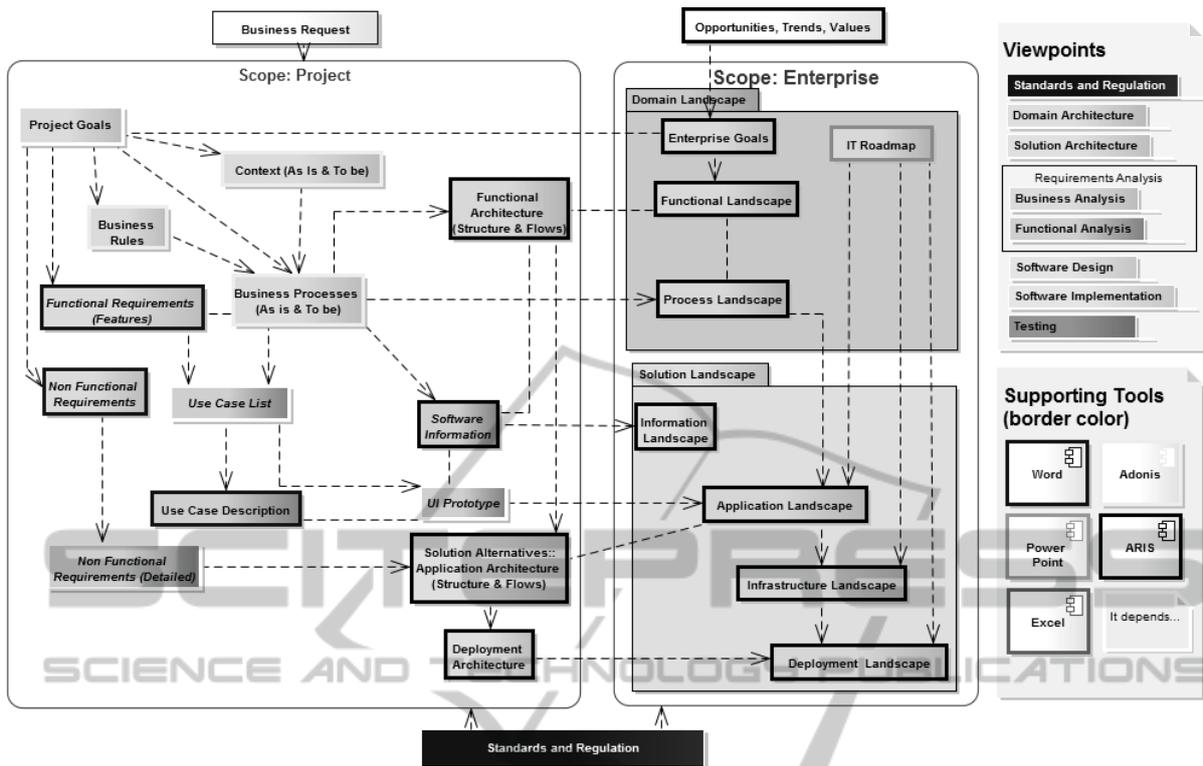


Figure 2: Project and EA Alignment.

the models defined at project level.

4 LESSONS LEARNT

Based on our experience we can formulate some interesting lessons learnt in relation with the topics discussed in Section 2.

About Adoption Factors - Efficiency. Having templates and guidelines defined and shared by the whole team is a key factor. It is important to ensure all people adhere to the agreed conventions and avoid using some "advanced" features that will not be understood by other reader. As the model repository becomes the reference source of information, it is important to keep it up to date and try to generate as much documentation as possible from the repository and minimise the extra work required to produce textual document. In order to be efficient as-is and to-be processes can be modelled together with specific convention to highlight the delta when the structure was not altered.

About Adoption Factors - Ease of Use. The methodology should definitely be kept simple. The toolset used should also have a good interface. In our experience, it was not always easy to control the layout in diagrams which generated some frustration and slowed down the learning curve for some analysts.

About Adoption Factors - Perceived Efficacy. It is important to make (partly) validated work visible not only to the team but to the whole organisation. All feedback should be welcome and people giving good feedback are good candidate for playing some role in the enterprise architecture. A good place to start is an enterprise intranet but the best place is a knowledge management platform (such as a forge, sharepoint) which is more easy to keep alive and also offer feedback channels. The information present is also very interesting for new people joining the organisation and a specific entry point should be dedicated to them.

About the Architecture Framework. Compliance with a standard framework is not a goal for VSE. Standards should only be used as check list to ensure no important aspect is missed. The goal is to produce an adapted/hybrid approach that covers the company needs and is both efficient and easy to use. The framework should be updated from time to time typically after some key milestone (large project, new strategic direction,...).

About Combining SPI and EA. It is definitely a good way to proceed: it is better to start by ensuring consistent analysis development processes across projects on which a clear enterprise vision can then be build. Building on project managed in various way

would not only be inefficient to gather the information but also to have a common communication basis. It is however not necessary to wait for the whole SPI to have taken place before starting enterprise modelling. Once the use of some artifacts have been standardised inside the organisation, the information it captures can be passed to the EA. The deployment can thus proceed from analysis, to design, tests, etc.

5 CONCLUSIONS

In this paper, we have addressed some questions related to the introduction of Enterprise Architecture by Very Small Entities. Preliminary answers from the literature were faced with our practical experience in a multi-year case study covering the introduction of EA in an organisation undergoing important changes.

Based on this we could draw a number of lessons learnt highlighting interesting adoptions practices. Among the interesting adoption factor identified, the adopted way to progressively introduce TOGAF concepts and steps incrementally in the course of successive projects could limit the overhead for the organisation and enable a progressive growth in maturity. It is also worth stressing the good complementarity between Software Process Improvement and Enterprise Architecture. Taking this path further, it is very relevant to take into account progressive Enterprise Architecture practices as part of the intermediate and advanced profile of the ISO29110 profile under preparation.

We are currently working on consolidating the identified practices and structuring them in the spirit of the emerging intermediate and advanced profiles of the ISO29110. Two other validation case studies are also ongoing respectively in the banking and clinical sectors. We also plan to report about our work to the ISO WG24 in order to guide the elaboration of those new profiles.

We also believe this work is worth being shared with the EA community given the currently limited available work reporting on this topic and the increasing incentive for VSE to adopt Enterprise Architecture practices.

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