

Engineering an enterprise: Practical issues of two case studies from the Luxembourgish beverage and tobacco industry

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Abstract. This study is a contribution to the discussion of practical issues in engineering enterprises that do not embrace classical enterprise architecture frameworks. It analyses two case studies within the beverage and tobacco industry in Luxembourg. The research settings provided an interesting context in an industry sector with high compliance regulations. In those case settings, no classical enterprise architecture framework was applied, so that the companies followed a rather pragmatic approach to cope with challenges. The research adopts an interpretive case study approach and explores qualitative data of work perspectives from higher along with lower hierarchy levels of IT and business people. The paper identifies three main motifs of practitioners that drive the engineering of their enterprise: standardization, financial aspects and organizational culture. The findings of this research suggest that contemporary EA frameworks are too rigid to be applied or appropriately tailored in some business environments. This paper suggests, that break from routine and training in EA frameworks should provoke more sophisticated approaches by the practitioners during enterprise engineering, but reflexive actions may substitute EA frameworks to some extent.

Keywords: enterprise engineering, enterprise architecture

1 Introduction

Engineering enterprises involves the purposeful design of an entire organization that is a socio-technical artifact. This enterprise wide perspective becomes in a turbulent environment increasingly important, hence modern enterprises can be regarded as dynamic and vibrant systems that have to continuously adapt to a changing situation (e.g. [1]). Those changes usually affect several aspects within one enterprise, so that the adaption process may nurture conflicting goals. Organizations with the capability to respond quickly enough to the changing environment achieve competitive advantage. This capability involves the restructuring of fundamental processes and approaches in order to answer to various challenges. The discipline of Enterprise Engineering (EE) is an emerging discipline and it describes an engineering based approach to design or transform enterprises. EE is providing guidance in

practice and matured from various research foci such as enterprise application integration [2] or alignment of business strategy and information systems and technology [3].

Authors have devoted considerable emphasis to the rise of methodological literature in the field of EE, which included different drivers for their approaches. From the organization perspective this involve internal drivers [4] such as business-IT alignment, cost reduction, standardization, and management / governance. External drivers [4] include various compliance regulations such as Clinger-Cohan Act, Sarbanes-Oxley Act, and Basel II [5,6]. However, to the best of our knowledge, a review about the drivers that is motivating the practitioners to engineer their enterprise is not available for organizations, which apply no classical enterprise architecture (EA) framework. A classical EA framework (such as TOGAF [10]) is a holistic and structured approach, which helps practitioners to govern and administer the architecture of an enterprise.

Particularly with regard to what motifs practitioners that engineer their enterprise have is relatively difficult to find in the literature. However, this would be interesting, because EE approaches could be designed accordingly. This paper presents in the following section (section 2) a brief overview about the drivers for using EE and prescriptive approaches of EE. This research is designed to identify what happens in practice concerning engineering enterprises in organizations without a classical EA framework. A classical EA framework can be part of engineering an enterprise, whereas it is not a necessity for EE. So, the enterprise is engineered also without the use of a classical EA framework. In particular, descriptions of real stories and detailed analysis may help practitioners to improve their activities in the field of enterprise engineering. In addition, as we will show in section 2, there is a lack of insight of real stories in the field of EE, which do not apply classical EA frameworks. Descriptions of what are driving them to engineer their enterprise and the way they do it would be helpful, because this improves our understanding of the “muddy” aspects of engineering enterprises. As such, this research tries to provide rich descriptions of engineering enterprises without a classical EA framework and to answer following research questions:

- What are driving motifs for practitioners to engineer their enterprise, which do not apply a classical EA framework?
- What is the difference between engineering enterprises without and with a classical EA framework?
- What are the potential practical and theoretical implications of the findings?

This in-depth research includes two case studies from the field of beverage and tobacco industry in Luxembourg. This field is of high interest to study enterprise engineering, because it involves great need for regulatory compliance with various standards (e.g. national and international beverage and tobacco laws). So, answering the research questions may involve a distinctive view to an industry field that includes those needs. Moreover, an investigation about what is happening in practice requires the collection of qualitative data, which requires an appropriate analysis approach.

This article is structured as follows. In the next section we present our literature review, and the third section outlines our research approach. The fourth and fifth sections present our case descriptions and analysis. This paper concludes with a discussion and implications of our findings for engineering enterprises in practice.

2 Literature study

The purpose of this research is to obtain a theoretical interpretation from empirical data [7]; we also draw on available literature to develop our theoretical interpretation. We considered two streams as most helpful to gain insight to answer our research questions. One stream involves the drivers for practicing EE, which includes internal and external drivers that drive the establishment and improvement of EA (e.g. [4,8]). The other stream is a brief overview of the classical EA framework literature (e.g. [9,10]). In addition to those two streams we draw on work from social sciences, more in particular Giddens' work [11]. Insight from the social sciences may enrich the discussion and implications, since enterprises are inherently social constructs.

2.1 Drivers for applying EA frameworks

In previous literature studies there is a growing understanding that organizations have common reasons why they seek to gain advantages from EA approaches [4]. The motivations can be differentiated into internal and external drivers [4]. Internal motives involve:

- Business – IT alignment [12-15],
- cost reduction [16,17,15],
- standardization [18,15],
- governance [14,15],
- agility [1,12] and
- others like risk management [19-21].

Business – IT alignment is a continuous concern for information systems executives and according to Schönherr's [4] literature analysis an intensive object of EA research by academic and pragmatic sources. Cost reduction is another main object of EA research [4] and involves financial efficiency and business effectiveness [17]. Standardization is another important factor why organizations try to apply EA approaches to increase for example maintainability, reliability and security of processes and/or technology [15]. Governance mechanisms through e.g. technology and/or processes establish and monitor EA approaches [15]. Agility of organizations is another reason why EA approaches get applied in order to increase speed and flexibility that is required in turbulent environments [1]. Since modern enterprises have a growing dependence on IT, a frequent motive in EA literature is its focus on e.g. technology-related risks [20]. In addition to those internal motives, Schönherr [4] cites several external motives that include various compliance regulations such as Clinger-Cohan Act, Sarbanes-Oxley Act, and Basel II [5,6]. Those compliance regulations place increased challenges on businesses' internal control systems and IT [6] and are required to fulfill in order to stay in competition. This literature strand is insightful to grasp the various motifs of organizations that are engineering their enterprise.

2.2 Prescriptive approaches for Enterprise Architecture

Classical EA is considered as an instrument to communicate an enterprise's future direction and this involves activities such as coordinating and steering that help to transform an enterprise [22]. Those activities necessitates a more holistic view on an enterprise and not only technical issues, such as IT [22]. Therefore, no universal perspective can be used in EA, which is illustrated by the wide variety of EA frameworks that were published [22], such as [10,23]. Because of this variety, principles were also differently positioned in EA literature. Architecture principles are described as the bridge from strategy to design [22]. Some frameworks consider principles from a technical perspective (e.g. [10]) other frameworks have a more business like point of view (e.g. [24]). Accordingly, EA literature involves multiplicity in methods and techniques that correspond to the respective ontology of its frameworks [25]. For example, TOGAF's Architecture Development Method (ADM) [10] provides an explicit description that is centered on requirement management and includes a cyclical and iterative understanding of architecture development (e.g. best practices for architecture procedures, organizational structures and responsibilities). This literature strand is helpful for comparing of what is done in practice and what could be done in theory with the help of EA frameworks.

2.3 Using insights of structuration theory to derive implications

As earlier indicated, we identified a lack of research, which describes the driving motifs of practitioners that engineer an enterprise without a classical EA framework. Literature about the drivers for applying EA frameworks is insightful to grasp the various motifs of organizations to apply EA that is engineering their enterprise. And the second main literature strand is helpful for comparing of what is done in practice and what could be done in theory with the help of EA frameworks. In addition, insight from the social sciences may enrich the discussion and implications, since enterprises are socio-technical artifacts. In this research we draw on Giddens' work [11] as "sensitizing device" in order to view the world from a certain perspective, such as context, process or the context-process linkage [26]. In the realm of system sciences research, interpretive researchers tend to generalize with the help of social theories such as Structuration Theory [11,27]. Structuration theory deals with social phenomena at an abstract level rather than their particular instantiation in a specific context [28]. Structuration theory presents various concepts (stratification model, reflexivity, etc.) and in this research we draw on the stratification model to derive implications for practitioners.

3 Research approach

We used an interpretive case study approach to study the driving motifs and activities how to engineer an enterprise without a classical EA framework in practice.

This involves an in-depth understanding of motifs and practices from research participants, a filtering of individual differences, a contextually grounded study of the activities from research participants and a sophisticated abstraction and generalization that is based on a social theory. We acquired this understanding through the collection of detailed, qualitative data from two case studies. Both case studies involved companies that are involved in the beverage and tobacco industry within Luxembourg. Company A produces at one site whereas company B has several sites within Europe, however, both are large enough to provide moderate data for the study. Narratives about company A and B are given in section 4.

This is a well suited research approach for exploring a phenomenon [29], when there are interactions between people and the organization [30]. In addition, it has several advantages for research of an exploratory nature, since it generates insights and rich descriptions [31]. This fully corresponds to our needs to explore the driving motifs and activities how to engineer an enterprise without a classical EA framework in practice.

3.1 Data collection

We understand that organizations purposefully design their enterprise that may experience business turbulences and transformations. By doing so, the organizations also engineer their enterprise. The goal was to collect data from practitioners that participate in engineering the enterprise, in order to explore their driving motifs and activities how they engineer their enterprise without a classical EA framework, such as TOGAF. To accomplish this goal, the researchers visited headquarters of both organizations and presented the research idea. The head of the companies and the researchers decided upon the people to interview. The researchers met at least two persons from the business as well as two persons from the IT departments. Those people covering various work perspectives from higher along with lower hierarchy levels. In Company A five persons were interviewed during visits from November 2011 and December 2011. The interviewed persons were responsible for legal and human resources, quality control, production planning, IT administration and new production site. Company B is rather complex compared to company A and we interviewed 8 persons to accommodate the research needs. The interviews with individuals from company B were during visits from March 2012 to April 2012. We interviewed persons that were responsible for logistics, distribution department, financial director, IT director, application development manager, CEO, supply chain manager and administration. We recorded and transcribed the interviews, each lasting approximately 80 minutes and held within a relaxed atmosphere. Although we collected a lot of data, we used the indirect speech in this paper. This is because both companies operate in a multi-lingual environment and all interviews were held either in French or German. As a result, we tried to avoid any misperception through translation of quotes.

To encourage the interviewees', we ensured that their statements remain confidential. In addition, we collected detailed information about the companies. However, we needed to limit the detail of information, since otherwise it would be relatively easy to track the origin of data in a considerably small country like

Luxembourg. Therefore, we provide only data that are most relevant to this research about EA issues in practice.

3.2 Analysis of interview data

We filed the data sets of qualitative material in order to simplify and accelerate further research progress. For data analysis we used an approach that is referred to as distinctive types of coding and was based on Miles and Huberman [32]. The progress of data analysis is conducted in three steps:

- With the help of spread-sheets we sorted the data sets, and transcriptions were read and reread to familiarize researchers with the information. The data was deposited with some meaning in order to expose the various activities, events, and incidents.
- Through short descriptions in table form we developed a better understanding by looking at the driving motifs and activities when practitioners engineer an enterprise without a classical EA framework in practice.
- Finally, we identified tendencies and patterns in the data collection by comparing the data with the reviewed literature streams that we identified to support this explorative research. In addition, we draw on work from Giddens' [11] to enrich the discussion and draw implications from this study. These implications provide the basis for the potential transferability of the gathered results of this study.

By applying this coding procedure to the collected data we were able to conceive various aspects of the theme of this research (what are driving motifs for practitioners to engineer their enterprise which do not apply a classical EA framework). With the help of this explorative approach, we were able to build a bottom-up conceptualization of the collected data sets while using the reviewed literature (first literature stream: drivers for applying EA frameworks; second literature stream: prescriptive approaches for EA) as guidelines what aspects are of interest for studying EE in practice.

4 Two case studies from the Luxembourgish beverage and tobacco industry

In this section, we provide narratives about company A and B, to get a coherent understanding about the “story of company” A and B. In addition, both narratives provide rich insight about driving motifs and activities how to engineer an enterprise without a classical EA framework in practice.

4.1 Company A

Company A operates independently and is export oriented with a diversified product range. Although the company witnessed some changes that involved the relocation to newer production sites, the business remained relatively stable. Research participants stated that dominant attributes: high cost control intensity, high market driven attitude, top-down strategy and the organizations intensive usage of revenue data for their decision making process.

People mentioned that various food standards and the fact that the business model is export oriented, influences the company most. Although the European Union tends to have more common standards, the market regulations within the beverage and tobacco industry are still nationally governed and the interviewees' stated this as dominant means. In addition, interviewees' stated new or altered means are communicated through various committees within the company. However, interviewees' affirmed the desire to formalize and automate communication at company A.

On specifically asking how the management of the organization could be improved we obtained various stories: people expressed that it seems to be difficult to find the right contact person; executive committees' team player attitude is improvable; there seems to be an overload of production data, whereas meaningful management data is missing. In addition to those prevalent difficulties, we asked about changes within the business-IT infrastructure of company A and found out that interviewees' experienced that newly adopted software could hardly be adapted afterwards. This seemed to be a great concern within company A and was adjusted through small modifications of the applications and staff training. Furthermore, we found it interesting that interviewees' stated language barriers as a problem during work within the multi-lingual environment of Luxembourg. Additional issues are continuous updates of European Union directives, which seem to challenge the beverage and tobacco industry; and some legacy that provides a double flow of information for production and quality. However, interviewees' felt not restricted in their work freedom through means, and understand standards as providing opportunities as well as challenges.

4.2 Company B

Company B, in contrast to company A, is a complex network of entities within the beverage and tobacco industry. Interviewees claim, that activities of the single entities are very independent and smaller projects likely suffer from a lack of appropriate data exchange within the organizations network. In addition to the independence or embeddedness in a network of organizational entities and the cultural variations, the researchers found additional contrasts that reflect the prevalent differences between company A and B. Research participants at company B stated that average attributes regarding cost control and market driven attitude.

Asking the interviewees' how to improve the management of company B they mentioned to be worried about not being asked during various decision processes when new means and IT related affairs were implemented. Especially the people from lower hierarchy levels and those who not worked for the core entity mentioned that

they were informed only at the end for doing the actual implementation. This is at odds with the statement of the CEO, who said the main improvement should be their supply chain project. This is similar to the interviewee's experiences during the introduction of new means, which were necessary because of mergers and the growing internationalization. They reported multiple difficulties when company B acquired another organization or new IT tools were integrated. In order to overcome those difficulties company B followed a hybrid approach, which involved the training of their employees and the tailoring of means as well as the advice of external consultants. Various regular meetings within the different entities should further support the communication and utilization of news and means. In addition, whereas the CEO negated to use additional instruments, other interviewees' stated to use in their day-to-day business additional means and tools that by-pass proposed instruments. Those interviewees' even stated that those by-pass instruments are too important to eliminate the tools.

5 Case study analysis

This section highlights what happens in practice in the field EE through analysis of two case studies within the beverage and tobacco industry. For this reason, we created analytical tables (Table 1 and Table 2) to get a clear view of the companies' organizational and cultural contexts, transition approaches, practiced processes and identified challenges.

5.1 Differences between company A and B

This compendium of what happens in practice in the field of engineering an enterprise shows the various features of two different companies within the beverage and tobacco industry in Luxembourg. Although both companies are engaged in the same industry sector, they are dissimilar in a number of issues (Table 1).

Organizational context: Their organizational context is contrasting, since company A operates as one independent entity whereas company B is rather a network of entities. This is an example how organizations may organize differently, so that they may need to follow different fundamental processes and approaches for EE.

People / cultural context: Company A follows a top-down strategy and this is contrary to company B, which adheres a bottom-up strategy. Those findings are interesting, since many classical EA frameworks involve a balanced, holistic and integrated view of the business and IT.

Transition approaches: Likewise, the companies' transition approaches varied, because company B also sought external consultancy compared to company A. However, both quested training of employees and tailoring of means. Based on the collected data during interviews we interpret the different transition approaches by means of the varying organizational and cultural contexts.

Practiced Processes: According to the answers of interviewees in company B they used also additional by-passing of proposed means. This information about what

interviewees' do in practice is interesting, since the beverage and tobacco industry involves great requirement of regulatory compliance with various standards (e.g. national and international beverage and tobacco laws). So, it is rather surprising that they admit to by-pass some of their “standard-procedures”.

	Company A	Company B
Organizational context	<ul style="list-style-type: none"> • independent • export oriented • relative stable business 	<ul style="list-style-type: none"> • network of entities with support function of the main production • multiple changes through acquisitions and internal developments
People / cultural context	<ul style="list-style-type: none"> • top-down strategy • high cost control intensity • intensive usage of revenue data for their decision making process 	<ul style="list-style-type: none"> • bottom-up strategy (e.g. team decisions) • average use of financial data
Transition approaches	<ul style="list-style-type: none"> • adopted software could hardly be adapted • adjustments through training • small adjustments of the application 	<ul style="list-style-type: none"> • training of employees • tailoring of means • seeking advice from external consultants
Practiced processes	<ul style="list-style-type: none"> • organizational means 	<ul style="list-style-type: none"> • organizational means • additional by-passing of proposed means

5.2 Similarities between company A and B

Despite those dissimilarities, the analytical table showed similar challenges, based on the answers that were given by interviewees' from both companies. Those common challenges involve two issues: too weak involvement of lower hierarchies during the decision-making processes and language barriers (Table 2).

We found it thought provoking, that interviewees' from both companies mentioned a too weak involvement of people from lower hierarchies, because those people stated that one organization follows a top-down strategy and the other one applies a bottom-up approach. Although the two organizations have a different organizational context, interviewees' still perceive the too weak involvement of lower hierarchies as a challenge to improve on.

In addition, we found it interesting that the interviewees' from both companies stated that the variety of languages is a challenge in practice within business and their related enterprise engineering. Besides Luxembourgish, French and German, English is another important business language. Nevertheless, information and communication technologies are usually described in one language and the users do

not necessarily comprehend this language. Likewise it is unavoidable to meet colleagues and / or external contacts that do not speak your language.

	Company A	Company B
Identified challenges	<ul style="list-style-type: none"> • executive committee is lacking team spirit • production data overload • some meaningful data is missing • language barriers 	<ul style="list-style-type: none"> • improvement project on their supply chain • lower hierarchies are hardly consulted during the decision making process • language barriers

The next section discusses the driving motifs for EE practitioners, who do not apply classical EA frameworks. In addition, we draw on work from Giddens' [11] to enrich the discussion and implications.

6 Discussion

The literature study of this research provided two streams to gain insight in engineering an enterprise without a classical EA framework in practice. The first literature stream involves the drivers for practicing EE, which includes motifs that drive the establishment and improvement of EA (e.g. [4,8]). This is useful to identify the motifs of practitioners (Table 3) and the two case studies of this research provide additional insight.

6.1 Driving motifs for EE practitioners, who do not apply classical EA frameworks

Strand	Literature	Company A	Company B
Internal and external standardization	[18,15,5,6]	external compliance regulations are dominant means	
Financial aspects	[16,17,15,14]	<ul style="list-style-type: none"> • high cost control intensity • intensive usage of revenue 	average use of financial data
Organizational culture	[14,15]	top-down strategy	<ul style="list-style-type: none"> • bottom-up strategy • social focus, team orientation, flat hierarchy

Standardization is in the literature (e.g. [18,15]) discussed as an important factor why organizations apply EA approaches. We need to differentiate between internal and external standardization (compliance) motifs. External compliance regulations are very important motifs in the realm of practitioners, because they are well recognized by interviewees' as dominant means that influence their business and EE. In addition, the researchers know that many (external) compliance regulations are holistic approaches, so that they may influence many internal standards as well. However, this research cannot confirm that internal standardization measures are an important factor, because the data analysis has not highlighted this.

Another main object in the literature involves financial aspects (e.g. [16,17,15]) and for company A is this apparently also an important issue. Interviewees' of company A stated high cost control intensity and intensive usage of business figures for their decision making process that are part of their cultural context. However, interviewees' of company B claimed only average use of financial data.

That interviewees' draw less attention to this aspect may be also reasoned in the company's organizational culture, which is another important motif of engineering enterprises [14,15]. The analysis highlights two different approaches of management and leadership, such as top-down vs. bottom-up strategy with company A and B. The applied bottom-up strategy is supplemented by companies B's strong social focus, team orientation and flat hierarchy.

Although agility is acknowledged as another reason for applying EA approaches (e.g. [1,12]), the beverage and tobacco industry is a relative stable business sector, compared to other environments that necessitates speed and flexibility. Similar reasons are relevant concerning risk management in EA [19-21]. Therefore, the analysis derived no further insight of these potential influence factors of business and EE.

6.2 Comparison of engineering enterprises with and without a classical EA framework

The second literature stream about a brief overview of the classical EA framework literature (e.g. [9,10]) helped to gather insight about the differences what *is done* and what practitioners *could do*, if they would apply e.g. TOGAF (Table 4).

The discussion about the motifs of practitioners found three main strands: standardization, financial aspects, and organizational culture. Those motifs are covered by TOGAF in a sophisticated way. Altogether, TOGAF presents an in-depth method, which should practitioners help to apply EA successfully. In comparison with what practitioners in the analyzed case studies do, it is apparent that practitioners follow a far less structured method, compared to the TOGAF approach.

The main motif of practitioners for engineering their enterprise is compliance regulations that influence their business and EE. The core of TOGAF's ADM [10] is requirement management, so that it is clear that business requirements like external compliance regulations are eminent important. Financial aspects are another main motif of practitioners, who engineer their enterprise. The TOGAF approach involves for example control criteria, and internal and external requirements of all architecture governance-related information. Finally, the organizational culture is another main

motif that drives engineering of an enterprise. TOGAF includes best practices for architecture procedures, organizational structures and responsibilities, and integration thereof procedurally and culturally.

Therefore, TOGAF [10] provides multiple instruments to communicate and steer an enterprise (e.g.: future direction, coordinating and steering, help to transform the enterprise) with a certain holistic view on an enterprise. Apparently, the case study analysis could not provide any information regarding the application of TOGAF (or other EA frameworks), by the investigated companies. However, the analyzed case studies provided insight about the differences what is done and what practitioners could do, if they would apply e.g. TOGAF.

Table 4: Comparison of what is important in EE by practicing it without a classical EA framework and what TOGAF is suggesting.			
	Engineering an enterprise without a classical EA framework in practice.		What practitioners could do, by applying TOGAF.
	Company A	Company B	TOGAF [10]
Standard-ization	External compliance regulations are dominant means		Core of TOGAF's ADM is requirement management
Financial aspects	<ul style="list-style-type: none"> • High cost control intensity • intensive usage of revenue 	Average use of financial data	Control criteria, and internal and external requirements of all architecture and governance-related information
Organizational culture	Top-down strategy	<ul style="list-style-type: none"> • Bottom-up strategy • social focus, team orientation, flat hierarchy 	Best practices for architecture procedures, organizational structures and responsibilities, integration thereof procedurally and culturally,

The comparison of what is important in EE by practicing it without a classical EA framework and what TOGAF is suggesting is insightful, but its similarity is not necessarily a surprise. This is reasoned in the long lasting EA framework development of TOGAF by academics and practitioners. However, it is interesting, because practitioners that do not apply a classical EA framework do not necessarily something completely different in their day-to-day activities. Rather they apply actions that are meaningful enough to cope with their issues concerning standardizations, financial aspects, and organizational culture.

7 Implications

The previous section compared the sophisticated descriptions of TOGAF [10] and what practitioners do in relation to the identified main motifs from the case study

analysis. Based in these findings, a number of practical implications become apparent, which should help practitioners to perform better.

7.1 Lesson for EE practitioners: Break from routine and training in EA frameworks

First of all, training upon EA related issues should provoke a more structured EE approach by the practitioners we interviewed. Currently, their business and EE approach is rather confined when responding to processes and challenges. There is certainly a lack of thinking more holistic by practitioners, which would allow them to approach transitions proactive. Obviously, practitioners remained to a great extent within their routines, which provided a safe environment to them. However, the collected data of company B indicate that multiple changes occur also within a relative stable business sector. Consequently, practitioners need a break from routine to improve upon their capability in engineering enterprises and training in EA frameworks would provide some help in doing so. However, participating in this research, which identified practitioners' motifs that drive their enterprise engineering activities, can be the trigger of change. As Giddens [11] states, motivation of action refers more to the potential for actions and motives appear most often only in special situations where, for example, routines are breached (such as the activities during this research with the participating companies). Then, Giddens [11] claims, change occurs and the previously safe environment is scrutinized.

The various approaches of EA frameworks, which involve various methods and techniques of steering an enterprise, may be contradictory to the findings of what the practitioners in the two case studies do. However, practitioners' success shows more or less an inherently intrinsic approach, which serves them enough to cope with business challenges (e.g. company B, fluctuation through mergers). Obviously, the sufficient tacit understanding of fundamental processes and approaches of their organization helps them to engineer their enterprise to some extent. This is not necessarily structured, but in practice their reflexive actions upon enterprise engineering are adequate enough. According to Giddens [11], reflexive monitoring is dependent on the competence of social agents, in terms of their capacity to rationalize ongoing social life and we imply that does include enterprise engineering. This supports our practical implications to call for training upon EE related issues. So, we imply that reflexive actions may substitute EA frameworks to some extent. The findings of this research suggest that organizations may prosper also with a rather simple and confined approach when responding to challenges.

7.2 Lesson for EE theory: rigidity in EA frameworks

Furthermore, the differences of what is important in EE by practicing it without a classical EA framework and what TOGAF is suggesting, showed some overlap (cf. section 6). This is not necessarily a surprise, because the insight of TOGAF is rather the product of long lasting EA framework development since the mid-1990s [10]. However, it is apparent – and TOGAF is only one example of many EA frameworks –

that specified EA frameworks seem to be too rigid and complex, to be applied by organizations, such as company A and B of this research. It seems that this rigidity and complexity of contemporary EA frameworks shows that those frameworks are not designed appropriate enough to allow manageable tailoring. Uncomplicated tailoring would allow more organizations to benefit from sophisticated enterprise architecting. Therefore, we imply that current EA frameworks are too rigid and complex that they could be easily applied for novice enterprise architects.

8 Concluding Remarks

This study is a contribution to the discussion of practical issues in engineering enterprises. The research settings provided an interesting context in an industry sector with high compliance regulations. Hence, its originality is the rich description of the practical issues in engineering enterprises without a classical enterprise framework. We found contrasts in the organizational and cultural contexts, transition approaches and practiced processes (cf. section 5). In addition, we found also similar challenges despite the dissimilarities of the investigated companies. The driving motifs for practitioners that engineer their enterprise and do not apply a classical enterprise architecture framework were explored. We discovered three main motifs of EE practitioners: standardization, financial aspects, and organizational culture (cf. Table 3). In addition, we compared of what is important in EE by practicing it without a classical EA framework and what TOGAF is suggesting. Hence, the findings of this research yield practical and theoretical implications for further research (section 7). We suggest that practitioners may break from routines and get training about EA frameworks. We imply that contemporary EA frameworks are too rigid to be of much help for organizations like in this research setting.

Although this thorough investigation seeks to give a comprehensive answer to the research questions, there is space for future research. The paper concentrates on only one EA framework (TOGAF), which is a fraction of the available EA literature and future research could involve other EA frameworks. Whereas two case studies provided insight into the driving motifs for practitioners to engineer their enterprise, more case studies are necessitated to get a better overview of what is happening in this field.

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