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Simplified Methodology for the Practice of Business Architecture in SMEs

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Metodologia Simplificada para a Prática de Arquitetura Empresarial em PME

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Resumo

O atual contexto das organizações tem feito com que os seus modelos de negócio tenham vindo a sofrer constantes evoluções, criando oportunidade para as inovações tecnológicas. As estratégias de negócio tornam-se um grande desafio, particularmente se as organizações forem pequenas ou médias empresas, com todos os constrangimentos tipicamente associados. As frameworks de transformação digital mais utilizadas são centradas em organizações de grande dimensão e as que até ao momento foram propostas para aplicação em organizações de menor dimensão apresentam algumas questões. Neste artigo apresenta-se uma nova proposta de metodologia, a SimpliSMEEA e descreve-se e avalia-se a sua aplicação a uma empresa concreta.

Palavras-chave: Arquitetura Empresarial; Enterprise Architecture; Prática de EA em PME; Alinhamento Negócio-IT

Abstract

The current context of organizations has meant that their business models have been continually evolving, creating opportunities for technological innovations. Business strategies become a significant challenge, mainly if organizations are small or medium-sized, with all the constraints typically associated with them. The most used digital transformation frameworks are centered on large organizations and those that until now have been proposed for application in smaller organizations present some questions. In this article, a new methodology proposal, SimpliSMEEA, is presented and its application to a specific company is described and evaluated.

Keywords: Business Architecture; Enterprise Architecture; EA practice in SMEs; Business-IT Alignment

1. INTRODUCTION

The current context of organizations means that their business models must be constantly evolving, creating opportunities for technology-based innovations. Business strategies become a major challenge, requiring even better communication between the hierarchical levels of organizations for decision making and indicating the strategic direction, which unfolds in tactical and operational indications.

It has been suggested that Enterprise Architecture (EA) is an approach to control complexity and constant change in an organization's business environment, allowing for a real alignment between the business vision, the business requirements and the Information System (IS) (Ylimäki, 2008a;

Ylimäki, 2008b; Ylimäki et al., 2008). EA can be used to structure and align the transformation and, consequently, manage that complexity. Therefore, EA has the potential to play an important role in today's times of digital transformation, enabling organizations to effectively manage and transform their architectures (Assar & Hafsi, 2019). The impact of digital transformation in an EA context must be constantly monitored and measured, in order to validate and evaluate the initiative, thus being able to analyze the maturity of the entire process, as addressed by (Ylimäki, 2008b). EA maturity refers to the organization's ability to manage the development, implementation and maintenance of the architecture, which consists of several points of view: business, data, applications and technological architecture. Furthermore, the idea of maturity models is that they evolve over time, from one level to another, more advanced towards an ideal final state. We consider these maturity models as a mean of improving the quality of the EA, providing at least an initial quality management system for it (Ylimäki, 2008b; Ylimäki, 2008a). To corroborate this situation, without the long-term commitment of the highest levels of management in the organization, an EA effort will not be successful (Ylimäki, 2008b).

Thinking about better communication between the hierarchical levels of an organization and decision-making related to strategy, we believe that measures should be taken to raise awareness of the administration of organizations. The alignment between business and Information Technology (IT) should be one of the main concerns at this level. This is commonly recognized as an important tool for organizational effectiveness. Achieving the alignment between business and IT requires many changes in the way managers view technology and its application and requires cooperation between management and IT managers, posing a challenge (Hämäläinen & Liimatainen, 2008). From a different perspective, it is suggested that a high-quality EA complies with the agreed and fully understood business requirements, if it suits its purpose (for example, more efficient IT decision making) and satisfies the main stakeholder groups, including economic issues and their current and future needs (Ylimäki, 2008b).

With the advent and practice of EA, many organizations have been restructuring and transforming themselves in a very dynamic way. Global competition and cooperation require networked business ecosystems that bring together co-specialized resources in a non-linear manner, eliminating time and distance barriers. On the other hand, IT has had fundamental consequences for organizations and society in general: unprecedented computing power, infinite virtual space and ubiquitous connectivity presented enormous potential to create unprecedented business effectiveness, increase flexibility and enable entirely new business models (Korhonen & Halén, 2017).

Following the affirmation of organizational transformation, with the evolution of business models and their ecosystems, as well as the change in business processes, we entered into a Digital Transformation initiative that is different from digitization, as it allows human beings and

autonomous objects to collaborate beyond of their local context using digital technologies (Zimmermann et al., 2018). Today, data, information and knowledge are fundamental basic concepts of our daily activities and are driving the digital transformation of global society. Furthermore, the digital transformation of our lives changes the way we work, learn, communicate and collaborate. Companies are transforming their strategy, culture, processes and information systems to become digital (Zimmermann et al., 2018).

If for large organizations the need for an EA practice can be crucial to achieve the goals of Digital Transformation (Hafsi & Assar, 2016), for small and medium-sized companies (SMEs), the situation may be different.

Small and medium-sized enterprises are important in the context of the world economy. Despite their low survival characteristics and the serious problems they face, such as more complex access to finance, low management capacity, little information about market opportunities, new technologies and methods of work organization and limited information on access to innovation funds and research (Keskġn, 2010), these companies present areas of opportunity in the integration of information and communication technologies in their key processes. EA practice can provide them with this integration model supported by strategic planning and integrated by partial architectures, such as business, applications and technology, with each partial architecture having components that differ from each other (Menchaca et al., 2013).

We identified a lack of studies on the adoption of EA in SMEs, since Bernaert et al. (2013) carried out a work that shows that there is a problem related to the overview of their business organization, concluding with the need to develop an EA approach specifically adapted for SMEs.

There are already simplified and oriented approaches to the application of EA in SMEs, such as KAOS (Bernaert & Poels, 2011) and CHOOSE (Bernaert, 2016).

KAOS recommends a way to better understand the processes (know-how), why activities (know-why) are carried out, which concepts are used (know-what) and who is responsible (know-who). This approach initially seemed interesting to us, but it ends up not answering all the questions necessary to be able to create a transformation plan for the organization. It has the potential to be used for the development of a business architecture or even a business model, but without the level of detail in terms of data, applications and technological architecture.

CHOOSE is a meta model, not defining a concrete method, practical and of immediate use, which clashed with our time constraint, because in addition to having to study the metamodel in depth, we would still have to derive an application method.

In conclusion, none of the above approaches will help us with time constraints and ability to develop a transformation plan.

This situation led us to conclude that there is a need to develop a new methodology to approach, in an agile and flexible way, an EA project and practice in SMEs.

The purpose of this article is to explore the use of an approach to the practice of EA in SMEs, using a simplified model, taking into account the constraints of the concrete situation. As a result, the proposal, validated by the application case, of the simplified EA model for SMEs is presented.

2. PROBLEM AND METHODOLOGY

This section describes the problem that gave rise to the work described in this article, as well as the scientific support methodology that was adopted.

2.1. The Problem

We were faced with the need to help an SME to understand what needed to be done to achieve the following goals:

- Have an information system capable of adequately supporting operational processes, avoiding the constant need to resort to alternatives without the ability to integrate data and, consequently, to share information;
- Have an information system in line with business strategy and activity, in order to allow the exploration of new business models;
- Have analytical information about the business with the highest level of correction and timeliness.

In addition to these objectives, the situation presented constraints that should also be considered, namely:

- Time constraints;
- Financial constraints (related with a typical low-cost business model).

Given this scenario, and the decision to use an EA practice as the best way to deal with the problem, we were faced with the challenge of how to make this approach viable within the constraints presented, therefore, without the complexity of the most used EA approaches. In other words, it is defined as the research question: is it possible to have a simplified EA practice to define a digital transformation plan for an SME, responding to time and financial constraints?

2.2. Action-Research Methodology

Considering that due to time constraints, we would have to apply the new approach as it was being developed, we opted for the action-research methodology. The action-research methodology is a flexible spiral process that allows action (change, improvement) and research (understanding, knowledge) to be achieved simultaneously. Understanding allows for a more informed change, while the researcher is, at the same time, informed by that change.

It can also be a natural way to act and research while practicing at a natural pace. In addition, action research provides flexibility that adapts well to changing situations. Achieves its flexibility mainly from its cyclical or spiral process (Avison et al., 1999).

We consider this to be the most appropriate methodology for the situation, as it focuses on critical reflection, on the one hand, and an operational attitude of practices that end up being the starting point for the emergence of possible theories. These aspects of the methodology took on more defined contours in the 1940s, with by Kurt Lewin's article "Action Research and Minority Problems" (Lewin, 1946).

Action research offers the possibility of intervention in the research entity and the analysis of the results. It allows an open approach to the research field and, therefore, it is possible to capture information that often cannot be predetermined.

The researcher can examine the change in the system, as well as the change in the researcher himself. In this way, a change can be brought about by the researcher and then the result of it is examined (Santos et al., 2013).

The action-research methodology develops in cycles, one or more, whose constitution has evolved over time. Kock, McQueen and Scott (1997) consider that the most consensual is that of the 5-phase cycle, as shown in figure 1 and the one we chose to follow.

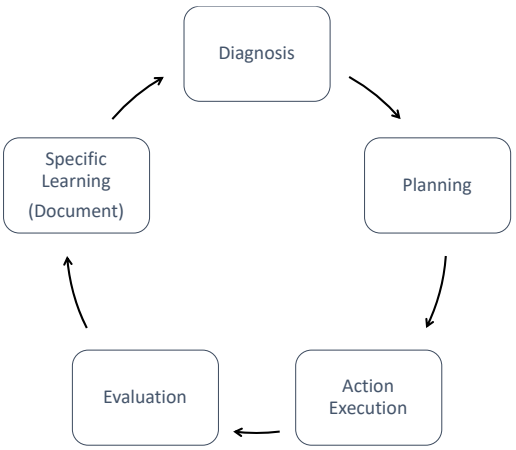

Figure 1 – Action-research Phases (adapted from (Santos et al., 2013))

This cycle can be performed multiple times in a converging macro spiral process. For the context of this work, only one execution cycle was carried out.

3. DIAGNOSIS AND PLANNING

The company involved in the application of the methodology that we will propose operates in the sector called "fast moving consumer goods" or FMCG. The company sells food brands, representing these brands in the markets where it is present. It currently present in the Portuguese and PALOP (*Países Africanos de Língua Oficial Portuguesa* – African Portuguese Speaking Countries) geographical areas.

At the beginning of the project, we started by analyzing the company's needs with the board of management, in order to propose a project more suited to the situation. In this preliminary analysis, we were able to determine the following facts:

- The Information System (IS) is centered on an internally developed application, over the past 20 years;
- The central component of the IS is based on a technological platform in obsolescence;
- Part of the programmers who have developed and still maintain the central IS environment are reaching retirement age;
- Difficulty, translated into time and cost, to introduce changes in the IS in order to support the development of new business models;
- Difficulty, due to time and cost, to develop backoffice support for digital channels;
- The ability to obtain operational reports is practically non-existent;
- Some problems regarding data integrity are resolved through direct access to them.

The situation presented a scenario in which neither the applications provided adequate functional coverage for the company's processes, nor was any additional investment in the existing platform justified. The company's employees showed normal reactions in this situation. That is, they try to fill the gaps and shortcomings of the IS with individual productivity tools, solving some of their problems with increased work and managing multiple files. These files are exchanged between interested parties by email. We quickly concluded the lack of any alignment between the business and the IS. In fact, we even found out that the IS is an obstacle to business development.

Our proposal started with the use of an EA framework, in this case TOGAF (TOGAF, 2018), as a support for the realization of work that would lead to the company's digital transformation, enabling it with all means in terms of people, processes and technology for this purpose.

However, other constraints were placed by the company's management, which made it impossible to apply the framework directly, namely:

- The deadline set for us to carry out the project gave us only 6 calendar months and one month of vacation, in this case the month of August, in the middle of this period;
- The maximum cost allowed for this project made it impossible for us to dedicate ourselves full time, allowing only the use of 95 man-days for a team of 3 senior consultants.

In view of this scenario, we opted to proposing a subset of activities that could be conducive to a result appropriate to the company's situation, considering all the restrictions mentioned and, also, following the principles of alignment between the business and IS.

Following the steps provided for in the Architecture Development Method (ADM), which is at the heart of TOGAF, we carried out a simplification, which was reflected in the agglutination of steps and the elimination of some tasks provided for in other steps. This proposal of ours, like ADM, is carried out in cycles, since EA is a living element of the organization.

This methodology follows the principles of a meta-architecture, where we identify the current situation (as-is architecture), the existing problems and gaps. From this as-is architecture, we derive, based on the strategic vision of management, a future architecture (to-be architecture), which responds to all identified elements. With these architectures in mind, a transformation plan is developed. This transformation plan indicates the projects to be developed, a macro calendar, the options or alternatives existing and applicable to the particular situation and an estimated cost for the realization. Based on this plan, management decides, creates a final version and proceeds to execution, as shown in figure 2.

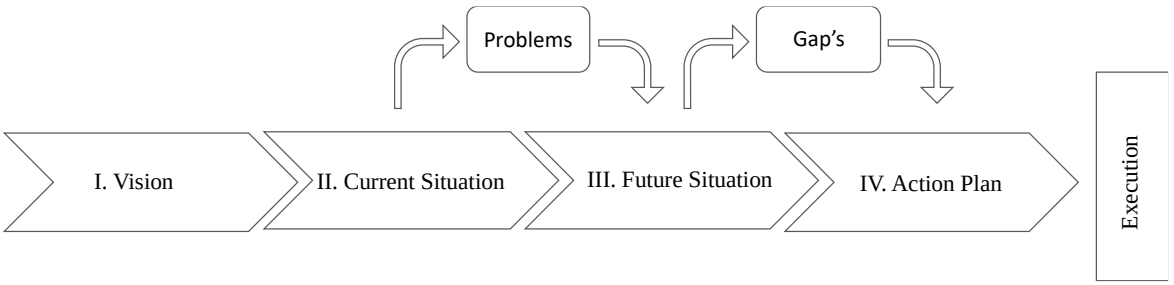

Figure 2 – Overview of SimpliSMEEA Methodology

At certain times, it will make sense to revisit the strategic vision, checking whether the original plan remains current or should be revised, in which case it starts a new methodology cycle, as detailed in Figure 3.

Figure 3 –Details of SimpliSMEEA Methodology

To this simplified methodology now proposed, we decided to name it Simplified SME Enterprise Architecture or SimpliSMEEA.

As we are based on ADM, it makes sense to compare the steps of it with the steps of our proposal, as shown in figure 4.

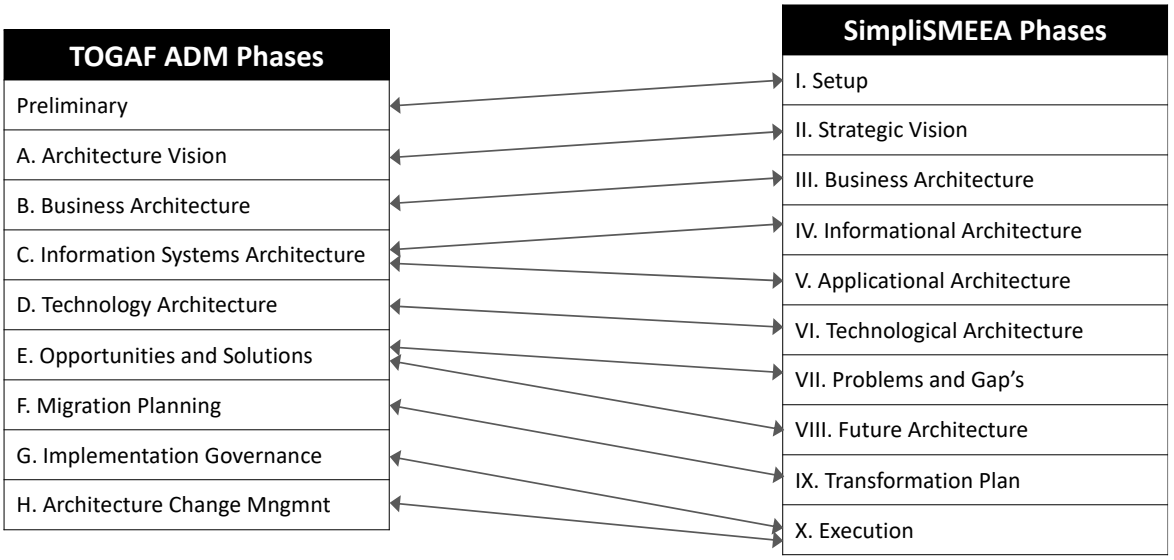

Figure 4 – Mapping TOGAF ADM phases with SimpliSMEEA phases

We ended up covering all the phases foreseen in the ADM. When analyzing the figure 4, the question arises about where, then, are the real differences from what we propose, in relation to ADM. If we look at figure 3, we immediately notice some differences in the application, as there are stages that we develop simultaneously, as is the case with phases III, IV, V and VI and phase X, which constitutes a circuit on itself.

In the case of SMEs, the survey and analysis carried out in different architectures are carried out simultaneously, at the same time that we immediately identify the problems and gaps experienced by all stakeholders, at different levels in the company.

Phase I (Setup) provides for the proper constitution of the team of consultants, the identification of the company's interlocutors, typically at the level of administration and first line of direction. A focal point of contact is defined and all existing elements are requested at the level of: organization chart,

existing processes, application documentation and technological environment. If there is documentation associated with processes such as quality certification like ISO 9001, it is also requested.

After the collection and preliminary analysis of all this information, the first meeting with the president or general manager takes place. This meeting takes the form of an interview, where all information related to the company's strategic directions, mission and vision is collected. These elements will be integrated into Future Architecture, in phase VIII.

Phases III to VII are stages of intensive information collection and normalization, gaining an understanding of the company's operational scenario. These steps are carried out through interviews with each of the directors and whoever can complement the respective information. In these interviews it is determined, from the start, the elements that allow to describe the different architectures, the existing problems and the suggestions they present at all levels. As we obtain these elements, the problems are transcribed to a support file (typically an Excel sheet), previously prepared, where they will be worked on, determining whether the problem is vertical or transversal, and whether it is related to the organizational structure, processes, applications (or lack of them) or others. These interviews result in a document that is sent for validation to each one of the interviewees, giving rise to the final version, having the opportunity to complete, correct or eliminate the collected aspects.

After dealing with all this information, we were able to determine the Current Architecture and the Future Architecture, which will respond to all identified problems and gaps. From this set of information, we could see the differences that lead us to list the necessary projects for the company to achieve Future Architecture. For each of these projects, the respective relevance and impact on the company must be identified, both in terms of processes, people and technology, but also by estimating the cost of implementation, the time of execution and presenting the possible alternatives. At the end, there will be a document that shows all the projects to be carried out, in time and in terms of the necessary resources, called the Transformation Plan. This is presented to the company's management and the board of directors and discussed, then deciding which initiatives to develop and the best execution schedule, obtaining the document in its final version. This final Transformation Plan serves as input and guide for the Phase X (Execution), and must be periodically reassessed before the company's Strategic Vision. Over time, different projects are carried out, adjusting this Transformation Plan whenever necessary, in order to accommodate potential changes in the Vision and, consequently, in all the company's architectures.

4. ACTION EXECUTION

This section describes the application of the proposed methodology and presented in the previous section. All the planned phases were followed, as detailed.

4.1. Phase I. Setup

In this phase of the methodology, several preparatory activities were developed, of which we highlight the following:

- Development of document templates to be used;
- Elaboration of information collection guidelines;
- Definition of the project's governance model;
- Requests for initial information – organization chart, contacts of members of the company's management, identification of the focal point of contact, description of macro processes (for example, related to quality certification).

The document templates that we determined to be necessary were as follows:

- Interview document and information collection;
- Summary document of the current Architecture;
- Document for registration, treatment and systematization of problems and opportunities;
- Document for registration and systematization of document sources in the company;
- Future Architecture synthesis document;
- Transformation Plan document.

The computer tool to support the preparation of documents was Microsoft Word, although for the registration, treatment and systematization of problems and opportunities, as well as for the registration and systematization of document sources in the company, Microsoft Excel was used.

For the design of macro processes, we decided to use Archimate (Lankhorst, 2012).

4.2. Phase II. Strategic Vision

The strategic vision was defined in an interview with the company's General Manager. The main lines of business development for the next 3 years were identified and discussed, a period that, it was determined, should also be considered for the base calendar of the Transformation Plan. This interview, with all its notes, was transcribed in a document, updated and validated after the meeting, by the General Manager, generating the final version.

4.3. Phases III to VII. As-is

These phases were carried out with interviews with the first and, in some cases, second lines of direction of the company's functional areas, obtaining the necessary elements for the business, informational, application and technological architectures. The latter, in particular, was centered on the company's IT staff and existing documentation.

For these phases, interviews were conducted with everyone, transcribed in documents, updated and validated after the meeting by each of the interviewees. In each interview we always had two consultants in order to collect as much information as possible and cross check it.

One of the elements collected were the existing problems, from organizational to technological issues, and they were organized by degree of importance. The same happened with suggestions for improvements. These elements were systematized in an Excel document, grouped and treated in order to obtain the final set of problems and suggestions, duly categorized by scope (sectoral or transversal to the company), degree of importance (high, medium or low) and type (business, informational, applicational or technological architecture).

Another element collected were the documents used internally in the company, indicating their means of production (electronic or manual), their support (paper or digital) and their description/purpose.

All the functional profiles existing in the company were also identified and we crossed them with the use of the applications and the referred documents.

With all this information, we were able to produce the Current Architecture document (as-is) in 4 months, with a total of 14 interviews.

This document was presented and discussed with the company's General Management.

4.4. Phase VIII. Future Architecture

Based on the Current Architecture, on the list of problems and suggestions for improvement, as well as on the vision of the company's General Management for the next three years, we prepared the Future Architecture. Within this framework, we define the Information Systems Architecture capable of resolving and adequately addressing all identified issues, problems and suggestions. Small changes were also suggested in terms of Business Architecture, essentially in terms of organization and processes.

This document was produced in 1 month, having been presented and discussed with the General Management, and approved.

4.5. Phase IX. Transformation Plan

In carrying out the work, described in the previous section, we were able to identify the gaps in the current situation and what it would be needed to do to achieve what was described in the future situation. With these elements in mind, we prepared the Transformation Plan. A benchmark was also carried out to determine which applications are most used by companies in the same sector of activity for the purposes foreseen in Future Architecture. It should be noted that these companies, practically all of them European or North American, were appointed by the company's General Management as being the most representative.

The actions of the Transformation Plan were sequenced, presenting the logic of the same and for each one we indicated: an estimated time for execution; interdependencies with other actions; functional areas of the company to be involved; estimated cost. In cases where the implementation of a software solution was foreseen, alternatives were presented, and in each case the result of the benchmark.

The Transformation Plan was presented to the General Manager and first line of Directors, discussed and approved. The document was prepared in 1 month.

4.6. Phase X. Execution

The next phase, execution of the Transformation Plan, started to be carried out immediately and, at this moment, it continues to be carried out. We were asked to monitor execution, advice and keep the defined architectures up to date.

5. EVALUATION AND DOCUMENTATION

We were able, within the initial constraints, in terms of time and cost, to carry out this work using the proposed methodology. These constraints, remember, were:

- The deadline set for us to carry out the project gave us only 6 calendar months and one month of vacation, in this case the month of August, in the middle of this period;
- The maximum cost with this project made impossible for us to dedicate full-time to it, allowing only the use of 95 man-days for a team of 3 consultants.

The work ended up consuming us 1 more month than expected (4 weeks), but as we had the month of vacation off, we resorted to this period so as not to finish out of time. So, despite this lag in relation to the initial schedule, we managed to finish within the stipulated deadline.

Another constraint was the cost, directly associated with the number of working days. We estimated the need for 95 man-days and ended up consuming 105 days, which represents a negative deviation of around 11%, which can still be considered marginal. This constraint was possible to overcome

due to the seniority and experience of the consultants involved in the project. If more junior elements had been used, where there is always a need for coaching and monitoring, this deviation would probably be of another order of magnitude.

In some aspects, we understand that we would not be able to go as far in time as initially anticipated. An example of this was the need to identify business processes only at the macro level. But we also understood that it would be enough for the purpose in view and it ended up being so. Anyway, one of the first actions proposed in the Transformation Plan was to detail all macroprocesses, a project in progress.

Based on the set of documents prepared and with due support from the developed and proposed methodology, we were able to carry out the work and demonstrate its viability.

6. CONCLUSION

EA practice supports the development of the organization, maintaining the alignment between the business and the information system, at the level of different architectures, from the processes to the technology.

For the particular case of SMEs, with constraints almost always related to time and/or cost, it becomes particularly difficult to create an EA practice. Having faced the problem of using such a practice in the case of a specific company, we started by asking whether it would be possible to use a simplified EA practice to define a digital transformation plan for an SME, responding to time and financial constraints.

Based on the TOGAF Framework, which we simplified, we proposed the Simplified SME Enterprise Architecture (SimpliSMEEA) methodology, as presented. Its main focus is to address the main typical constraints in an SME business environment.

Using the action-research methodology, we applied SimpliSMEEA to a particular case, in order to be able to determine its suitability and applicability and its ability to respond to the indicated constraints.

The application demonstrated the need for some minor adjustments, which were introduced. It has been demonstrated that, with a senior team of consultants, the proposed methodology meets the objectives for which it was designed.

However, the question of the potential impact caused by the constitution of the team of consultants remains unanswered. In other words, it represents a future work, to understand if a team that integrates junior elements will be able to achieve the same results that have now been obtained. Equally important, it will also be the validation of the methodology in more specific cases. More

topics to be developed in future work comprises the understanding of what was the impact of the EA changes on the enterprise IS and how to keep business alignment with the IS.

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