

Article

A Frameworks-Free Look at Enterprise Architecture

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Abstract

The concept of Enterprise Architecture (EA) is typically associated with popular EA frameworks. However, EA frameworks are far from the practical realities and typically adapted or simplified to fit the needs of specific organizations. Even if used as information sources, they hardly explain the real essence of an EA practice. The frameworks-free conceptualization of EA as a set of Principles, Visions, Standards, and Models presented in this article provides a clearer, more meaningful, realistic, and actionable explanation of the notion of EA. Additionally, this article provides actionable “one minute” guidelines for mastering these four essential components of EA.

Keywords

Enterprise Architecture (EA), frameworks, artifacts

INTRODUCTION

In the modern day IT plays a critical role for most companies and businesses. For many private and even public sector organizations implementation of any strategy is essentially equivalent to implementation of the corresponding information systems supporting that strategy. However, despite the foremost importance of achieving the alignment between business plans and organizational information systems, the universal solution to this problem had not been found and associated difficulties with business and IT alignment are still among the top issues facing IT executives today (Kappelman et al. 2014).

In order to alleviate this intractable problem and provide some mechanisms for facilitating communication between business and IT managers the notion of Enterprise Architecture (EA) was introduced. EA is a collection of documents describing an enterprise from an integrated business and IT perspective intended to bridge the communication gap between business and IT stakeholders and, thereby, to improve business and IT alignment. EA can be considered as a “city plan” helping enterprises evolve smoothly, manage change, simplify their IT landscapes, find optimal solutions for pressing business issues, and even drive radical business transformations.

Traditionally, the discourse on EA revolves around EA frameworks such as the Zachman Framework, Federal Enterprise Architecture Framework (FEAF), or The Open Group TOGAF® Standard (Zachman 1987; FEAF 1999; TOGAF 2011). These frameworks suggest how to structure and organize the EA documentation, recommend exactly which EA documents should be created, describe detailed processes for developing the

EA documentation, and provide other guidelines, tools, and recommendations on various aspects of an EA practice. Consequently, existing EA frameworks essentially describe all aspects of an EA practice and seemingly provide comprehensive advice for organizations practicing EA.

However, the strict following of EA frameworks is recognized as one of the worst EA practices (Burton 2009). Full implementation of EA frameworks is typically found impractical and rejected (Gerber et al. 2007).

According to Haki et al. (2010, p.1):

“[EA] frameworks have been suggested as guidelines to [EA] implementation, but our experience indicates that very few companies follow the steps prescribed by such frameworks.”

And according to Evernden (2015, p.29):

“Many practitioners see frameworks as theoretical or conceptual rather than a highly practical everyday device for managing and thinking about architectures.”

Buckl et al. (2009, p.15) even argue that EA frameworks: “appear theoretical and impossible to implement”. Unsurprisingly, organizations practicing EA either do not use EA frameworks at all or use them only as idea contributors (Buckl et al. 2009; Smith et al. 2012).

Therefore, regardless of ample available advice on EA, the essence of an EA practice still remains largely unclear because this advice is typically ignored or significantly modified. If the processes recommended by EA frameworks are not followed and the EA documents recommended by EA frameworks are not created, then it is impossible to say definitely what EA is and how it is used in real organizations since all available conceptualizations of EA are essentially based on popular EA frameworks.

Motivated by the poor understanding of the basic EA-related questions, we studied successful EA practices in different organizations aiming to provide an inductive evidence-based explanation of what EA is, what components constitute EA, and how they are used and, thereby, to formulate reasonable guidelines for establishing an EA practice. In total, we conducted 18 one-hour interviews with different participants of an EA practice (predominantly architects) in four large Australian organizations working in diverse industries that wished to remain anonymous (a retail chain, university, telecom, and bank, all large and widely known). During the interviews we asked all interviewees about the EA documents used in their organizations. In particular, we investigated the role, content, developers, stakeholders, usage, purpose, and benefits of all EA documents used in selected organizations. All interviews were recorded, transcribed, and analyzed with the grounded theory method. Samples of various EA documents provided by organizations were also studied and analyzed.

ESSENTIAL TYPES OF ENTERPRISE ARCHITECTURE DOCUMENTS

Our observations of EA practices in the four studied organizations generally support the conclusion that the real value of existing EA frameworks is at least questionable. Most interviewees mentioned that their organizations used one or more EA frameworks, most often the TOGAF framework, as an information resource for organizing an EA practice. However, none of the organizations used framework-specific EA terminology, filled the cells of the Zachman Framework, or followed the TOGAF Architecture Development Method (ADM) steps, even though one of these organizations was included in the list of TOGAF users provided by The Open Group (TOGAF 2016). Moreover, none of the organizations had comprehensively documented their EA, describing its current state, future state, and transition roadmap as recommended by EA frameworks (FEAF 1999; TOGAF 2011). Interestingly, some organizations did not have any articulate envisioned future states at all. Consequently, even if used as information sources, EA frameworks hardly influence the actual EA-related activities in organizations and do not define an EA practice in any real sense.

Instead of “using” EA frameworks, each organization followed idiosyncratic company-specific EA-related processes that hardly correlate with the typical step-wise “plan entire enterprise and then implement” recommendations found in the mainstream EA literature (Bernard 2012; FEAF 1999; Spewak & Hill 1992; TOGAF 2011). Moreover, organizations used unique sets of diverse EA documents underpinning their EA practices. The EA documentation in each organization

described typical EA domains (business, information, applications, infrastructure, and security), but this classification is fuzzy and explains neither the roles of individual EA documents nor the essence of an EA practice in general.

However, our analysis shows that all EA documents used in these organizations, regardless of their apparent diversity, can be also classified based on the similarities of their content and usage according to two dimensions helping to understand their meaning and purpose in the context of EA practice. Firstly, all EA documents tend to be either business-focused or IT-focused. Business-focused EA documents are aimed at the business audience, used for decision-making, and facilitate mutual understanding between business executives and IT leaders. On the other hand, IT-focused EA documents are purely technical documents used inside IT departments helping implement corporate information systems. For instance, maxims and business capability models help senior business and IT managers make mutually-agreed decisions on how to operate and where to invest, while patterns and platform architectures provide re-usable best practices and landscape diagrams for IT specialists facilitating project implementation activities. Secondly, all EA documents tend to be either generic or specific. Generic EA documents typically answer the question “How?” and represent some universal rules relevant for all organizational information systems, but do not describe any specific plans or systems. On the other hand, specific EA documents usually answer the question “What?” and represent concrete goals, plans, IT systems, or other entities. For instance, principles and standards only describe how information systems should be organized conceptually and technically, while roadmaps and solution designs describe what exactly should be done.

Therefore, all EA documents can be classified into four broad but fundamentally different categories: Principles (generic business-focused documents), Visions (specific business-focused documents), Standards (generic IT-focused documents), and Models (specific IT-focused documents). Although these titles briefly and precisely describe the identified categories of EA documents, they should not be interpreted literally since the titles of specific EA documents related to these categories can be very different and company-specific. Interestingly, though specific EA documents (titles, content, meaning, etc.) varied significantly across the four studied organizations, this general classification is still valid for all EA documents used in these organizations regardless of their industry, size, maturity, and experience with EA. Consequently, the classification of EA documents into Principles, Visions, Standards, and Models is, arguably,

fundamental for a mature EA practice and these essential types of EA documents constitute EA in all organizations (except for EA practices in their infancy).

Principles

Principles is an umbrella name for generic business-focused EA documents. In the studied organizations these documents were titled principles, core drivers, maxims, and policies. Principles typically describe high-level policy statements with their rationales and implications influencing the development and use of IT systems in organizations. For example, in one studied organization one of the core drivers stated that “we are always on”, meaning that all information systems should be designed for high availability, which is an essential requirement for that company’s business. Information security policies specified what types of data can be stored in the cloud, and data exchange policies described which information can be exposed to partners. In another organization one of the maxims titled “common business processes” suggested that standardized business processes and software should be used across all points of presence. Principles can be relevant for the whole organization or for specific lines of business within an organization. Sometimes they are structured into several domains: business, information, technology, security, etc. The number of executive-level Principles is usually limited by the “twenty is plenty” rule.

The purpose of Principles is to serve as intermediate proxies between the business considerations and underlying information systems. Since they are expressed in simple statements, they are easily understandable and appealing to business executives providing them with a powerful instrument to shape corporate information systems according to their business visions. Therefore, Principles are usually developed collaboratively by C-level business and IT stakeholders, including senior architects, and reviewed on a periodic basis, often yearly. Once approved, Principles guide all IT projects. Each project is reviewed at its early stage by architects who ensure that Principles are respected and reflected in the project’s design. Using Principles helps organizations align their IT landscapes with their basic values, overall business vision, and philosophy.

Visions

Visions is an umbrella name for specific business-focused EA documents. In the studied organizations these documents were titled business capability models, roadmaps, blueprints, and business reference architectures. Visions typically describe abstract high-level strategic plans based on the consensus understanding between senior business and IT stakeholders. They can represent abstract envisioned

future states for several years ahead or strategic roadmaps describing the desired step-wise progression of capabilities. However, probably the most typical example of Visions is a “heat map” – a business capability model with highlighted critical capabilities according to the organizational strategy. The schematic examples of Visions (business capability model and roadmap) are shown in Figure 1. These two Visions are complementary to each other: business capability models help decide where to invest IT dollars, while roadmaps help decide when.

The purpose of Visions is to provide a common basis for planning and prioritizing to senior business and IT leaders. Visions are usually described using simple, intuitive, often one-page diagrams and plain language executive-level descriptions. They typically operate in conventional business terms (profits, costs, customers, advantages, capabilities, etc.) and are easily understandable to C-level business stakeholders. Therefore, they allow business executives to discuss their plans with IT leaders and develop a shared desired vision of the future. Visions are typically developed with joint efforts of business executives, IT leaders, and senior architects and updated periodically according to ongoing changes in the business environment. Once developed, Visions are used to prioritize IT projects. After an IT project has been proposed, architects prepare an initial business outline for this project describing its value, impact, and capability footprint (affected business capabilities) and estimate its costs, timelines, and risks. Then, business executives evaluate each proposed IT project against Visions and, based on its business outline and estimates, decide whether the project needs to be implemented and, if yes, when. Using Visions helps organizations synchronize their business and IT plans and improve the correlation between business and IT priorities.

Standards

Standards is an umbrella name for generic IT-focused EA documents. In the studied organizations these documents were titled standards, technology reference models, patterns, principles, and architecture strategies. Standards typically describe specific technical or semi-technical guidelines relevant for information systems implementation. They usually define a list of recommended technologies to be used in IT projects (server hardware, network equipment, operating systems, application servers, programming languages, databases, etc.). However, they can also describe implementation-specific principles or rules; e.g., “services must be used to integrate applications”. They can document established best practices in some domains or recommend specific technical patterns – generic re-usable solutions to commonly occurring

problems; for example, for website deployment, authentication, or reporting. They can also outline some strategic technology choices; for instance, specify which family of network routers is likely to be the most suitable for the company's needs in the future. Standards can be relevant for specific lines of business as well as for entire organizations. They are typically structured according to different domains they describe such as networking, storage, integration, analytics, mobile applications, etc.

The purpose of Standards is to limit the number of supported technologies, products, and vendors, provide standard means for project implementation, and, thereby, simplify corporate IT landscapes. Standards are purely technical documents important for IT departments, but irrelevant to business stakeholders. They are typically defined and periodically updated by architects and other subject-matter experts according to their best understanding of the strategic business goals. Once defined, Standards shape all IT projects by offering standard solutions and limiting possible design options. All IT projects are reviewed by architects on the early phases of the delivery cycle in order to ensure their conformance to Standards. However, in practice usually not all projects can strictly follow Standards. Therefore, controlled and justified deviations should be allowed and corresponding exemption procedures should be established to manage such deviations. Using Standards helps organizations simplify their IT landscapes, standardize IT staff competences, and reduce associated IT costs and risks.

Models

Models is an umbrella name for specific IT-focused EA documents. In the studied organizations these documents were titled platform architectures, technical reference architectures, one-page diagrams, conceptual architectures, solution overviews, solution blueprints, high-level designs, and solution designs. Models typically describe specific information systems, their components, and interconnection in a formal technical manner ("boxes and arrows"). Typically, they represent detailed low-level implementation plans or designs for specific IT projects. However, they can also be drawings of certain areas of the IT landscape depicting the relationship between different applications, databases, servers, and other entities intended to support detailed project planning. The schematic examples of Models (landscape diagram and project design) are shown in Figure 2. These two Models are complementary to each other: landscape diagrams describe the overall context for projects, while project designs explain how exactly the projects are implemented and fit into the broader context.

The purpose of Models is to provide instruments for detailed technical project planning and for transferring these plans to in-house or outsourced project teams for subsequent implementation. Models are typically described with formal architecture modeling languages (UML®, the ArchiMate® language, ARIS, etc.) comprehensible only to IT specialists and considered as "techno-babble" by business managers. Therefore, Models are developed by architects and used inside IT departments. For each IT project, which has been approved by business executives based on its alignment with Visions, an architect develops the corresponding technical design describing how exactly the project needs to be implemented. Other Models showing relevant areas of the current IT landscape can facilitate this technical project planning. Then, the technical design for the project is peer-reviewed by other architects in order to ensure compliance with Principles and Standards, as discussed above. After being approved, the technical design for the project is transferred to a project manager and other project team members to implement the project. However, the architect who produced the technical design typically supervises the project team to ensure compliance and resolve possible problems, especially at the early stages of the project. After the project is implemented, its documentation is usually stored in some repository for future reference to provide a description of the current state for subsequent projects. Using Models helps organizations implement IT projects in an efficient manner, re-use relevant solution components, and restrain complexity of the corporate IT landscape.

FRAMEWORKS-FREE LOOK AT ENTERPRISE ARCHITECTURE

The four types of EA documents described above, Principles, Visions, Standards, and Models, are the essential elements of mature EA practices found in all studied organizations. Although studied organizations created company-specific sets of EA documents, the meaning and purpose of these seemingly unique documents were closely aligned with the meaning and purpose of the four general types of EA documents regardless of their specifics. Consequently, Principles, Visions, Standards, and Models provide evidence-based, simple, and sound conceptual explanation of the very notion of EA. The concept of EA described through the four types of EA documents is shown in Figure 3.

Figure 3 presents the notion of EA as a set of Principles, Visions, Standards, and Models. "Frameworks-Free Look at Enterprise Architecture" clearly explains what EA is, what elements constitute the essence of EA, how they are different, how they benefit organizations, who uses them, and how. Moreover, this conceptualization provides empirically-substantiated actionable "one

minute” guidelines for mastering the four critical components of EA and, thereby, for establishing a successful EA practice.

CONCLUSION

EA is a very important instrument for modern organizations critically dependent on IT in their daily activities. However, EA is also an extremely complex and multifaceted instrument which is still poorly understood. The idea of EA is typically explained through popular EA frameworks, but their prescriptions hardly correlate with successful EA practices in real organizations, as it was previously noticed by many authors and completely supported by this study.

“Frameworks-Free Look at Enterprise Architecture” (see Figure 3) is the result of our inductive analysis of successful EA practices in real organizations intended to provide an evidence-based conceptual explanation of the notion of EA. It explains EA as a set of Principles, Visions, Standards, and Models. Each of these essential components of EA has its own unique role, purpose, and value in the context of EA practice, but each of them is equally important for a mature EA practice. “Frameworks-Free Look at Enterprise

Architecture” also provides an easy-to-understand, practical, and research-based model for an EA practice with relevant “one minute” guidelines for mastering the four essential elements of EA.

However, successful EA practices are often unique and involve company-specific documents, people, and processes. There are no one-size-fits-all solutions applicable to all organizations. Establishing an EA practice always requires substantial organizational learning and is certainly not an easy endeavor. The experience of studied companies suggests that mastering the four essential types of EA documents, especially Visions, can be tricky.

Therefore, “Frameworks-Free Look at Enterprise Architecture” gives only an abstract explanation of EA and provides only the most essential guidelines for mastering its elements that proved valid in all the studied organizations. It does not recommend exactly which documents should be created, exactly who should use them, and exactly how the processes around them should be organized. Any detailed universal recommendations can hardly be given in the discipline of EA.

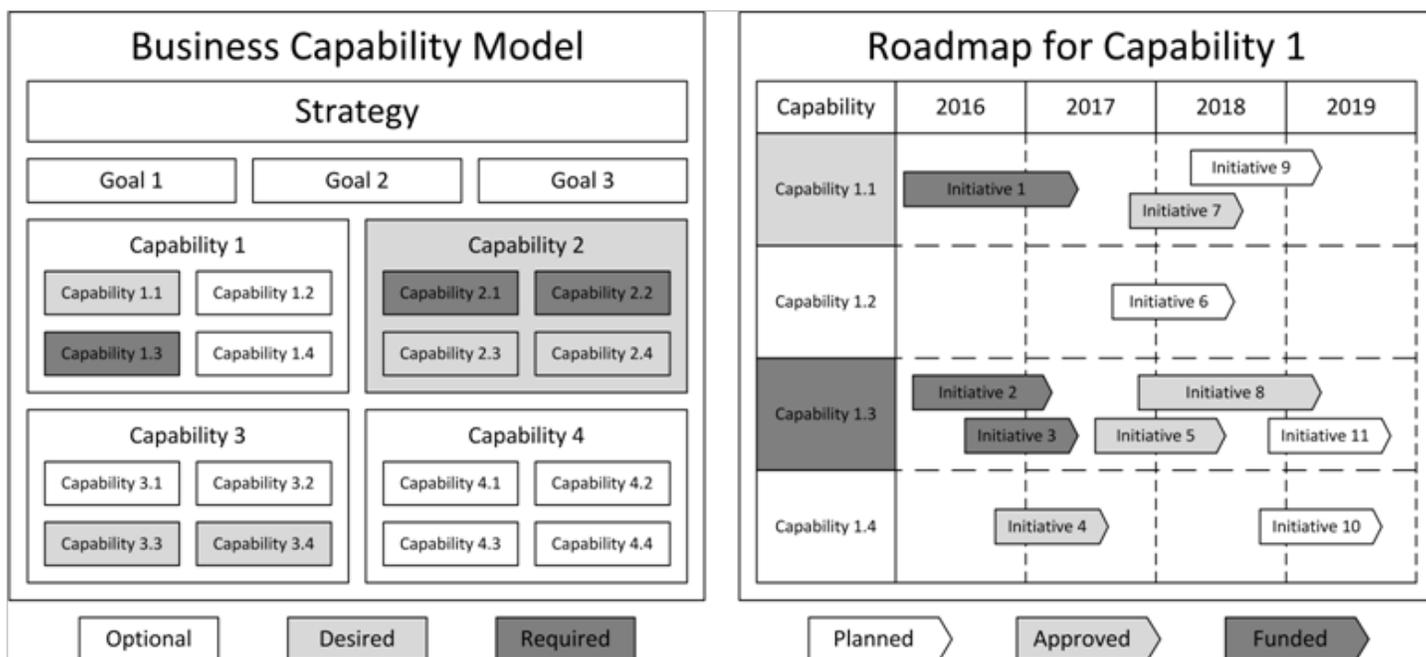


Figure 1: Examples of Visions

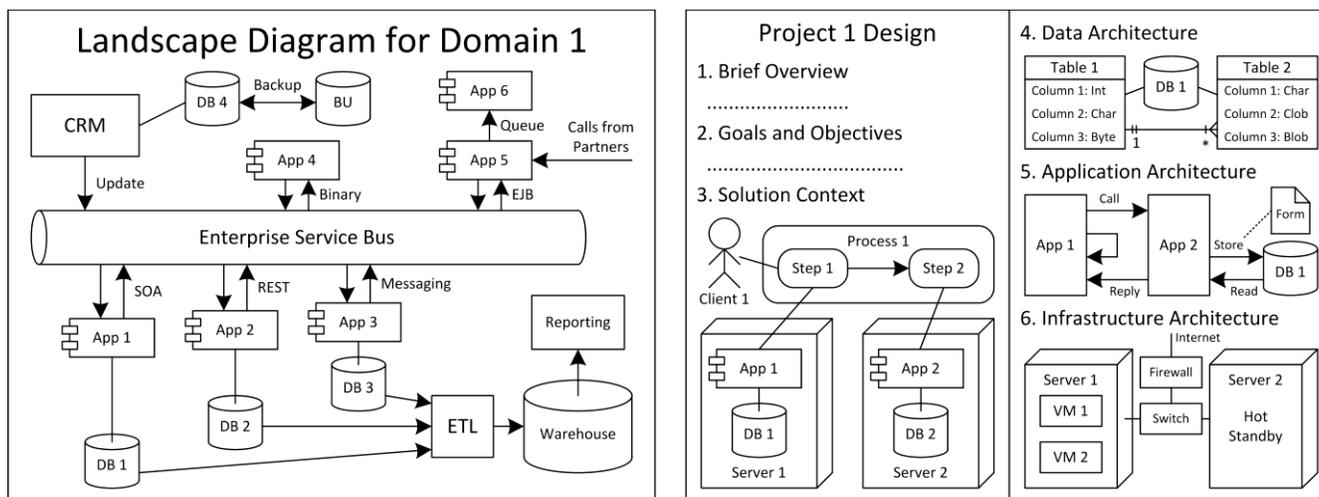


Figure 2: Examples of Models

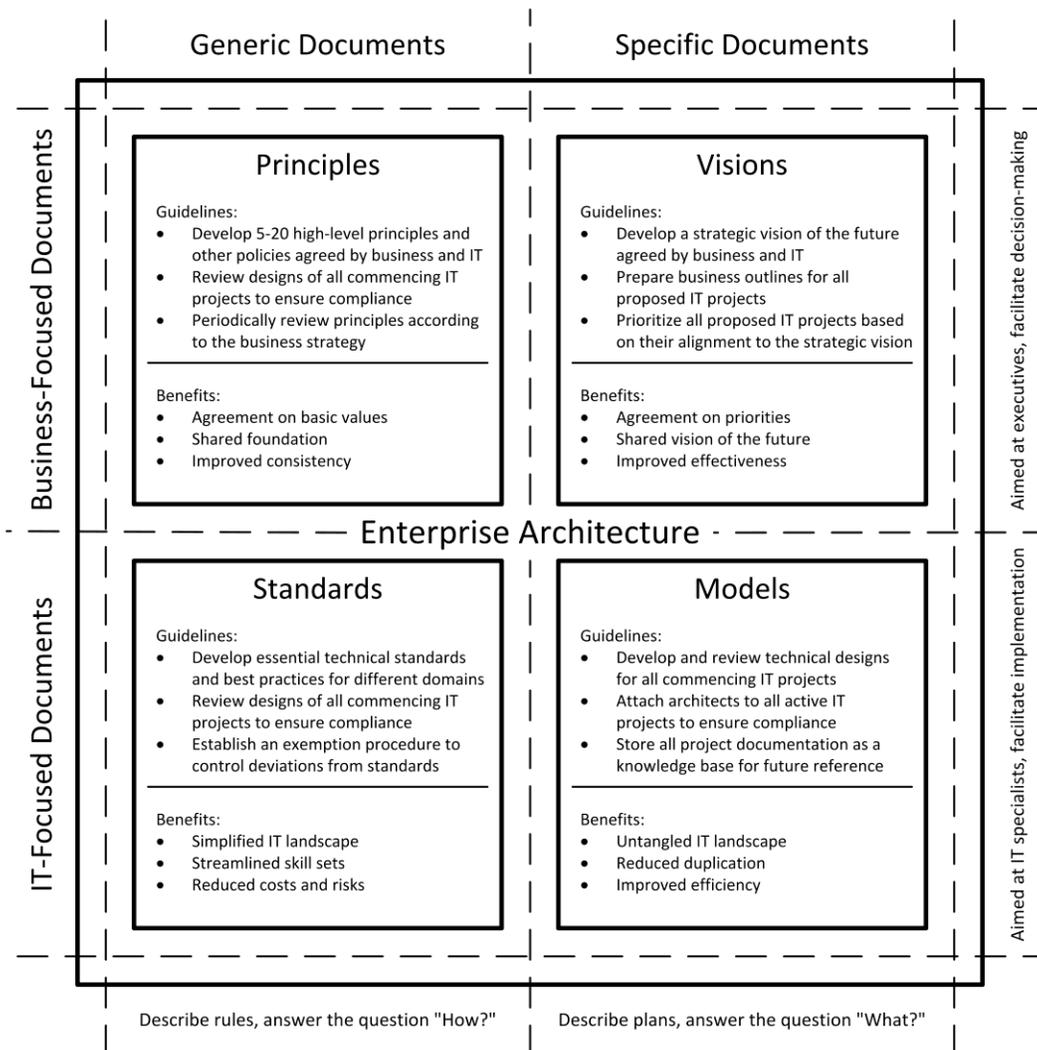


Figure 3: Frameworks-Free Look at Enterprise Architecture

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REFERENCES

S.A. Bernard: An Introduction to Enterprise Architecture (3rd Ed.), Bloomington, IN: AuthorHouse (2012).

S. Buckl, A.M. Ernst, J. Lankes, F. Matthes, C.M. Schweda: State of the Art in Enterprise Architecture Management, Software Engineering for Business Information Systems (SEBIS), Munich, Germany, pp.1-31 (2009).

B. Burton: Thirteen Worst Enterprise Architecture Practices, G00164424, Gartner, Stamford, CT, pp.1-8 (2009).

R. Evernden: The Architect Role – What Kind of Architect Are You?, *Journal of Enterprise Architecture* (11:2), pp.28-30 (2015).

FEAF: Federal Enterprise Architecture Framework, Version 1.1, Chief Information Officer Council, Springfield, VA (1999).

S. Gerber, U. Meyer, C. Richert: EA Model as Central Part of the Transformation Into a More Flexible and Powerful Organization, in Proceedings of the 2nd International Workshop on Enterprise Modeling and Information Systems Architectures, M. Reichert, S. Strecker, K. Turowski (Eds.), St. Goar, Germany: Gesellschaft für Informatik, pp.23-32 (2007).

M.K. Haki, C. Legner, F. Ahlemann: Beyond EA Frameworks: Towards an Understanding of the Adoption of Enterprise Architecture Management, in Proceedings of the 20th European Conference on Information Systems, J. Pries-Heje, M. Chiasson, J. Wareham, X. Busquets, J. Valor, S. Seiber (Eds.), Barcelona, Spain: Association for Information Systems, pp.1-12 (2012).

L. Kappelman, E. McLean, V. Johnson, N. Gerhart: The 2014 SIM IT Key Issues and Trends Study, *MIS Quarterly Executive* (13:4), pp.237-263 (2014).

H.A. Smith, R.T. Watson, P. Sullivan: Delivering an Effective Enterprise Architecture at Chubb Insurance, *MIS Quarterly Executive* (11:2), pp.75-85 (2012).

S.H. Spewak, S.C. Hill: Enterprise Architecture Planning: Developing a Blueprint for Data, Applications, and Technology, New York, NY: Wiley (1992).

TOGAF® Version 9.1, an Open Group Standard (2011).

TOGAF® Users by Market Sector; retrieved June 23, 2016 from: [web.archive.org/web/20151121161238/http://www.opengroup.org/togaf/users-by-market-sector](http://www.opengroup.org/togaf/users-by-market-sector).

J.A. Zachman: A Framework for Information Systems Architecture, *IBM Systems Journal* (26:3), pp.276-292 (1987).