The IT Implicated Within The Enterprise Architecture Model
Analysis of Architecture Models and Focus IT Architecture Domain

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Abstract— This paper describes the importance of Information Technology in improving business; due to technological changes and the strong impact of technology on all areas of business it is necessary to clearly distinguish the importance of the IT architecture domain, and its architecture types within enterprise architecture. Today business managers need fast and reliable access to information for decision-making which involves the integration of all business units within the company in order to achieve these objectives; it is very important to consider the role of enterprise architecture as a key element in achieving good business management.

Keywords- Enterprise Architecture; Business Architecture, Information Architecture; Data Architecture; Application Architecture, Technology Architecture.

I. INTRODUCTION

Currently Information Technology (IT) plays an important role in business, so most companies try to maximize value from IT investments by aligning IT and IT-enabled business process with business strategy. The latter is multi-faceted, encompassing decision-making as to which markets to compete in, the position of the company in each market, and which capabilities to develop and leverage.

In this paper we intend to underline that business must have a solid base in order to properly implement its processes, which is precisely why enterprise architecture (EA) is assuming a relevant value to permit the support of operation processes and, good management within companies supported by IT; the EA and IT are closely related to the achievement of business success.

Consequently, it is necessary to consider the EA, which should provide a framework to ensure that company objectives, policies and IT objectives are consistent and reflect appropriate decision-making related to the construction, implementation or change of information systems to provide reasonable assurance standards for internal communication processes, nomenclature data, data representation, structure data; and information systems must be consistent and properly applied to the company.

This EA-oriented approach requires the Chief Executive Officer (CEO), as directly responsible for the conduct of the company business to work closely with the Chief Information Officer (CIO) as one of the collaborators with the highest strategic level in the organization, which enables CIOs to take responsibility for their government to ensure that the EA is used to identify the problems approached by the architecture and the architecture used for the following cases: decision-making, change management, improve communications, ensure that information technology is acquired and information resources are consistent with business planning.

In this paper we analyze some Frameworks for enterprise architecture and highlight the importance of different types which have a direct relationship to information technology as key factors for success in business.

The structure of this paper is as follows: Section (I) is an introduction to the IT and Enterprise Architecture. Section (II) defines Enterprise Architecture. Section (III), enterprise architecture models. Section (IV), Analysis of architectures. Section (V), Focus IT architecture domain, and its architecture types. Section (VI), Some conclusions are drawn, which may assist other companies to create their own models of EA.

II. ENTERPRISE ARCHITECTURE

The EA is perhaps one of the most highly topical ideas on the agenda for IT organizations, because of the hard decisions to make in relation to resources, investment, information, applications and technology. For that reason, to manage all these elements, enterprise architecture is required.

The EA helps communication of key elements that explain the operations of an organization, enabling their directors to have a clear idea about which cases should be detailed to achieve their desired goals. In this way, the entire organization is represented, expressing the alignment of the objectives, vision, strategies, principles of governance, operational processes, organizational structure, automation aspects, such as information systems and technology infrastructure [1].

The EA is responsible for defining and maintaining architectural models, governance and transition initiatives
necessary for effective coordination of semi-autonomous groups toward common business and IT goals [2]. The EA will accelerate business transformation; strengthen linkages and relationships between business and IT.

The objective of the EA is to be a consistent reference for business and IT planning, for decision-making in large enterprises globally integrated, through the relationship of various business and technology stakeholders, including support for strategic planning, new initiatives, project planning, planning for the optimization of operations, business units, integrated operations teams, the activities of the processes to define a single integrated view of strategic architecture and mapping the route, ensuring conformity to the architecture, while allowing us to state exceptions for unique business requirements. This also serves to ensure the development of architecture to find new business changes with appropriate IT solutions.

The management of senior executives view EA as a critical component in making decisions that are consistent with the strategic plan for their organization. Architecture can be defined as the representation of Conceptual Framework components and their relationships at a point in time. Discussions of architecture have to be traditionally focused on technology cases. The EA is taking a broader view of business, considering the information associated with such businesses [3].

III. ENTERPRISE ARCHITECTURE FRAMEWORKS

A Framework for an EA is a model used by an organization to develop good corporate governance, creating added value for their business. Zachman was the first to formalize and publish the concept, which was later named after him. Among the best known of the EA Frameworks we have the following:

A. The Zachman Enterprise Framework

The Zachman EA model is at present a taxonomy for architectural artefacts of an organization (design documentation, specifications, models) that takes into account business owners and developers, to target devices on individual cases, (data, functionality) that is beginning to be used. J. Zachman describes enterprise architecture as a framework that is applied to companies: it is simply a logical structure for classifying and organizing the descriptive representations of an enterprise that have a specification for enterprise management and for the development of systems in the enterprise [4].

The scheme of the Zachman Framework model is typically depicted in a 6 x 6 “matrix”, characterized by the intersection of rows and columns. The first is essential for communication in finding answers to the questions: “what, how, when, who, where and why”. This is the integration of responses to these questions that allows the understanding of the composite description of complex ideas. The second is derived from reification, the transformation of an abstract idea into an instance that was initially postulated by the ancient Greek philosophers and is labelled with the Zachman Framework: Identification, Definition, Representation, Specification, Configuration and Instantiation. Zachman’s original model was the basis to enable development of new Frameworks of EA, such as NIST EA Model, the C4ISR AE, the DOE AE, and the DoDAF.

B. NIST Model Enterprise Architecture

The EA model was developed by the National Institute of Standards and Technology (NIST) and was put into use by agreement of the board of the CIO, and its duties were expanded to meet the organizational needs and to manage a federal EA. This model has been promoted within the federal government as a management tool that illustrates the interrelationships of the enterprise business, information and technology environments.

This model identifies 5 layers: (1) Business Architecture, (2) Information Architecture, (3) Information System Architecture, (4) data Architecture and (5) Delivery System Architecture, that allow the organization, planning and construction of an integrated package of information and technology architectures. These layers are defined separately, but are interrelated and intertwined.

A company is composed of one or more business units which are responsible for a specific area of business [5].

C. Federal Enterprise Architecture Framework - FEAF

The Framework of the Federal Enterprise Architecture (FEAF) is considered to be an organizational mechanism for managing the development and maintenance of architecture descriptions. The FEAF model provides a structure for the organization of the federal resources and the description and management of the activities of the federal representation of Architecture [6].

The CIO Council has adopted architectural layers similar to the NIST model for the FEAF with a slightly different concept of the Federal Company, reflecting the latest developments in IT.

The procedure of the Federal Enterprise Architecture is a strategic base of the information asset that defines the business, the information needed to run it, the technologies needed to support its operations and transition to the application of new technologies in response to changing business needs. In designing the framework, the CIO Council has identified eight components needed: (1) Drivers of architecture, (2) Strategic directions, (3) Current Architecture, (4) Target architecture, (5) Transitional processes, (6) Architectural segments, (7) Architectural models, and (8) Standards, for development and maintenance of a Federal Enterprise Architecture.

D. Federal Enterprise Architecture - FEA

The model of Federal Enterprise Architecture (FEA) is an architecture that was created for the federal government to join its agencies and functions in a single one that is common and ubiquitous EA [7].

FEA is based on a comprehensive taxonomy taken from Zachman and architectural processes taken from TOGAF. FEA can be viewed as a methodology for
creating an EA or the results of an application for processes of a particular enterprise.

Many authors describe FEA as a combination of 5 benchmarks to improve performance: business, service, parts, technique and data. This methodology is used in complex organizations in the world (the U.S. government), designed to facilitate the exchange of information and resources by means of federal agencies, to reduce costs and improve public services. This is an initiative of the Office of Management and Budget of the U.S., which aims to comply with the Clinger-Cohen Act1.

This model takes into account the following reference models within the EA: (1) Performance Reference Model (PRM), (2) Reference Model for Business (BRM), (3) Reference Model Component Services (SRM), (4) Reference Model of Data (DRM), and (5) Reference Model Technology (TRM).

E. The Open Group Architecture Framework - TOGAF

The model of the Framework of Open Group Architecture (TOGAF) was based on the model of Technical Architecture Framework for Information Management (TAFIM), The Agency for Defence Information Systems (DISA), of the United States contributed to the development of TOGAF 1.0. This architecture consists of components that are: (1) Architecture Development Method (ADM), (2) Guidelines and Techniques ADM, (3) Architecture Framework of Content, (4) Enterprise Continuum, (5) Reference Models, and (6) Architecture Capability Framework.

The basic structure of the ADM, shows the development cycle of this architecture, which is considered as the core of TOGAF [8]. It provides a step - by - step instruction guide for developing architecture, consisting of a series of phases by teams of architecture.

The Architecture Framework of Content provides a detailed model of architectural work products, including deliverable artefacts and the Architecture Building Blocks of (ABBS).

This provides a better integration of work products and standards as well as providing detailed breaks to indicate how the architecture should be described, including a detailed metamodel.

F. Department of Defence Architecture Framework - DoD AF

The model of the DoD Architecture Framework (DoDAF), which was created by the Department of Defence (DoD) of the USA, is defined as a common approach to the development of DoD architecture description, presentation and integration to ensure business operations and processes.

The Framework defines three viewpoints of a description of the architecture: operational, systems, and technical standards. Each viewpoint is composed of a set of architectural elements that represent data through graphs, tables, or textual products. All Core Architecture Data Model (CADM), Department of Defence (DoD) defines the entities and relationships of the data architecture [9].

DoDAF is an architecture description, whose model is composed of other sub-models called products, which are the following: (1) Operational View (OV), (2) Systems / Services View (SV), (3) Technical Standards View (TV), (4) All views (AV). Each view describes some prospect of an architecture and. represents the information that relates, operationally, the view of systems and services and the view of technical standards. The three views and their interrelationships driven by a common architecture for data elements, provide the basis for referral to measures such as interoperability or performance and to measure the impact of values of these metrics on operational mission and effective tasks.

G. Enterprise Architecture IBM Model

The EA model of IBM believes that an EA should be more than a collection of IT and other standards that must be adhered to project developing and implementing IT based business solutions. The objective of the EA is to make a consistent reference for business and the planning of IT decision-making. This EA describes the architectural models, governance and transition initiatives necessary for effective coordination of stakeholders towards a common goal.

The EA includes business, applications, data and infrastructure architectures and iterations with key business strategy, project design and implementation and maintenance operations of IT solutions [10]. This model involves four architecture types that are as follows: (1) Business Architecture, (2) Data Architecture, (3) Application Architecture, and (4) Technology Architecture / Infrastructure.

IV. ANALYSIS OF ARCHITECTURES

This study viewing the Framework has enabled a comparative analysis of the different elements involved in EA. Table I shows the relationship between them and the different architectures that comprise it. As seen in Table I, the results are:

- The business architecture is common to the entire revised Framework, as well as the technology architecture / infrastructure.
- The data architecture can also be found in most architecture reviewed.
- Some refer to Framework application architecture as information system architecture.
- Some Frameworks consider the information architecture along with the data architecture or within the information systems.

From this analysis it is necessary to distinguish the main domain of IT architecture and clearly define the

1 The Clinger-Cohen Act (CCA), formerly the IT Management Reform Act of 1996 (ITMRA), is a 1996 United States federal law, designed to improve the way the federal government acquires, uses and disposes of IT.
types of architecture that must be taken into account in this domain.

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V. Focus IT Architecture Domain

During the last century, IT architecture has not been universally accepted in the context of research and industry [11].

Due to technological changes and the strong impact of technology on all areas of business it is necessary to clearly distinguish the domain of IT architecture.

Due to the different names that the architectures in the revised Framework have taken, from the standpoint of IT, two major architectures may be clearly defined that make up the EA: (a) business architecture and (b) IT architecture. Figure 1 shows the EA comprising IT architecture domain that gives the necessary support to business architecture to achieve the strategy objectives of the company.

A. Business Architecture

Business architecture is responsible for managing design, development, implementation and improvement of the architecture of the company business, to deliver value to businesses. Business architecture must be supported by the Business Process Management (BPM); it also describes the core components of business processes that support the mission of the organization. The components of the architecture of the business units usually focus on the requirements of reporting external, internal and functional areas.

This architecture is a high-level analysis of work performance, to support the business mission, vision and objectives. The business processes can be described by the decomposition of processes derived from business activities which determine the information needs and processes for the organization.

B. IT Architecture

The architecture of IT and communications controls a set of architectures that have a close relationship between them. These architectures, as a whole, are those that serve to give adequate support to business architecture, transforming business opportunities and opportunities for innovation in design solutions, implementation and maintenance.

This IT architecture domain is responsible for managing the design, development and implementation, as well as the improvement of each of the architecture models to deliver value to businesses.

The following describes each of the architectures of IT

1) Information Architecture

Information architecture involves the definition of a framework that reflects the "Model Company" from the point of view of information and processing [12].

The information architecture (flow of information and relationships) analyzes the information components used by the organization's business processes, identifying the information used and the movement of information within the organization.

The components of the architecture include original documents, data, reviews, and responsible organizations. The discretionary standards include safety standards, rules and procedures to ensure the integrity of information. Other standards which a company must take into consideration are those of government and / or industrial regulatory requirements.

The relationships between the various flows of information are also described in this component and indicate where information is needed and how information is shared to support the missions of the function. This level represents the flow of technical information and management as well as the impact of time on the integrity of information and meaning.

2) Application Architecture

Application architecture, also known as information systems architecture, represents applications and their relationships that allow managing data and supporting the
execution of business functions, without specifying the technology to be used [13].

This architecture identifies, defines and organizes activities to capture, manipulate and manage business information to support mission operations and the logical dependencies and relationships between business activities. This establishes a framework to meet the requirements of specific information given by information architecture. It uses its components to acquire and process data, enables automation and procedures oriented to information systems that support information flows and produces and distributes the information according to the requirements of the architecture and standards.

The components for architecture applications refer to specifications, requirements, applications, modules, databases and procedures; this architecture defines the approaches to the development of information systems, such as an approach to object orientation, and application development languages, such as the use of java or ActiveX to design methodologies and flow processes. Standards must be the business of software development.

3) Data architecture

Data architecture (description of data and relationships), identifies how the data is kept, their access and use. At a high level, it defines the data and describes the relationships between data elements in information systems in organizations. It also defines interfaces for application system components, for storing or locating information required to process, or storage for subsequent application systems.

The components of this architecture may include data models describing the nature of the data underlying the business and information needs, such as physical database design, database structures and files, data definition, data dictionaries and data elements that support the information systems of the company.

In this architecture it is important to minimize data redundancy and support new applications. The standards that the company can select as part of the architecture are for compatibility of database and files, specifically in the areas of interest shared processes.

4) Technology Architecture

Technology architecture (infrastructure and communication technology) describes and identifies the architecture which links information systems, service network and components, including operational characteristics, capabilities, and interconnections of the hardware, software and communications (networks, protocols and nodes).

This represents the connection diagrams of the physical infrastructure of IT, provides necessary support requirements and must reasonably accommodate and connect these assets in an integrated manner. This architecture is similar to data architecture; its components are related to technology and communication infrastructure.

VI. CONCLUSIONS

The conclusions that can be drawn are as follows:

- Today business visions are changing due to the great impact of IT, which facilitates their growth, reduces costs and increases their return on investments.
- This paper has analyzed some major Frameworks in relation to EA where we can see that there are similarities in that all have a business architecture and technology architecture. Others have a difference of nomenclature for the application architecture that defines it as system architecture; as well as data architecture which also includes information architecture.
- To avoid confusion it is necessary to consider an EA Framework as composed of two large architecture domains: business architecture and information technology architecture.
- IT architecture domain is composed of information, applications, data and technology.

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