

Enterprise Architecture is a holistic view of an enterprise's processes, information and information technology assets as a vehicle for aligning business and IT in a structured, more efficient and sustainable way. This practice has attracted significant attention over the past 2 or 3 years with a number of organizations implementing this practice to align their IT and business goals. The methodology encompasses all of the various IT aspects and processes into a single practice. However, realizing the full potential of Enterprise Architecture (EA) can be challenging. There are many aspects to EA, including architecture planning, governance, taxonomies and ontologies, all of which impact its success. Without the right guidance, tools, frameworks and methodologies EA can quickly become unwieldy.

The most widely and commonly accepted methodology is The Open Group Architecture Framework (TOGAF) model. TOGAF is an industry standard architecture framework that may be used freely by any organization wishing to develop an information systems architecture for use within that organization. It has been developed and continuously evolved since the mid-90's by representatives of some of the world's leading IT customer and vendor organizations, working in The Open Group's Architecture Forum. It is a detailed method and set of supporting resources for developing an Enterprise Architecture and represents an industry consensus framework and method for Enterprise Architecture that is available for use internally by any organization around the world. As an open method for Enterprise Architecture, TOGAF 8 complements, and can be used in conjunction with, other frameworks that are more focused on specific aspects of architecture or for vertical sectors such as Government, Defense, and Finance. The latest version of TOGAF 8 is Version 8.1.1.

TOGAF consists of three main parts:

1. The TOGAF Architecture Development Method (ADM), which explains how to derive an organization-specific enterprise architecture that addresses business requirements. The ADM

provides a reliable, proven way of developing the architecture along with guidelines on tools for architecture development

2. The Enterprise Continuum, which is a virtual repository of all the architecture assets including models, patterns, architecture descriptions, etc. These exist both within the enterprise and in the IT industry at large, which the enterprise considers itself to have available for the development of architectures.
3. The TOGAF Resource Base, which is a set of resources such as guidelines, templates, background information, etc. to help the architect in the use of the ADM.

TOGAF is based on four architecture domains. Business (or business process) architecture phase defines the business strategy, governance, organization, and key business processes of the organization. Applications architecture provides a blueprint for the individual application systems to be deployed, the interactions between the application systems, and their relationships to the core business processes of the organization. Data architecture describes the structure of an organization's logical and physical data assets and the associated data management resources and finally, technology architecture describes the hardware, software and network infrastructure needed to support the deployment of core, mission-critical applications. These domains are discussed in further detail below.

Before starting any IT project, an **Architecture Vision** needs to be established. This is known as phase A in the TOGAF model. The Architecture Vision is essentially an elevated pitch that includes the key opportunity to sell the benefits of the proposed development to the decision-makers within the enterprise. The goal is to articulate an Architecture Vision that enables the business goals, responds to the strategic drivers, conforms with the principles, and addresses the stakeholder concerns and objectives.

Clarifying and agreeing the purpose of the architecture effort is one of the key parts of this activity and this needs to be clearly reflected in the vision that is created. Architecture projects are often undertaken with a specific purpose in mind - a specific set of business drivers that represent the return on investment for the stakeholders in the architecture development. Clarifying that purpose, and demonstrating how it will be achieved by the proposed architecture development, is the fundamental purpose of the Architecture Vision.

Usually the key elements of the Architecture Vision such as the enterprise mission, vision, strategy, and goals are documented as part of the wider business strategy. In such cases, the activity in Phase A is to verify and understand the documented business strategy and goals, and ensuring that the strategy and goals on the part of the enterprise that lies within the scope of the project is in line with the overall enterprise strategy and goals.

In other cases, little or no Business Architecture work may have been done to date. In such cases, there will be a need for the architecture team to research, verify, and gain buy-in to the key business objectives and processes that the architecture is to support. This may be done as a free-standing exercise.

The Architecture Vision includes a first-cut, high-level description of the baseline and target environments, from both a business and a technical perspective. Business scenarios are an appropriate and useful technique to discover and document business requirements, and to articulate an architectural vision that responds to those requirements. Once an Architecture Vision is defined and documented in the Statement of Architecture Work, it is critical to use it to build a consensus. Without this consensus it is very unlikely that the final architecture will be accepted by the organization as a whole. The consensus is represented by the sponsoring organization signing the Statement of Architecture Work.

To summarize, the key steps in Phase A include:

1. Establish the Project
2. Identify Business Goals and Business Drivers
3. Review Architecture Principles, including Business Principles
4. Define Scope
5. Define Constraints
6. Identify Stakeholders and Concerns, Business Requirements, and Architecture Vision
7. Develop Statement of Architecture Work and Secure Approval

The artifacts generated from this phase include:

- Approved Statement of Architecture Work
- Refined statements of business goals and strategic drivers
- Architecture principles including business principles
- Architecture Vision

The next phase of the model is the **Business Architecture** or Phase B. A knowledge of the Business Architecture is a prerequisite for architecture work in any other domain (Data, Applications, Technology), and is therefore the first architecture activity that needs to be undertaken, if not catered for already in other organizational processes (enterprise planning, strategic business planning, business process re-engineering, etc.). In other words, the Business Architecture is also often necessary to

demonstrate the business value of subsequent Technical Architecture work to key stakeholders, and the return on investment to those stakeholders from supporting and participating in the subsequent work.

The extent of the work in Phase B will depend to a large extent on the enterprise environment. In some cases, key elements of the Business Architecture may be done in other activities; for example, the enterprise mission, vision, strategy, and goals may be documented as part of some wider business strategy or enterprise planning activity. In such cases, there may be a need to verify and update the currently documented business strategy and plans, and to bridge between high-level business drivers, business strategy, and goals on the one hand, and the specific business requirements that are relevant to this architecture development effort.

In other cases, little or no Business Architecture work may have been done to date. In such cases, there will be a need for the architecture team to research, verify, and gain buy-in to the key business objectives and processes that the architecture is to support. This may be done as a free-standing exercise, either preceding architecture development, or as part of Phase A.

A key objective is to re-use existing material as much as possible. In mature architecture environments, there will be existing architecture definitions, which have been maintained since the last architecture development cycle. Where existing architectural descriptions exist, these can be used as a starting point, and verified and updated if necessary. One must ensure that only information that allows informed decisions to be made relevant to the scope of this architecture effort are gathered and analyzed. If this effort is focused on the definition of business processes, then Phase B will necessarily involve a lot of detailed work. If the focus is more on the Target Architectures in other domains (data/information, application systems, infrastructure) to support an essentially existing Business Architecture, then it is important to build a complete picture in Phase B without going into unnecessary detail. Some tools that can be used for this include activity models, use case models, class diagrams (object-oriented tools) and

node connectivity diagrams. Once this is completed the business architecture team needs to identify those artifacts that are relevant to ensure *enterprise continuum*.

The inputs required for this phase include:

- Request for Architecture Work
- Approved Statement of Architecture Work
- Refined statements of business goals and strategic drivers
- Architecture principles, including business principles, when pre-existing
- Enterprise Continuum
- Architecture Vision

To summarize, the key steps included in Phase B includes:

1. Develop Baseline Business Architecture Description
2. Identify Reference Models, Viewpoints, and Tools
3. Create Architecture Models
4. Select Business Architecture Building Blocks
5. Conduct Formal Checkpoint Review of Architecture Model and Building Blocks with Stakeholders
6. Complete Business Architecture

The outputs generated from this phase include:

- Statement of Architecture Work

- Validated business principles, business goals, and strategic drivers
- Target Business Architecture
- Baseline Business Architecture
- Views corresponding to the selected viewpoints addressing key stakeholder concerns
- Gap analysis results
- Technical requirements (identifying, categorizing, and prioritizing the implications for work in the remaining architecture domains)
- Business Architecture Report
- Updated business requirements

The next phase is called **Target Architectures** phase or Phase C which covers both, the **Data and Application Systems** domains. The scope of the business processes supported in Phase C is limited to those that are supported by IT, and the interfaces of those IT-related processes to non-IT-related processes.

Phase C involves some combination of Data and Applications Architecture. Implementation of these architectures does not necessarily follow a one standard approach but the most common implementation approach is top-down design and bottom-up implementation. Another approach is a data-driven sequence, where application systems that create data are implemented first, then applications that process the data, and finally applications that archive data.

The objective of **Data Architecture** is to define the major types and sources of data necessary to support the business, and ensuring that the data is:

- Understandable by stakeholders
- Complete and consistent
- Stable

This effort is not concerned with database design. The goal is to define the data entities relevant to the enterprise, not to design logical or physical storage systems. As part of this phase, the architecture team will need to consider what relevant Data Architecture resources are available in the organization's Enterprise Continuum, particularly generic data models relevant to the organization's industry "vertical" sector. For example, ARTS has defined a data model for the Retail industry.

A key step in validating an architecture is to consider what may have been forgotten (i.e. gaps). The architecture must support all of the essential information processing needs of the organization. The most critical source of gaps that should be considered is stakeholder concerns that have not been addressed in architectural work. This could include data not located where it is needed, data not available when needed, data not created etc.

Gap analysis highlights shortfalls in data services and/or data elements that have been accidentally left out, deliberately eliminated, or are yet to be defined. This can be done by the Gap Analysis Matrix. When the exercise is complete, anything under "Eliminated Services" or "New Services" is a gap, which should either be explained as correctly eliminated, or marked as to be addressed by reinstating or developing the function.

The inputs to this phase are:

- Data principles
- Request for Architecture Work

- Statement of Architecture Work
- Architecture Vision
- Relevant technical requirements that will apply to this phase
- Gap analysis results (from Business Architecture)
- Baseline Business Architecture
- Target Business Architecture
- Baseline Data Architecture
- Target Data Architecture
- Re-usable building blocks, from organization's Enterprise Continuum

The steps involved in this part of the phase includes:

1. Develop Baseline Data Architecture Description
2. Review and Validate Principles, Reference Models, Viewpoints, and Tools

Create Architecture Models

Select Data Architecture Building Blocks

Conduct Formal Checkpoint Review of Architecture Model and Building Blocks with Stakeholders

Review Qualitative Criteria (e.g., performance, reliability, security, integrity)

Complete Data Architecture

Conduct Checkpoint/Impact Analysis

Perform Gap Analysis and Create Report

The outputs of this phase are:

- Statement of Architecture Work
- Baseline Data Architecture
- Validated data principles, or new data principles
- Target Data Architecture
- Viewpoints addressing key stakeholder concerns
- Views corresponding to the selected viewpoints
- Gap analysis results
- Relevant technical requirements that will apply to this evolution of the architecture development cycle
- Data Architecture Report, summarizing what was done and the key findings
- Impact Analysis
- Updated business requirements, if appropriate

The objective of the **Applications Architecture** phase is to define the major kinds of application system necessary to process the data and support the business. In other words the goal is to define what kinds of application systems are relevant to the enterprise, and what those applications need to do in order to manage data.

As part of this phase, the architecture team will need to consider what relevant Applications Architecture resources are available in the Enterprise Continuum.

Gap analysis is also performed in this phase and is a key step in validating an architecture is to consider what may have been forgotten. The architecture must support all of the essential information processing needs of the organization. The most critical source of gaps that should be considered is stakeholder concerns that have not been addressed in architectural work. Like in the Data Architecture phase, the gap analyses highlights shortfalls in applications that have been accidentally left out, deliberately eliminated, or are yet to be defined.

The inputs to this phase include:

- Application principles
- Request for Architecture Work
- Statement of Architecture Work
- Architecture Vision
- Relevant technical requirements that will apply to this phase
- Gap analysis results
- Baseline Business Architecture
- Target Business Architecture
- Re-usable building blocks, from organization's Enterprise Continuum
- Baseline Applications Architecture

- Target Applications Architecture

The steps in this phase include:

1. Develop Baseline Applications Architecture Description
2. Review and Validate Principles, Reference Models, Viewpoints, and Tools

Create Architecture Models

Identify Candidate Application Systems

Conduct Formal Checkpoint Review of Architecture Model and Building Blocks with Stakeholders

Review Qualitative Criteria (e.g., security, availability, performance, costs)

Complete Applications Architecture

Perform Gap Analysis and Create Report

The outputs of this phase are:

- Statement of Architecture Work
- Baseline Applications Architecture
- Validated application principles, or new application principles
- Target Applications Architecture
- Viewpoints addressing key stakeholder concerns
- Views corresponding to the selected viewpoints
- Gap analysis results

- Applications Architecture Report, summarizing what was done and the key findings
- Impact Analysis
- Updated business requirements, if appropriate

Benefits

The primary reason for developing an enterprise architecture is to support the business by providing the fundamental technology and process structure for an IT strategy. This in turn makes IT a responsive asset for a successful modern business strategy. Businesses know that the effective management and exploitation of IT is the key to business success, and vital to achieve competitive advantage. An enterprise architecture addresses this need, by providing a strategic context for the evolution of the IT system in response to the constantly changing needs of the business environment.

A good enterprise architecture enables you to achieve the right balance between IT efficiency and business innovation. It allows individual business units to innovate safely in their pursuit of competitive advantage. At the same time, it assures the needs of the organization for an integrated IT strategy, permitting the closest possible synergy across the extended enterprise.

The technical advantages that result from a good enterprise architecture bring important business benefits, including:

- A more efficient IT operation
- Better return on existing investment, reduced risk for future investment
- Faster, simpler, and cheaper procurement

Using an architecture framework speeds up and simplifies architecture development, ensures more complete coverage of the solution, and makes certain that the architecture selected allows for future growth in response to the needs of the business. TOGAF plays an important role in helping to simplify the architecture development process, enabling IT users to build genuinely open systems-based solutions to their business needs.

IT customers who do not invest in enterprise architecture typically find themselves pushed unavoidably to single-supplier solutions in order to ensure an integrated solution. At that point, no matter how open any single supplier's products may be in terms of compliance to standards, the customer will be unable to realize the potential benefits of truly heterogeneous, multi-vendor open systems.

Sources:

1. www.ibm.com/developerworks/library/ar-togaf1/
2. www.opengroup.org/architecture/togaf8-doc/arch/
3. www.togaf.org/
4. *en.wikipedia.org/wiki/TOGAF*