Article

A Need for Formalization and Auditing in Enterprise Architecture Approaches and Programs

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Abstract

This article discusses two important improvements that are needed in Enterprise Architecture (EA) programs: (1) formalization in EA approaches and (2) auditing of EA programs. Formalization occurs through the implementation of six elements that are foundational to any EA approach: governance, methodology, framework, artifacts, repository, and best practices. Auditing is accomplished through an approach-neutral process that evaluates completeness, consistency and utilization to promote transparency, accountability, maturity, and value. The article provides context through a discussion of the background of EA, the growing popularity of EA programs in the public and private sectors, and the mixed record of value the EA programs have produced for different stakeholder groups, some of whom tend to view a formalized architecture as expensive to develop, light on returns, and a threat to project or system-specific interests. Auditing is discussed as a best practice that should be considered as an essential aspect of any EA program, just as auditing is integral to most quality assurance approaches and is the impetus for several influential federal laws that seek to improve accountability, accuracy, and service delivery. The article concludes with an introduction of the EA Audit Model (EA2M) as a method to support the formalization and maturation of EA programs.

INTRODUCTION

Enterprise Architecture (EA) is a management and technology discipline that has emerged during the last two decades. In this timeframe, EA has evolved from a concept for improving the use of information technology (IT) to a holistic approach for all dimensions of an enterprise: strategic, business, and technology. This is done by linking strategic drivers, business requirements, and technology solutions within and between all of an enterprise's lines of business. Today, the primary goal of EA is to improve performance by achieving and maintaining coherence, which is a clear understanding of an enterprise's current capabilities and future options.

During the past twenty years, formal EA programs have been established in many public, private, military, academic, and non-profit organizations around the world. This is especially true for large, complex enterprises that continually deal with issues of aligning strategic goals and integrating business requirements across a broad spectrum of stakeholder interests. The popularity of EA programs has grown with the increasing importance of IT within organizations, especially in the form of e-business and e-government applications. Nevertheless, EA programs have produced varying degrees of value for different stakeholder groups, some of whom tend to view a formalized architecture as expensive to develop, light on returns, and a threat to project or system-specific interests.

The fact that some EA programs have not produced desired levels of value is an indication that requirements and/or expectations for EA development and use are often not sufficiently articulated. Also, even with twenty years of

investment, the EA discipline is still evolving toward a useful meta-architecture, so perceptions of low value delivery among some stakeholder groups is to be expected and is not an indication of EA's ultimate capability. Additionally, it should be recognized that the very act of 'structuring' an organization (or other type of enterprise) inherently creates an architecture, which may remain undocumented and therefore may not be available as a reference for planning and decision-making. The lack of a formalized architecture that can help to manage change and create agility is arguably more of a problem than are the issues associated with the creation and use of a documented EA.

Having said this, two concepts are discussed in this article that can improve EA program development and use in public and private sector organizations:

Architectures Must Be Formalized. Harnessing the power of an enterprise-wide architecture requires that it be formally documented and maintained on an ongoing basis through an EA program that meets criteria for formalization and completeness.

Architectures Must Be Audited. EA program performance and value can be enhanced through the use of a best practice - a formal audit process that is applied on a periodic basis through annual reviews and no-notice spot checks. The "EA Audit Model" that is presented in basic form for the first time in this article builds upon and extends prior methods, is current in that it accommodates many popular EA approaches (e.g., Zachman, TOGAF, DODAF, EA3), and is comprehensive in auditing three primary areas: completeness, consistency, and utilization.

BACKGROUND

Enterprise Architecture Approaches and Assessment Methods

The widely-acknowledged initial description of what was to become the practice of EA was published in a 1987 article entitled "Information Systems Architecture" by John Zachman in the *IBM Systems Journal.* His approach began with a set of data, function, and network artifacts (artifacts are models and other types of documentation) that were expanded in 1992 to include people, time, and motivation-related artifacts (Zachman, 1997; Zachman & Sowa, 1992). In 1992, a book on "Enterprise Architecture Planning" by Steven Spewak (Foreword by John Zachman) presented the first EA development methodology and a framework that called for the development of current and future views of an enterprise's business, data, application, and technology sub-architectures using Zachman's initial artifact set. What was different about the writings of Zachman, Spewak, and Sowa is that they moved the initial thinking about IT architecture from a systems-centric view to an enterprise-wide view.

While this new architecture thinking expanded the focus beyond the individual system, most practitioners continued to treat the development of an architecture as an IT activity. This IT-centric view continued until the mid-1990s when business requirements were increasingly recognized as the driver for IT solutions, and EA began to be described in more business/mission-centric terms for use in the public and private sectors (Cook, 1996; Federal CIO Council, 1999). The expansion continued when a decade later a strategic level of the architecture was specified apart from the business layer. Indeed, strategic goals and initiatives were recognized as being the context and rationale for identifying business workflow requirements and technology solutions at the application, system, and infrastructure levels (Bernard, 2004, Ross et al., 2006). Additional topics such as security and workforce planning also began to emerge in several EA approaches (Bernard, 2004; Federal EA Security and Privacy Profile, 2005).

During the past decade, a parallel development was the emergence of methods to assess the maturity and effectiveness of EA programs, led primarily by the U.S. Federal Government. This movement began in 1996 with passage the Clinger-Cohen Act, which mandated the development and maintenance of an IT architecture by each Federal Agency (Public Law 104-106). From this, two government approaches were articulated: (1) the "C4ISR Framework" published in 1997 and re-released in 2001 as the Department of Defense Architecture Framework (DODAF) which is mandated for use in defense agencies, and (2) the Federal CIO Council's publication of the Federal EA Framework in 1999 for use in civilian agencies.
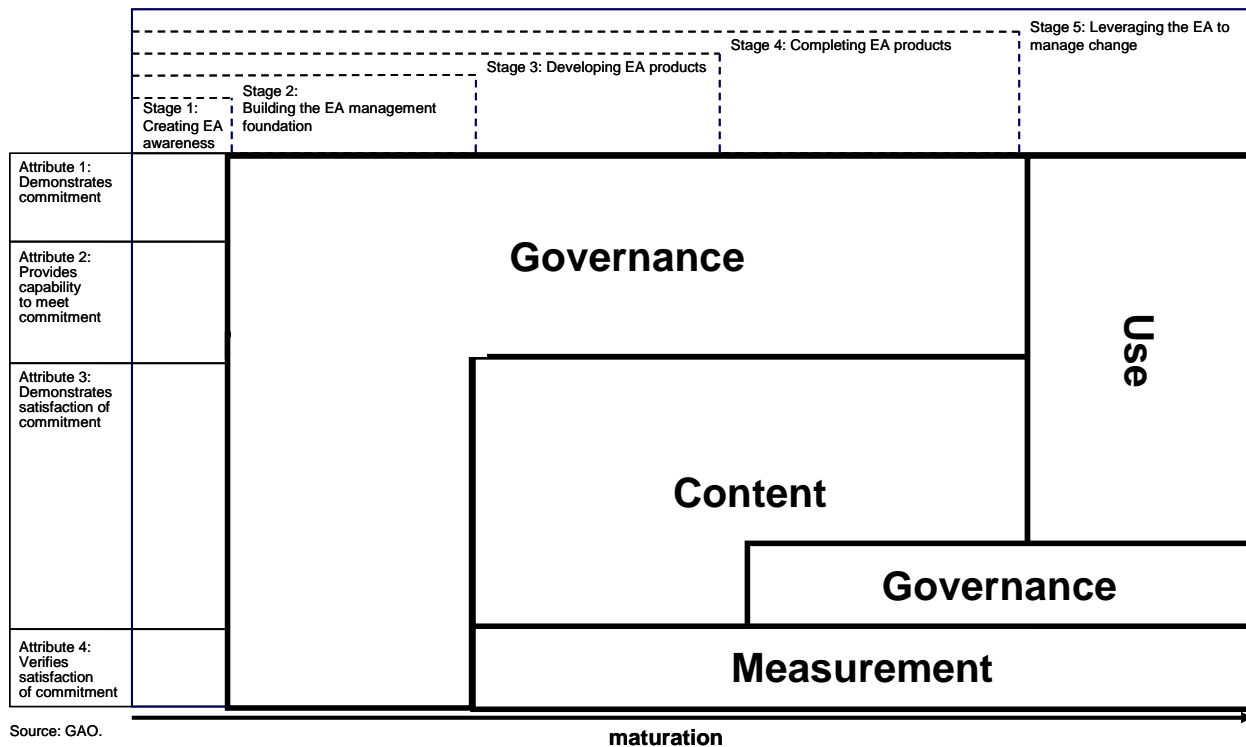
The General Accounting Office, later renamed the Government Accountability Agency (GAO), is an organization in the Legislative Branch of the U.S. Government that supports Congress by performing various assessment functions, including audits of Federal Government agencies in the Executive Branch to determine if the mandates of laws passed by Congress are being correctly and effectively implemented by the agencies. To do this GAO develops assessment and audit methods, some of which become best practices in the public and private sectors. In 2002, GAO developed the EA Management Maturity Framework (EAMMF) for use by GAO and Federal Government agencies to assess compliance with the EA-related provisions of the Clinger-Cohen Act and the maturity of managing agency EA programs. The EAMMF identifies five stages of architecture management maturity and four sets of success attributes for an EA program, as well as nineteen core elements that must be achieved for an agency's EA program to be ranked at the top stage of maturity. The EAMMF was updated in 2003 to extend to thirty-one core elements and has been used in subsequent government-wide surveys and EA program audits conducted by GAO. The maturity levels, success attributes, and core elements of the EAMMF are shown in Figure 1, and the general evaluation purposes of the EAMMF (governance, content, measurement, and use) are shown in Figure 2 (GAO, 2007).

	Stage 1: Creating EA awareness	Stage 2: Building the EA management foundation	Stage 3: Developing EA products	Stage 4: Completing EA products	Stage 5: Leveraging the EA to manage change
Attribute 1: Demonstrates commitment		Adequate resources exist. Committee or group representing the enterprise is responsible for directing, overseeing, and approving EA.	Written and approved organization policy exists for EA development.	Written and approved organization policy exists for EA maintenance.	Written and approved organization policy exists for IT investment compliance with EA.
Attribute 2: Provides capability to meet commitment		Program office responsible for EA development and maintenance exists. Chief architect exists. EA being developed using a framework, methodology, and automated tool.	EA products are under configuration management.	EA products and management processes undergo independent verification and validation.	Process exists to formally manage EA change. EA is integral component of IT investment management process.
Attribute 3: Demonstrates satisfaction of commitment		EA plans call for describing both the "as-is" and the "to-be" environments of the enterprise, as well as a sequencing plan for transitioning from the "as-is" to the "to-be." EA plans call for describing both the "as-is" and the "to-be" environments in terms of business, performance, information/data, application/service, and technology. EA plans call for business, performance, information/data, service, and technology descriptions to address security.	EA products describe or will describe both the "as-is" and the "to-be" environments of the enterprise, as well as a sequencing plan for transitioning from the "as-is" to the "to-be." Both the "as-is" and the "to-be" environments are described or will be described in terms of business, performance, information/data, application/service, and technology. Business, performance, information/data, application/service, and technology descriptions address or will address security.	EA products describe both the "as-is" and the "to-be" environments of the enterprise, as well as a sequencing plan for transitioning from the "as-is" to the "to-be." Both the "as-is" and the "to-be" environments are described in terms of business, performance, information/data, application/service, and technology. Business, performance, information/data, application/service, and technology descriptions address security. Organization CIO has approved current version of EA. Committee or group representing the enterprise or the investment review board has approved current version of EA.	EA products are periodically updated. IT investments comply with EA. Organization head has approved current version of EA.
Attribute 4: Verifies satisfaction of commitment		EA plans call for developing metrics for measuring EA progress, quality, compliance, and return on investment.	Progress against EA plans is measured and reported.	Quality of EA products is measured and reported.	Return on EA investment is measured and reported. Compliance with EA is measured and reported.

Source: GAO.

maturation →

Figure 1. GAO's Enterprise Architecture Management Maturity Framework (EAMMF), Version 1.1

Figure 2. EAMMF – General Evaluation Categories

In 2004, the U.S. Office of Management and Budget (OMB) developed the EA Assessment Framework (EAAF) that has been used on an annual basis as a self-assessment tool for Federal Agencies. OMB is part of the Executive Office of the President and provides budget and program policy, guidance, and procedures to all of the agencies in the Executive Branch of the U.S. Federal Government (there are over two-hundred Departments, Agencies, Boards, and Commissions). OMB is "focused on helping agencies develop their Enterprise Architecture (EA) programs so that they can benefit from the results of using EA as a strategic planning tool. OMB is striving to help agencies link departmental-level EA throughout their operations, so that its value is reflected in both internal operational decision-making, as well as the identification of government-wide common solutions for improved service to citizens. The EAAF was updated in 2006 and 2007 to reflect new initiatives and guidance developed within the Federal EA community" (OMB 2008). The EAAF is organized into three capability areas: Completion, Use and Results. The current version (3.0) of the EAAF had a number of changes, which OMB described as follows:

"*Enterprise Architecture Assessment Framework (EAAF) Version 3.0 measures planned and delivered improvements to agency performance in five ways:*

- *Closing agency performance gaps identified via agency performance improvement and strategic planning activities.*

- *Saving money and avoiding cost through:*

- *Collaboration and reuse;*

- *Process reengineering and productivity enhancements; and*

- *Elimination of redundancy.*

Strengthening the quality of investments within agency portfolios as reflected in critical attributes including (but not limited to): security, inter-operability, reliability, availability, end-user performance, flexibility, serviceability, and reduced time and cost to deliver new services and solutions.

Improving the quality, validity, and timeliness of data and information regarding program performance output and outcome; program and project planning and management; and cost accounting.

Under previous versions of the EAAF, agencies have achieved, to varying degrees, a basic level of process and architectural maturity. Looking forward, the evolution of the EAAF is being driven by what agencies are doing to drive to outcome-focused architecture. In particular, recognizing that strategic planning, enterprise architecture (EA), capital planning and investment control (CPIC), and performance assessment and management are linked processes. And that the only way to insure that they work together towards targeted outcomes is to insure that at each step we understand and measure process outcomes vs. process compliance.

The scope of EAAF Version 3.0 spans planning, investment, and operations activities required to work in concert to improve agency performance through the management and use of information and information technology. EAAF Version 3.0 features extensive use of key performance indicators (KPIs) measuring outcomes across strategic planning, EA, CPIC, and performance data. To support automation and accuracy in producing the KPIs, EAAF Version 3.0 moves agency EA submissions to a template-based model similar to the current agency budget submission process for the Exhibit 53 and Exhibit 300.

EAAF Version 3.0 also changes the assessment and reporting process. Instead of a single annual assessment, Version 3.0 moves to separate submissions for each of the Completion, Use, and Results capability areas in order to better align EA with the other linked processes. Also, the thresholds for certain KPIs are being phased in over two submission cycles to allow agencies the opportunity to properly implement the changes required in the move to Version 3.0.

The EAAF supports the policy implementation assessment and enforcement for achieving the EA and related requirements set forth in OMB Circulars A-130 and A-11. EAAF Version 3.0 is closely aligned with the methodologies, reporting templates, and tools such as the Federal Transition Framework (FTF), the Federal Segment Architecture Methodology (FSAM), and VUE-IT or Visualization to Understand Expenditures in Information Technology."

In 2004, Jaap Schekkermann, founder of the Institute for EA Developments in the Netherlands developed the Extended Enterprise Architecture Maturity Model (E2AMM) that lists six maturity levels and the following eleven areas for measuring maturity:

- Business & Technology Strategy Alignment
- Extended Enterprise Involvement
- Executive Management Involvement
- Business Units Involvement
- Extended Program Office
- Extended Developments
- Extended Enterprise Architecture Results
- Strategic Governance
- Enterprise Program Management
- Holistic Extended Enterprise Architecture
- Enterprise Budget & Procurement Strategy

Process Maturity Approaches
Many approaches to evaluating process maturity were influenced by the work of Philip Crosby (1979) and Watts Humphrey (1989). Crosby introduced the concept of a "quality management maturity grid" with five stages of maturity for initiatives intended to manage quality in organizations, and Humphrey applied this to the task of managing quality in the domain of software development. In 1991, Humphrey's efforts at Carnegie Mellon University's Software Engineering Institute (SEI) bore fruit in the form of the publication called the Capability Maturity Model® (CMM®; see Paulk, et al., 1991). The CMM contained five levels of maturity for software development organizations, along with an auditing method useful to guide their self-improvement or as a framework for a formal, external capability determination. In 2002 the newer CMM Integration[SM] (CMMI®) model was introduced, along with training components and a family of appraisal methods (the Standard CMMI Appraisal Method for Process Improvement, SCAMPI[SM] Class A, Class B, and Class C). Class A appraisals are complete in documenting and verifying objective evidence and in validating findings. They provide reliable and repeatable rating results. Class B and C appraisals are less intensive, using fewer resources and smaller teams, for example, to perform a preliminary analysis of an organization's processes. (Note: The terms Capability Maturity Model, CMM, and CMMI are registered with the U.S. Patent and Trademark Office by Carnegie Mellon University. The terms

"CMM Integration" and "SCAMPI" are service marks of Carnegie Mellon University).

Since 2002, the CMMI product suite has expanded to include model components, training components, and appraisal components organized by areas of interest called "constellations." As is shown in Figure 3, three of SEI's constellations are "CMMI-DEV" for organizations that develop products or services, "CMMI-ACQ" for organizations that are acquiring products and services, and "CMMI-SVC" for organizations that are service providers or their clients. The current set of constellations contains 16 common core process areas, plus additional process areas that are unique to each

constellation. Taken together, the process areas encompass the ways an organization performs its work, so the set of process areas comprise a framework to implement best practices and thereby gain expected improvements in cost, schedule, productivity, quality, and customer satisfaction. SEI reports that, since 2002, more than 80,000 people have received training on CMMI models, and more than 3,000 SCAMPI appraisals have been conducted by organizations in over 60 countries around the world (for more information see www.sei.cmu.edu). Stimulated by this approach, many other capability models and/or maturity models have emerged in many different application domains.
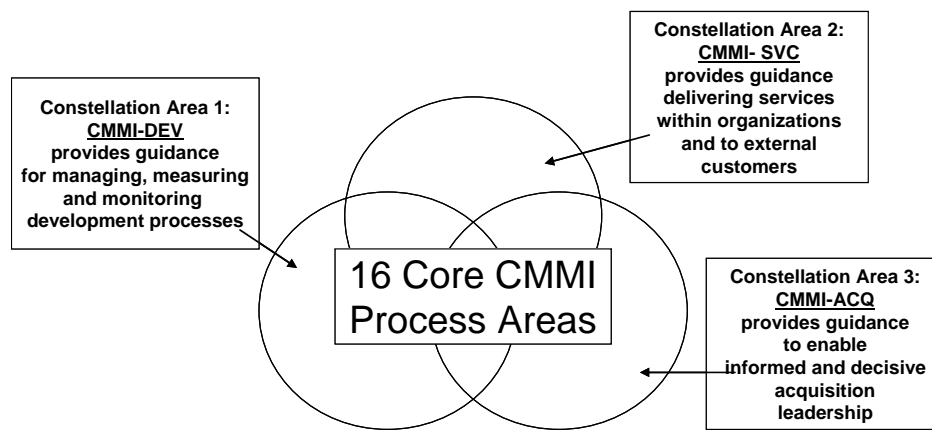
Figure 3. CMMI Constellation Areas and Core Processes

ENTERPRISE ARCHITECTURE FORMALIZATION

For an EA to be effective and authoritative at all levels and in all dimensions of an enterprise, the EA must integrate the strategy, business, and technology aspects of the architecture through a formal, ongoing program and an approach that has six basic and essential elements: (1) an EA governance process that integrates with other management processes; (2) a repeatable methodology that supports program implementation and maintenance: (3) a

framework to establish the scope of the architecture and the relationship of sub-architectures and other components; (4) a comprehensive and integrated set of documentation artifacts; (5) documentation tools to assist with modeling, and configuration control that uses an on-line repository for storing the documentation; and (6) associated best practices to guide EA documentation and use. Figure 4 shows the six essential elements of an enterprise architecture approach.
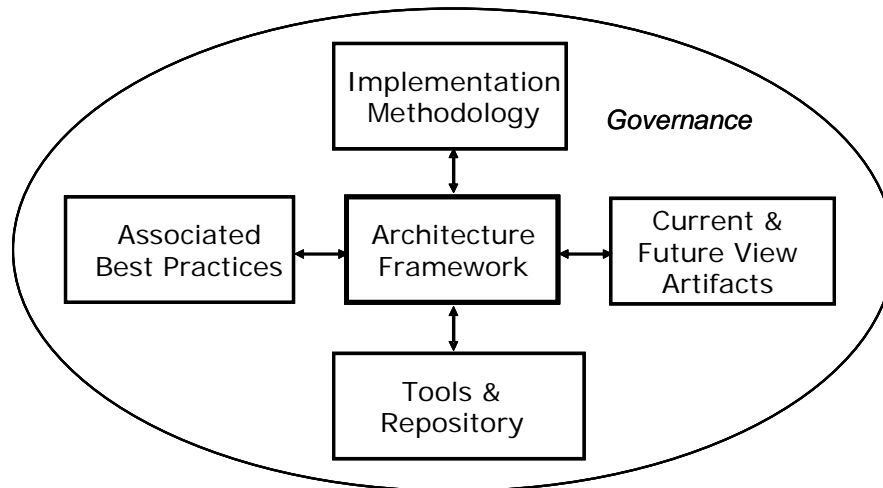
Figure 4. The Essential Elements of an Approach to Enterprise Architecture

Each of these six basic and essential elements plays an important part in the development, maintenance, and use of the architecture. The elements must not only be present, but they must be designed to work together to make the EA approach useful in the strategic, business, and technology dimensions across all lines of business. Their presence is also key to enabling the EA to serve as the meta-architecture for an enterprise and is essential to achieving higher levels of architecture maturity. Therefore these elements are a foundational part of the EA audit procedure described later in this article. A number of current EA approaches do not have all six of these elements and therefore are lacking in fundamental ways. For example, without a prescribed artifact set that covers all areas of the framework, it is not possible to document and relate the strategic, business, and technology areas of the architecture in a consistent way across all lines of business. Without a specified way to select associated best practices for use within the EA approach at various sub-architecture levels, there can be confusion about which one is the meta-approach and which one is the supporting approach (e.g., Balanced Scorecard™, service-oriented architecture methods, object-oriented database design methods, CORBA software integration standards, and IT Infrastructure Library™

standards). EA has evolved to be a meta-approach, which stands in contrast to other planning, design, analysis, modeling, and management methods – which are best suited to serve in a supporting role in the strategic, business, data, application, infrastructure, and/or security areas of the EA. Figure 5 provides an example EA approach called the "EA^3 Cube" (Bernard, 2004) which contains all six essential elements in a way that is designed to integrate the elements. The governance element provides for how the architecture information is used by stakeholders; the methodology element provides how to establish and maintain the EA and ongoing program; the framework establishes the scope and relationship of the architecture; the artifacts document the architecture (in current and future states); the repository is designed to contain the artifacts in a navigable way and align with the underlying framework; and best practices are identified for use at each sub-architecture level that is defined in the framework.

The auditing of EA programs, which is described in more detail later in this article, would be considered as one of the "best practice" elements, in that it is a proven way to improve many types of programs and processes.
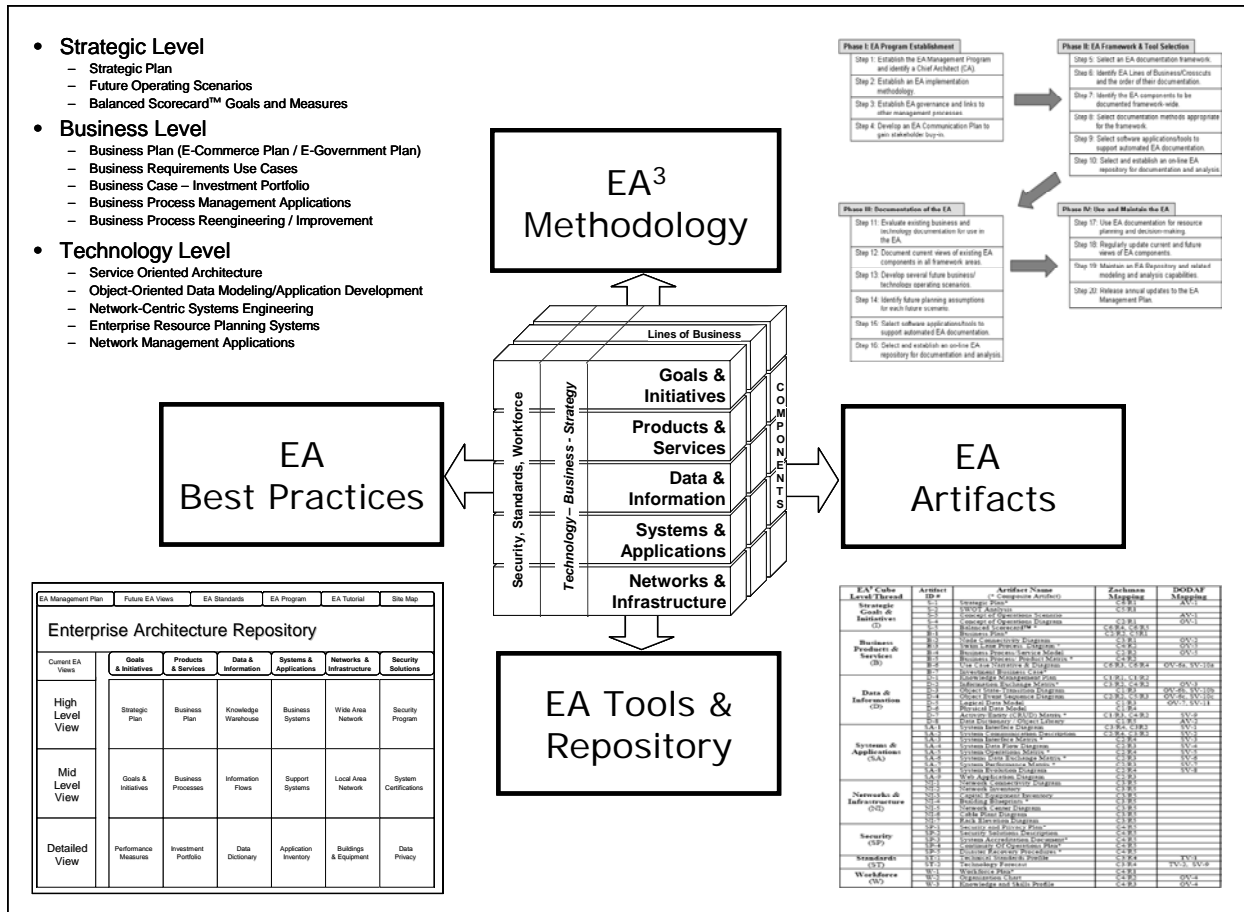
Figure 5. Example of the Essential Elements of a Complete EA Approach – EA^3 Cube

AUDITING AN ENTERPRISE ARCHITECTURE PROGRAM

Since the primary purpose of an EA program is to document an enterprise in current and future states to improve performance and coherency, the process for auditing an EA program must include general areas for completeness, consistency, and utilization. The Enterprise Architecture Audit Model (EA2M) follows generally accepted audit procedures and can be used with public and private sector EA programs based on any specific approach (e.g., Zachman, TOGAF, DODAF, FEAF, EA3, and GERAM) to measure maturity in the three areas: Completeness, Consistency, and Utilization. For example, in the 'Completeness' audit category the six basic elements of any EA approach are evaluated. In this way, the audit method can be consistently employed and resulting maturity

scores can be used to track progress. Figure 6 shows the basic format, audit categories, maturity levels, and indicators of the EA2M approach.

Most of these public and private sector EA approaches do not have program formalization, activity, or maturity evaluation or auditing methods at present, which is a gap in the general practice of EA that the EA2M closes in that it can be used with any of them because EA2M's three maturity areas (Completeness, Consistency, and Utilization) are general (yet foundational) in nature and it is the particular EA2M audit template for each approach that provides the specificity needed for an effective audit – in the context of that approach.

Enterprise Architecture Audit Model (EA2M)					
	Level 1	Level 2	Level 3	Level 4	Level 5
Maturity Level	**No Formalized Architecture**	**Foundational Architecture** (General Indicators)	**Extended Architecture** (General Indicators)	**Embedded Architecture** (General Indicators)	**Balanced Architecture** (General Indicators)
Audit Category #1: Completeness					
Governance	Default initial level	EA Governance process selected	Governance initial implementation	Governance full implementation	Ongoing integration with management processes
Methodology		EA Methodology steps selected	Methodology initial implementation	Methodology full implementation	Methodology repeatable and steps optimized
Framework		EA Framework design selected	Framework initial implementation	Framework full implementation	Framework design optimized
Artifacts		EA Artifact set selected	Artifact intial implementation	Artifact full implementation	Artifacts used to support planning/decision-making
Tools / Repository		EA Tools & Repository selected	Tool & Repository initial implementation	Tool & Repository full implementation	Tool use & Repository design optimized
Best Practices		Best Practices selected	Best Practices initial implementation	Best Practices full implementation	Ongoing integration of Best Practices
Audit Category #2: Consistency					
Program	Default initial level	EA program approved	EA program initial implementation	EA program full implementation	EA program optimized
Policy		EA policies selected	EA policy initial implementation	EA policy full implementation	EA policy optimized
Resources		EA resources identified	EA resource requirements met	EA resources fully utilitzed	EA resources optimized
Training		EA training requirements identified	EA training initial implementation	EA training full implementation	EA training optimized
Audit Category #3: Utilization					
Strategic Value	Default initial level	Strategic goals & metrics identified	Strategic goals & business svcs mapped	Strategic goal attainment supported by the EA	Strategic goal attainment optimized via the EA
Business Value		Business services & requirements indentified	Business requirements and IT solutions mapped	Future business service scenarios established	Business services optimized via the EA
Technology Value		Current technology solutions identified	Future technology solutions refined	Future technology scenarios established	Technology use optimized via the EA
Risk & Security Management		Risk & security areas identified	Risk & security solution initial implementation	Risk & security solution full implementation	Risk mitigation optimzed via the EA
Coherency		Coherency goals & metrics identified	Coherency goals initially met	Coherency goals fully met	Coherency optimized via the EA

Figure 6. The Enterprise Architecture Audit Model (EA2M)

The EA2M's five maturity levels are based on the progressive stages of development that architectures go through (Doucet et al, 2009). Table A describes in summary form each of the five levels. It should be noted that just as with the CMMI maturity method, reaching each subsequent level for EA program maturity is a cumulative process, in that the key elements of the architecture at each maturity level are retained as the program progresses upward toward Level 5. This top level is where all of the elements of the EA program are working synergistically to create value as the architecture is used to support planning, decision-making, and to drive change in the organization.

EA Program Maturity Level 1	EA Program Maturity Level 2	EA Program Maturity Level 3	EA Program Maturity Level 4	EA Program Maturity Level 5
No Formalized Architecture	**Foundational Architecture**	**Extended Architecture**	**Embedded Architecture**	**Balanced Architecture**
Maturity Level 1 is the 'default' level for all enterprises that do not have an established EA program and/or documented architecture.	At Maturity Level 2, the 'foundational' elements of the EA are being put in place. EA is documented for the entire enterprise in its current and future states. The focus is on well-architected, well-designed IT systems with enterprise-level alignment, efficiency, and interoperability. Accordingly, EA at this level is very IT-centric, and for many people the EA would be viewed as a data and technology architecture, except that it is being implemented at the enterprise level. This perspective does help to leverage concepts such as federated patterns, but under-delivers from an enterprise-wide strategy and business perspective. Also, the value of EA is measured according to the success of IT investments.	At Maturity Level 3, the architecture is 'extended' to focus on engineering an entire enterprise from an integrated strategy, business, & technology perspective. To support this, approaches and tools are developed to provide standardized, repeatable methods for describing the enterprise in all dimensions - beyond just the IT perspective. Whereas early EA used architecture methods and tools to capture business requirements in order to design IT systems, an "extended" EA approach uses architecture methods and tools to capture strategic goals and related business requirements in order to design the enterprise.	At Maturity Level 4, EA tools, methods, and models become 'embedded' in the normal (usually existing) processes of the day. Rather than relying on processes and people extraneous to the business programs (and their processes), the architecture is produced by the processes themselves. In this way the architecture is organic and is renewed on an ongoing basis as a natural outcome of normal business processes.	At Maturity Level 5, the elements of architecture at the three previous levels are 'balanced' and are all working synergistically to optimize EA completeness, consistency, and utilization. In so doing, the EA helps the organization to be more agile and competitive as various future operating scenarios are envisioned on an ongoing basis and appropriate courses of action are chosen and implemented in ways that effectively mitigate risk and help to manage change, innovation, and continuous improvement.

Table A. Maturity Levels of the EA Audit Model

EA2M AUDIT PROCEDURE

Auditing is accomplished through an approach-neutral process that evaluates completeness, consistency and utilization to promote transparency, accountability, maturity, and value Auditing is an essential aspect of most program/process quality assurance approaches (including CMMI), as well as a number of public laws that seek to improve accountability, accuracy, and service delivery. These include the U.S. Government's Federal Financial Management Improvement Act of 1996 (FFMIA), the Sarbanes-Oxley Act of 2002, and the Federal Information Security Management Act of 2002 (FISMA). Auditing of EA programs has been occurring in U.S. government agencies since 2002 and EA audits were included as a mandate of the Korean Government's IT Architecture Act of 2006.

The EA2M audit is designed to help organizations to identify the strengths and weaknesses of their EA program, reveal crucial risks, set priorities for improvement plans, derive ratings, and support realistic benchmarking. The EA2M is the evaluation 'framework' to be used for the collection and analysis of information, and to generate accurate and valid level ratings to be reported to the organization.
The EA2M Audit Procedure (EA2M-AP) is the method including all steps necessary for objective evaluation, including preparation, collection of evidence, formulation of preliminary findings and ratings, finalizing findings, reporting, and follow-on activities. As with SCAMPI Class A, B, or C appraisal methods, which vary in their intensity and resource consumption, each organization should tailor their audit plans on dimensions including the goals to be served, the amount of objective evidence to be gathered, the resources to be allocated, the size of the team to be involved, and the nature and use of final reports to be prepared. The following is the set of steps covering the basic elements of the EA2M-AP:

1. Plan & Prepare for the EA Program Audit
1.1 Set Goals, Analyze Objectives/Requirement
1.2 Develop an Audit Plan and Schedule
1.3 Select and Prepare an Audit Team
1.4 Obtain/Inventory Initial Objective Evidence
1.5 Prepare for Conduct of the Audit

2. Conduct the EA Program Audit
2.1 Prepare Participants
2.2 Examine and Collect Objective Evidence
2.3 Document Objective Evidence
2.4 Verify Objective Evidence
2.5 Prepare and Validate Preliminary Findings
2.6 Generate Audit Results

3. Report Audit Results
3.1 Deliver Audit Results
3.2 Package and Archive Appraisal Assets

The EA2M-AP is intended to be implemented at both a basic and an advanced audit level to allow organizations to choose the depth to which they want the audit analysis to occur. A basic audit provides an organization with an initial estimate of the maturity of the program, or may be used to assist in establishing an EA program, with no 'official' maturity rating being given. The advanced audit provides a comprehensive look at all aspects of the EA program using the audit categories and indicators in the EA2M model, and results in an 'official' maturity level rating. Repeated annual audits and periodic spot checks that use the EA2M are the best way to ensure consistency in evaluating the EA program and progress in attaining higher levels of maturity. A summary of these audit levels is provided in Table B as follows:

	Basic EA Program Audit	**Advanced EA Program Audit**
Audit Team	1-2 People	2-5 People (Depends on EA Program Size)
Timeframe	2-4 Days	5-10 Days (Depends on EA Program Size)
Depth of Analysis	Cursory	Complete
Recommended Groups	Beginning EA programs and all initial audits. Provides feedback but no official rating.	After the basic audit is done and for subsequent audits. Allows for consistency in maturity tracking. Only way to get official rating.

Table B. Basic and Advanced EA2M Audit Characteristics

The final aspect of the EA2M-AP to be covered is the training and credentialing of the auditors. To maintain consistency and respect for the audit procedure, findings, recommendations, and ratings it is important that the auditors be experienced senior enterprise architects who are trained in the EA2M-AP process. At present, the authors are the only approved EA2M auditors, yet auditor training courses are planned for the mid- to late-2010 timeframe. Links with existing quality assurance groups are also in coordination to promote consistency in the training levels and integration with other quality approaches.

CONCLUSION AND NEXT STEPS

This article focused on the importance of formalizing and auditing enterprise architecture programs in order to improve their value to public and private sector organizations. Formalization of an EA program centers on the establishment and maintenance of six basic elements: governance, methodology, framework, tools/repository, and associated best practices. The EA Audit Model (EA2M) was presented as the basis for an audit procedure that reviews EA programs for maturity in three general categories: completeness, consistency, and utilization. The basic steps of the EA2M Audit Procedure were introduced which create a comprehensive and repeatable method for conducting EA program audits. Basic and advanced forms of the EA2M audit were also introduced as a way for organizations to have the option of doing preliminary reviews prior to comprehensive audits. The training and certification of EA2M auditors is in the beginning stages, with courses and reference materials planned for release in 2010. Subsequent research in this area and application of the EA2M audit process will provide the basis for additional writings, an EA2M Auditor's Handbook, and applied case studies. Templates for using the EA2M to audit architectures based on popular approaches will also be provided (e.g., Zachman, DODAF, TOGAF, FEAF, and EA3).

AUTHOR BIOGRAPHIES

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