a|EA JOURNAL

Article

Using Enterprise Architecture to Integrate Strategic, Business, and Technology Planning

Scott Bernard

ABSTRACT

One of the greatest challenges that large, complex enterprises face is to develop a way to holistically see themselves as they currently are and as they want to be in the future. It is valuable for large, complex enterprises to be able to do this so they can optimize the use of current resources in accomplishing strategic goals and line-of-business objectives, as well as being able to model and analyze alternative future states that will improve agility and competitiveness. This article proposes that enterprise architecture (EA) is an effective way to develop current and future views of the entire enterprise, or parts of the enterprise, on an ongoing basis. EA does this primarily by integrating the processes for strategic, business, and technology planning in a way that also integrates with other business and technology governance processes (e.g., capital planning, program management, risk management, security, and workforce planning). EA also provides a detailed, repeatable, and scalable methodology for documentation and analysis that utilizes an organizing framework, documentation artifacts, a repository, and best practices. The EA^3 Cube Framework™ and the "Living Enterprise™ repository (developed by the author in 2003) will be used to discuss how EA works and how it integrates with other areas of governance. The role of theory in grounding governance and best practices is discussed, and the "Organization Network Model" is introduced as a model of how modern organizations often function and as the underpinning of the EA^3 Cube Framework. The article concludes by observing that EA is unique among existing management practices in that it provides a way to abstract and understand large, complex enterprises in their entirety, and is increasingly being used on a global basis in the public and private sectors to support planning and decision-making at the executive, management, and staff levels of the enterprise, as well as to guide the selection and implementation of projects to achieve strategic and tactical goals.

KEYWORDS

enterprise architecture, strategic planning, business agility, technology planning, integration, governance, EA^3 Cube Framework, methodology, repository, best practices, artifacts, theory, Network Organization Model, Living Enterprise

INTRODUCTION

Large, complex enterprises in the public and private sectors have difficulty creating holistic, understandable, and scaleable models of themselves on an ongoing basis, and few of the enterprises that attempt to model themselves can do so from an integrated strategic, business, and technology perspective across all of their lines of business. When they are created, these integrated models amount to an architecture of the entire enterprise that promotes agility and competitiveness by improving analysis, planning, and decision-making at the executive, management, and staff levels.

The need to improve the performance and agility of large, complex enterprises has been covered extensively in business and technology

publications for many years, but the role of enterprise-wide standards for abstraction and modeling were often absent in those writings. This omission is akin to discussing the need to improve the design of skyscrapers without having standard methods for developing blueprints. For example, a popular business book in the 1990's was *Reengineering the Corporation* (Hammer and Champy, 1993) and it discussed the need for corporations to reinvent themselves through reengineering, which these authors defined as "the fundamental rethinking and radical redesign of business processes to achieve dramatic improvements in critical, contemporary measures of performance, such as cost, quality, service, and speed." Process reengineering activities at Ford Motor, IBM Credit, and Kodak were discussed as examples of how to reengineer, yet today Ford is in continuing economic trouble, Kodak has been radically downsized, and IBM Credit Corporation morphed into a financing group that mainly supports large customer purchases. Something must have been missing in the reengineering approach, or perhaps the approach was not done properly, but in either case the vitality that was predicted did not come true for these or many other corporations.

Other approaches to quality and process improvement have had some effect on enhancing agility and competitiveness, especially when those approaches were adopted across the enterprise and were maintained over a number of years (e.g., Carnegie Mellon University's Capability Maturity Model) but there remained the consistent lack of a meta-model to guide implementation and help manage change. Enterprise Architecture (EA) provides that meta-model, and has been around for as long as many of the aforementioned reengineering and quality improvement approaches (Zachman, 1987, Sowa & Zachman 1992; Spewak 1992), yet EA has only recently been recognized by mainstream management and academic publications as being the context for other improvement approaches and an enabler of change in itself. Jeanne Ross and Peter Weill of MIT's Sloan Center for Information Systems Research recently collaborated with David Robertson of the International Institute of Management Development in Lausanne Switzerland to produce a book entitled *Enterprise Architecture as Strategy* (2006). Ross, Weill, and Robertson argue that "Enterprise Architecture is the organizing logic for IT and business processes, reflecting the integration and standardization requirements of a firm's operating model".

EA began as a concept for defining standards and methods for implementing information technology (IT) systems within and between the lines-of-business (LOBs). These forerunner concepts included information engineering (Martin, 1986), and various approaches to systems analysis and design (SA&D). At present, over twenty textbooks are in print on SA&D, yet only a few mention EA as a way to provide enterprise-wide context for specific SA&D projects, which is one of the reasons that large-complex enterprises still have "stovepipe" applications being developed and struggle with data and system integration initiatives.

EA has evolved over the past decade to include a business component, and now a strategy component that enables it to be "the" meta-model in that EA now reflects all aspects of large, complex enterprises and properly relates strategic priorities to business activities and requirements, to technology solutions. When EA moved beyond systems-level documentation and incorporated strategy and business, it moved into a category if its own for management best practices. EA, as it is now practiced, is the only management practice that can integrate strategic, business, and technology planning (Bernard, 2005).

ENTERPRISE ARCHITECTURE: WHAT IT IS

As an idea, EA is how to create abstract views of an enterprise (often an organization) that help the people in the enterprise to make better plans and decisions. EA extends beyond technology planning, by adding strategic planning as the primary driver of the enterprise, and business planning as the source of most program and resource requirements. The place for technology planning is to provide systems, applications, networks, call centers, networks, and other capital resources (e.g. buildings, capital equipment) to meet the business requirements… which are the heart of the enterprises activities… creating and delivering those products and services that accomplish the strategic goals and initiatives of the enterprise. This is why in its simplest form, the idea of Enterprise Architecture is that of integrating strategy, business, and technology (EA=S+B+T), as is shown in Figure 1.

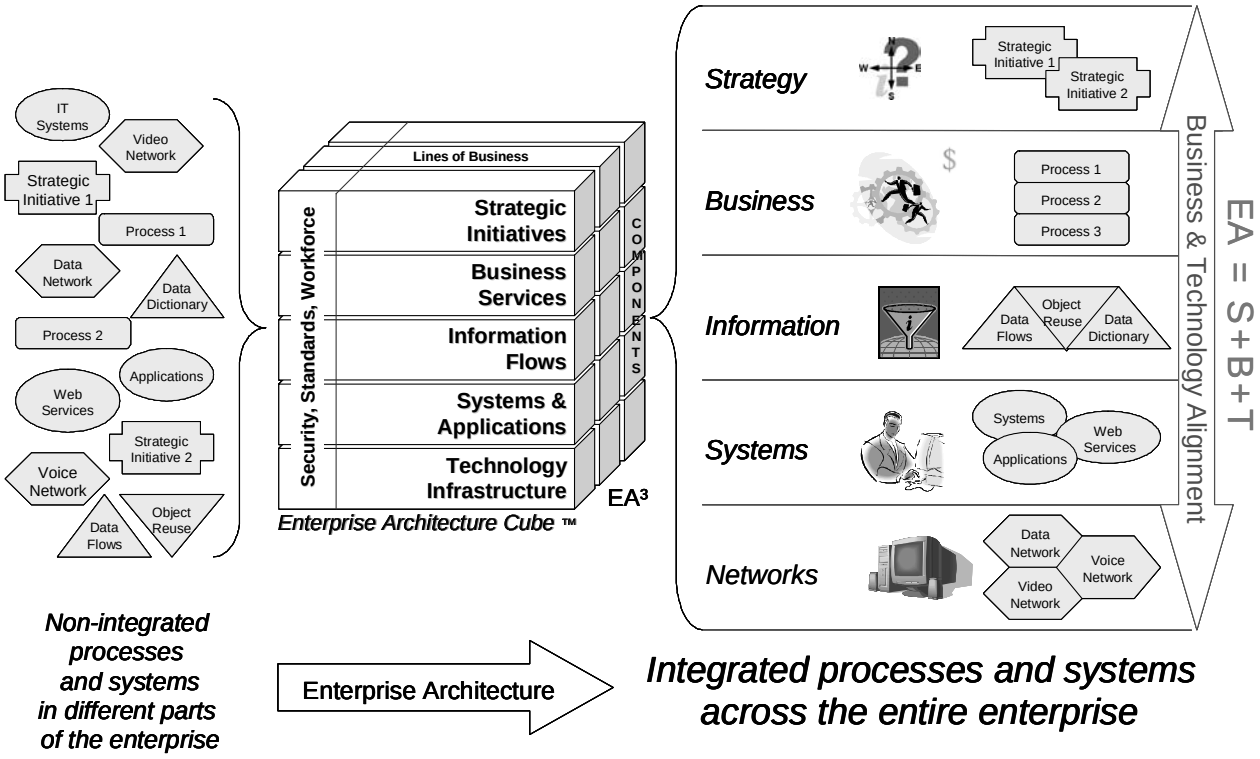

Figure 1. Enterprise Architecture Integrates Strategic, Business, and Technology Planning

EA is both a *management program* and a *documentation method* that together provides an actionable, coordinated view of an enterprise's strategic direction, business services, information flows, and resource utilization. For the purposes of this book, there will be a focus on IT resource utilization, though the concepts apply to other types of resources throughout the enterprise.

EA is a management program that provides a strategic, integrated approach to resource planning. An EA program is part of an overall governance process that determines resource alignment, develops standardized policy, enhances decision support, and oversees resource development activities. EA can help to identify *gaps in the performance* of line of business activities and the capabilities of supporting IT services, systems, and networks. As a management program, EA provides:

- Resource Alignment: Resource planning and standards determination
- Standardized Policy: Resource governance and implementation
- Decision Support: Financial control and configuration management
- Resource Oversight: Lifecycle approach to development/management

Resource Alignment

EA supports strategic planning and other operational resource planning processes by providing macro and micro views of how resources are to be leveraged in accomplishing the goals of the enterprise. This helps to maximize the efficiency and effectiveness of these resources, which in turn will help to promote the enterprise's competitive capabilities. IT resources and associated development projects within the enterprise should be reviewed to determine if they support (and conform to) one or more of the enterprise's strategic goals. If a resource and/or project is not aligned, then its value to the enterprise will remain in question. Figure 2 on the next page shows how IT projects (and associated resources) align with the goals of sub-enterprises, and eventually with enterprise-wide goals and initiatives.

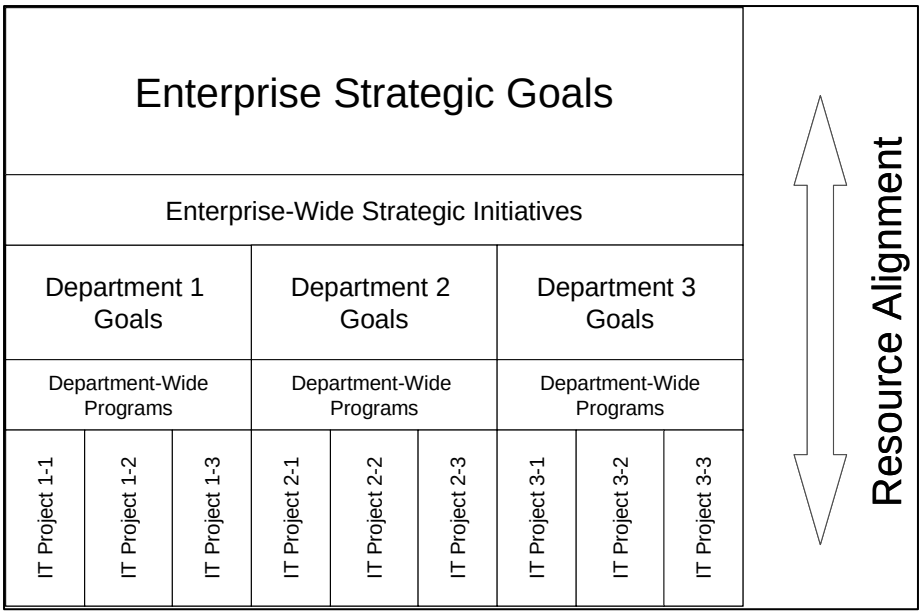

Figure 2. EA Promotes the Strategic Alignment of Resources

Standardized Policy
EA supports the implementation of standardized management policy pertinent to the development and utilization of IT and other resources. By providing a holistic, hierarchical view of current and future resources, EA supports the establishment of policy for:

- Identifying strategic and operational requirements
- Determining the strategic alignment of activities and resources
- Developing enterprise-wide business and technology resources
- Prioritizing the funding of programs and projects
- Overseeing the management of programs and projects
- Identifying performance metrics for programs and projects
- Identifying and enforcing standards and configuration management

Policy documents include those which can be categorized as general guidance (e.g., high-level directives and memos); specific program guidance (e.g., plans, and manuals); and detailed process guidance (e.g., standard operating procedures). By using these hierarchical categories of documents, succinct and meaningful policy is established. It does so in a way that no single policy document is too long and therefore not too burdensome to read. It is also important to understand how the various areas of policy are inter-related so that program implementation across the enterprise is coordinated. EA policies must integrate with other policies in all governance areas, so as to create an effective overall resource management and oversight capability.

Decision Support
EA provides support for IT resource decision-making at the executive, management, and staff levels of the enterprise. At the executive level, EA provides visibility for large IT initiatives and supports the determination of strategic alignment. At the management level, EA supports design and configuration management decisions, as well as the alignment of IT initiatives with technical standards for voice, data, video, and security. At the staff level, EA supports decisions regarding operations, maintenance, and the development of IT resources and services.

Resource Development
EA supports standardized approaches for developing IT and other resources. Depending on the scope of the resources involved and the available timeframe for development, various

system development lifecycle methods can be used to reduce the risk that cost, schedule, or performance parameters may not be met. EA further supports standardized, proven approaches to project management that promote the comprehensive and effective oversight of ongoing programs and new development projects. Finally, EA supports the use of a standardized process for selecting and evaluating investment in IT resources from a business and financial perspective.

ENTERPRISE ARCHITECTURE AS A DOCUMENTATION METHOD

As a documentation method, EA provides:

- EA Approach: A modeling framework and implementation methodology
- Current Views: Views of as-is strategies, processes, and resources
- Future Views: Views of to-be strategies, processes, and resources
- EA Management Plan: A plan to move from the current to the future EA

The approach to EA documentation is based on the adoption of a documentation framework and a related implementation methodology. Documenting current and future views of an EA helps the enterprise to identify and manage its current resources, select and implement future resources, and manage the EA transition in an effective, standardized manner. The transition from current to future architectures is an ongoing aspect of an EA program. Figure 3 below shows the six elements of a complete EA approach.

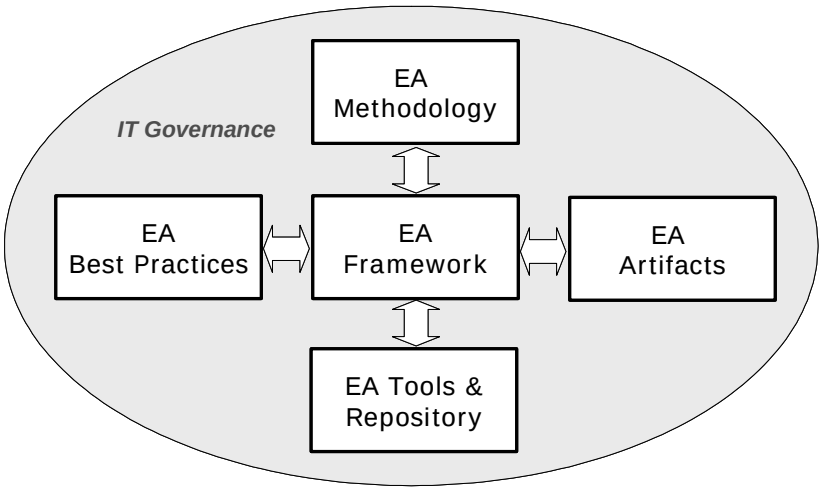

Figure 3. Elements of a Complete EA Approach

As Figure 3 shows, EA documentation is accomplished through six basic elements: (1) an integrated business and technology governance process; (2) an EA documentation framework; (3) an implementation methodology that uses the framework to support the creation of current and future views of the architecture, as well as the development of an EA Management and Transition Plan to manage the enterprise's transition from current to future architectures; (4) a standard set of documentation artifacts; (5) a repository for archiving and using the EA artifacts (often a website linked to documentation and analysis tools); and (6) selected best practices for developing and using the architecture.

EA Element #1: Integrated Governance. The EA provides a strategy and business-driven approach to policy, planning, decision-making, and resource development that is useful to executives, line managers, and support staff. To be effective, an EA program must be part of an integrated group of management policies and processes that form an overall governance structure. This governance structure includes strategic planning, enterprise architecture, program management, capital planning, security, and workforce planning, as is shown in Figure 4 on the next page.

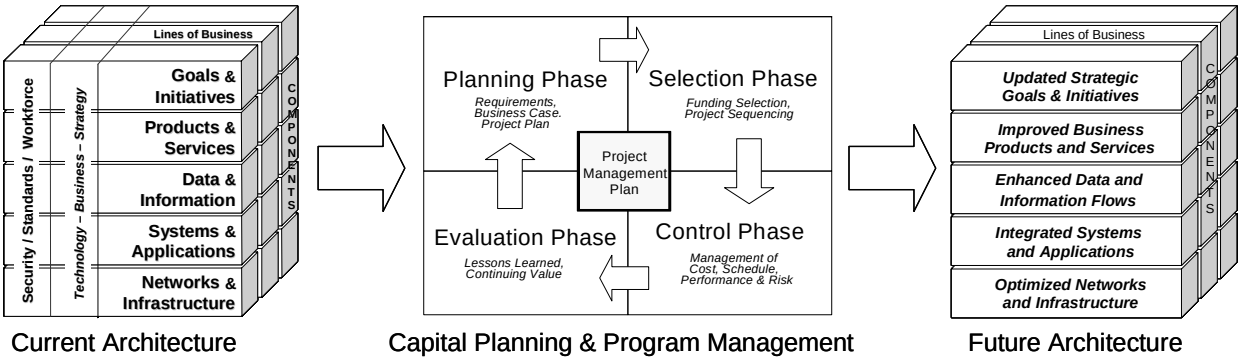

Figure 4. EA as Part of Integrated Business and Technology Governance

EA Element #2: The Framework. The EA documentation framework identifies the scope of the architecture to be documented and establishes relationships between the architecture's areas. The framework's scope is reflected through its geometric design and the areas that are identified for documentation. The framework creates an abstracted set of "views" of an enterprise through the way that it collects and organizes architecture information. An example that is used throughout the article is the framework that is illustrated in Figure 5 below, which has a cubic shape with three dimensions that relate to different aspects of documenting the abstracted enterprise.

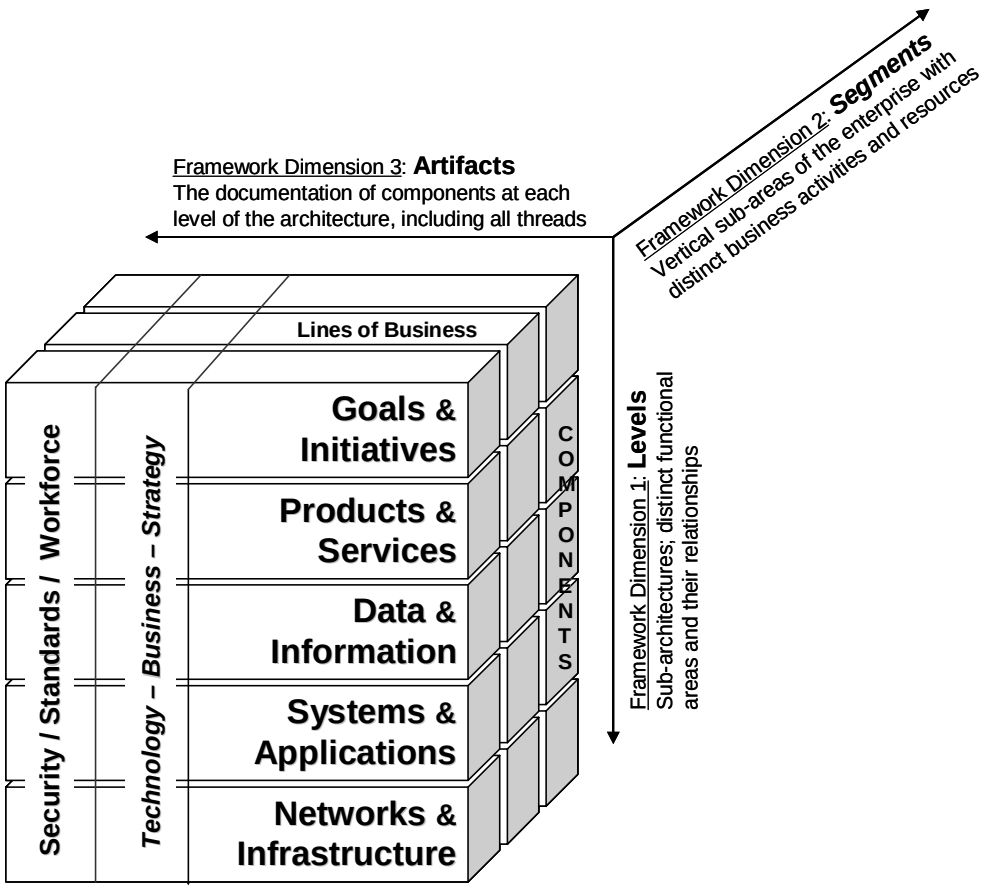

Figure 5. The EA^3 "Cube" Framework

Known as the EA³ Cube™, the levels of this framework are hierarchical so that the different sub-architectures (that describe distinct functional areas) can be logically related to each other. This is done by positioning high-level strategic goals/initiatives at the top, business products/services and data/information flows in the middle, and supporting systems/applications and technology/infrastructure at the bottom. In this way alignment can be also be shown between strategy, information, and technology, which aids planning and decision-making.

To lower risk and promote efficient, phased implementation methods, the EA^3 Cube Framework is divided into segments of distinct activity, referred to as Lines of Business (LOBs). For example, each LOB has a complete sub-architecture that includes all five hierarchical levels of the EA³ framework. The LOB therefore can in some ways stand alone architecturally within the enterprise except that duplication in data, application, and network functions would occur if each LOB were truly independent. An architecture encompassing all five framework levels that is focused on one or more LOBs can be referred to as a *segment* of the overall EA.

EA components are *changeable* goals, processes, standards, and resources that may extend enterprise-wide or be contained within a specific line of business. Examples of components include strategic goals and initiatives; business products and services; information flows, knowledge warehouses, and data objects; information systems, software applications, enterprise resource programs, and web sites; voice, data, and video networks; and supporting infrastructure including buildings, server rooms, wiring runs/closets, and capital equipment. Figure 6 below provides examples of *vertical* and *crosscutting* EA components at each level of the EA³ Cube Framework.

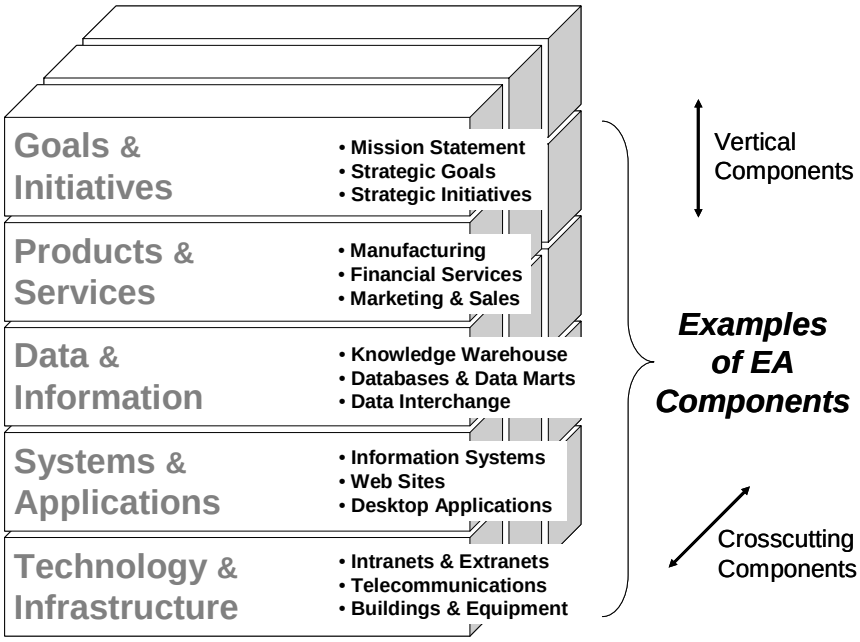

Figure 6. Examples of Architecture Components at Each Level of the EA^3 Cube Framework

The current architecture contains those EA components that currently exist within the enterprise at each level of the framework. This is sometimes referred to as the "as-is" view. The current view of the EA serves to create a 'baseline' inventory of current resources and activities that is documented in a consistent way with the future view of the EA so that analysts can see gaps in performance between future plans and the current capabilities. Having an accurate and comprehensive current view of EA components is an important reference for project planning, asset management, and investment decision-making. The current view of the EA is

composed of 'artifacts' (documents, diagrams, data, spreadsheets, charts, etc.) at each level of the framework, which are archived in an on-line EA repository to make them useable by various EA stakeholders.

The future architecture documents those new or modified EA components that are needed by the enterprise to close an existing performance gap or support a new strategic initiative, operational requirement, or technology solution.

As is shown in Figure 7 below, the future architecture is driven at both the strategic and tactical levels in three ways: new directions and goals; changing business priorities; and emerging technologies. The EA cannot reflect these changes in the future architecture unless the enterprise's leadership team provides the changes in strategic direction and goals; unless the line of business managers and program managers provide the changes in business processes and priorities that are needed to accomplish the new goals; and unless the support/delivery staff identifies viable technology and staffing solutions to meet the new business requirements.

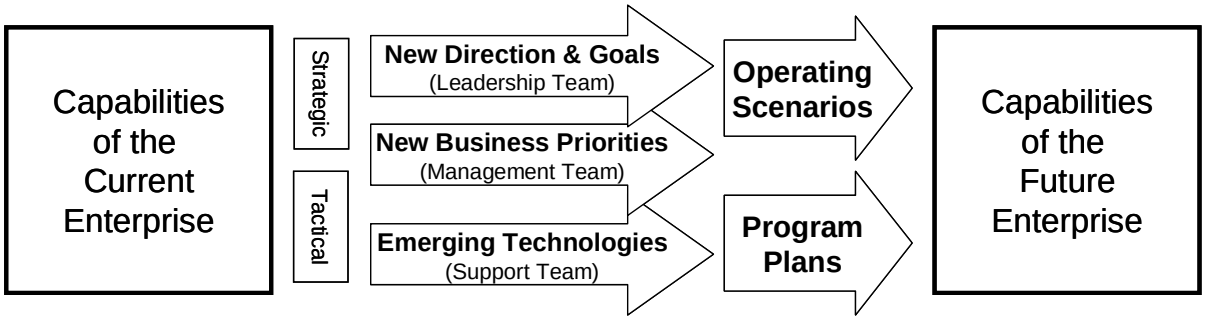

Figure 7. Drivers of the Future Architecture

The future architecture should cover planned changes to EA components in the near term (tactical changes in the next 1-3 years), as well as changes to EA components that are a result of the implementation of long-term operating scenarios that look 4-10 years into the future. These scenarios incorporate different internal and external drivers and can help to identify needed changes in processes, resources, or technology that translate to future planning assumptions, which in turn drive the planning for new EA components.

As is shown is Figure 8 below, the EA Management and Transition Plan articulates the EA program and documentation approach.

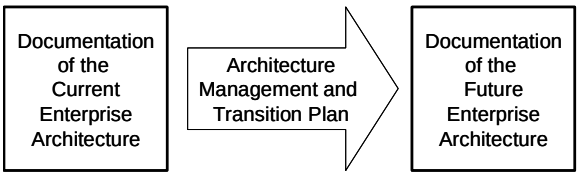

Figure 8. EA Management Plan

The EA Management and Transition Plan also provides descriptions of current and future views of the architecture, and a sequencing plan for managing the transition to the future business/technology operating environment. The EA Management Plan is a living document that is essential to realizing the benefits of the EA as a management program. How the enterprise is going to continually move from the current architecture to the future architecture is a significant planning and management challenge, especially if IT resources supporting key business functions are being replaced or upgraded.

EA documentation includes 'threads' of common activity that are present in all levels of the framework. These threads include IT-related security, standards, and workforce considerations.

IT Security. Security is most effective when it is an integral part of the EA management program and documentation methodology. A comprehensive IT Security Program has several focal areas including: information, personnel, operations, and facilities. To be

effective, IT security must work across all levels of the EA framework and within all of the EA components.

IT Standards. One of the most important functions of the EA is that it provides technology-related standards at all levels of the EA framework. The EA should draw on accepted international, National, and industry standards in order to promote the use of non-proprietary solutions in EA components. This in turn enhances the integration of EA components, as well as better supporting the switch-out of components when needed.

IT Workforce. Perhaps the greatest resource that an enterprise has is people. It is therefore important to ensure that IT-related staffing, skill, and training requirements are identified for LOB and support service activities at each level of the EA framework, and appropriate solutions are reflected in the current and future architectures.

EA Element #3: Implementation Methodology. The establishment of an EA program has many facets and one of the keys to success is to use a detailed implementation methodology to get the program started, and then to guide the EA documentation effort. The EA methodology described in this book is generalized so it can be used in a wide variety of public and private sector enterprises, and can support many types of EA frameworks, tools, and repositories. Depending on the type of enterprise, some parts of the EA methodology may need to be changed.

It is important to develop an EA methodology as one of the first steps in establishing the EA program, because it forces the enterprise to 'think through' the following important considerations:

- Which areas of the enterprise the EA will cover (scope)
- The approach to EA governance (e.g., centralized or decentralized)
- The types of EA documentation (known as artifacts) that will be needed to support business and technology resource planning and decision-making
- The EA documentation framework that best supports the needs of the enterprise
- The methods and techniques for gathering or developing EA documentation
- The software modeling tools, web applications, and databases that will be needed to automate documentation techniques and enable future scenario modeling
- How EA users will access and share EA documentation (e.g. an EA repository)
- How often EA documentation is updated

The following 20-step process is an example EA implementation methodology that contains all of the general steps that would support the creation of a comprehensive EA program. It should be noted that the revitalization of an existing EA program will involve additional steps that will vary with each situation. Revitalization could focus on the selection of a different EA framework and implementation methodology, and/or the identification of new vertical and horizontal partitions of the enterprise that is being documented (segments and crosscuts).

Phase I: EA Program Establishment

Step 1: Establish the EA Program and identify the Executive Sponsor(s).

Step 2: Identify an in-house Chief Architect. Hire internal / contracted architects.

Step 3: Establish EA governance and links to other management processes.

Step 4: Publish an EA Communication Plan to gain stakeholder buy-in.

Phase II: EA Framework and Tool Selection

Step 5: Select and implement an EA documentation framework.

Step 6: Identify EA Lines of Business and Crosscuts - order of documentation.

Step 7: Identify the EA components to be documented framework-wide.

Step 8: Select artifact documentation methods appropriate for framework.

Step 9: Select software applications/tools to support automated documentation.

Step 10: Establish an easy-to-navigate EA website that is linked to tools and the artifact repository (database).

Phase III: Documentation of the EA

Step 11: Evaluate existing documentation for use in the EA, conform as artifacts.

Step 12: Develop additional artifacts to complete current views of existing EA components in all framework areas. Archive in on-line repository.

Step 13: Develop several future business and technology operating scenarios.

Step 14: Identify future planning assumptions for each scenario. Use scenarios and other stakeholder input to drive the future architecture at all levels.

Step 15: Develop artifacts to show views of future components in all framework areas. Archive in on-line repository.

Step 16: Develop an EA Management and Transition Plan to sequence planned changes in the architecture.

Phase IV: Use and Maintain the EA

Step 17: Use EA documentation to support analysis, planning, and decision-making throughout the enterprise.

Step 18: Regularly update current and future views of architecture components.

Step 19: Maintain the repository and related modeling/analysis capabilities.

Step 20: Release annual updates to the EA Management and Transition Plan.

This EA implementation methodology addresses the establishment of a new EA program and the initial and ongoing documentation sets (versions of the EA). The revitalization of existing, but unproductive EA programs, or switching approaches, key personnel, or contracted support should be handled through the addition of Steps in Phase I and/or Phase II to address these type of needed changes.

EA Element #4: Documentation Artifacts.

EA components are the active elements of the enterprise's business and technology operating environment. EA components include IT-related strategic goals and initiatives, supply chains, information systems, software applications, knowledge warehouses, databases, websites, and voice/data/video networks, and the security solution. These EA components should function together to create a robust and seamless IT operating environment that effectively supports the enterprise's business needs. Availability, reliability, security, scalability, and cost effectiveness are key performance measurement areas for the general IT operating environment. These areas apply to each EA component, along with measures for integration and reuse.

EA artifacts are types of documentation that describe components, including reports, diagrams, charts, spreadsheets, video files, and other types of recorded information. High-level EA artifacts are often text documents or diagrams that describe overall strategies, programs, and desired outcomes. Mid-level EA artifacts are documents, diagrams, charts, spreadsheets, and briefings that describe organizational processes, ongoing projects, supply chains, large systems, information flows, networks, and web sites. Low-level EA artifacts describe specific applications, data dictionaries, technical standards, interfaces, network components, and cable plants. When these EA artifacts are harmonized through the organizing taxonomy of the EA framework, new and more useful views of the functioning of EA components are generated. This is one of the greatest values of EA as a documentation process… creation of the ability to see a hierarchy of views of the enterprise that can be examined from several perspectives.

For example, by recognizing that EA components are the building blocks of the an EA framework, and that most IT hardware and software is now commercially procured (versus being custom developed in-house), the stage has been set for a "plug-and-play" approach to IT support that must be reflected at all levels of the EA framework.

Table 1 on the next page provides the list of recommended artifacts for use with the EA^3 Cube Framework to document the current and future views of the architecture. Additional or replacement artifacts can be used if that is called for by the guiding policies or requirements of a particular enterprise. This list is comprised of both composite and primitive artifacts. Composite artifacts are those which are made up of one or more primitive artifacts. A primitive artifact is a type of EA documentation that describes/models a specific aspect of the architecture (such as an entity relationship data diagram, a list of business activities, a network diagram, or a security controls list). John Zachman stresses the importance of doing primitive artifacts (Zachman, 1992).

EA^3 Cube Level/Thread	Artifact ID #	Artifact Name (* Composite Artifact)	Zachman Mapping	DODAF Mapping
Strategic Goals & Initiatives (I)	S-1	Strategic Plan*	C6/R1	AV-1
	S-2	SWOT Analysis	C5/R1	
	S-3	Concept of Operations Scenario		AV-1
	S-4	Concept of Operations Diagram	C2/R1	OV-1
	S-5	Balanced Scorecard™ *	C6/R4, C6/R5	
Business Products & Services (B)	B-1	Business Plan*	C2/R2, C5R1	
	B-2	Node Connectivity Diagram	C3/R1	OV-2
	B-3	Swim Lane Process Diagram *	C4/R2	OV-5
	B-4	Business Process/Service Model	C2/R2	OV-5
	B-5	Business Process/ Product Matrix *	C4/R2	
	B-6	Use Case Narrative & Diagram	C6/R3, C6/R4	OV-6a, SV-10a
	B-7	Investment Business Case*		
Data & Information (D)	D-1	Knowledge Management Plan	C1/R1, C1/R2	
	D-2	Information Exchange Matrix*	C3/R2, C4/R2	OV-3
	D-3	Object State-Transition Diagram	C1/R3	OV-6b, SV-10b
	D-4	Object Event Sequence Diagram	C2/R2, C5/R3	OV-6c, SV-10c
	D-5	Logical Data Model	C1/R3	OV-7, SV-11
	D-6	Physical Data Model	C1/R4	
	D-7	Activity/Entity (CRUD) Matrix *	C1/R3, C4/R2	SV-9
	D-8	Data Dictionary / Object Library	C1/R5	AV-2
Systems & Applications (SA)	SA-1	System Interface Diagram	C3/R4, C3R2	SV-1
	SA-2	System Communication Description	C2/R4, C3/R2	SV-2
	SA-3	System Interface Matrix *	C2/R4	SV-3
	SA-4	System Data Flow Diagram	C2/R3	SV-4
	SA-5	System/Operations Matrix *	C2/R4	SV-5
	SA-6	Systems Data Exchange Matrix *	C2/R3	SV-6
	SA-7	System Performance Matrix *	C2/R3	SV-7
	SA-8	System Evolution Diagram	C2/R4	SV-8
	SA-9	Web Application Diagram	C2/R3	
Networks & Infrastructure (NI)	NI-1	Network Connectivity Diagram	C3/R5	
	NI-2	Network Inventory	C3/R5	
	NI-3	Capital Equipment Inventory	C3/R5	
	NI-4	Building Blueprints *	C3/R5	
	NI-5	Network Center Diagram	C3/R5	
	NI-6	Cable Plant Diagram	C3/R5	
	NI-7	Rack Elevation Diagram	C3/R5	
Security (SP)	SP-1	Security and Privacy Plan*	C4/R5	
	SP-2	Security Solutions Description	C4/R5	
	SP-3	System Accreditation Document*	C4/R5	
	SP-4	Continuity Of Operations Plan*	C4/R5	
	SP-5	Disaster Recovery Procedures *	C4/R5	
Standards (ST)	ST-1	Technical Standards Profile	C3/R4	TV-1
	ST-2	Technology Forecast	C3/R4	TV-2, SV-9
Workforce (W)	W-1	Workforce Plan*	C4/R1	
	W-2	Organization Chart	C4/R2	OV-4
	W-3	Knowledge and Skills Profile	C4/R3	OV-4

Table 1. Recommended Artifacts for use with the EA3 Cube Framework

EA Element #5: Repository and Tools. Providing easy access to EA information and artifacts is essential for their use in planning, management, and decision-making. The EA repository is intended to provide this type of easy access by being a "one-stop-shop" for all of the documents that populate the various levels of the EA framework as is shown in Figure 10 on the next page. This type of framework-based repository is intended to be implemented as a website and is designed to be easy to navigate by executives, managers, and technical staff.

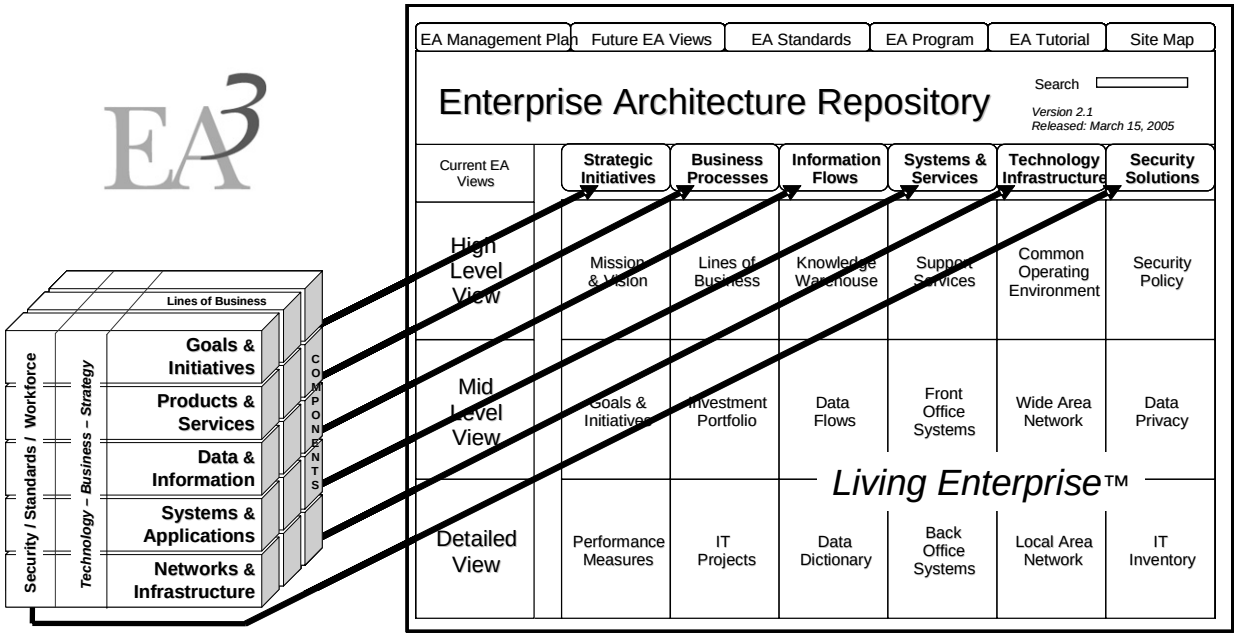

Figure 9. Relationship Between the EA^3 Cube Framework™ and the Living Enterprise™ Repository

The approach to the design of the example EA repository (and the underlying EA³ framework) provided in Figure 9 is based on the work of John Zachman (1989, 1992) who created a very intuitive schema for visually organizing EA information. He did this by using hierarchical rows and functional columns to create cells that contain "primitive" EA artifacts which answer basic questions about information systems (who, what, why, where, when, and how). The word "primitive" in Zachman's work refers to EA documentation that is singular in its method of development and use. For example, using traditional methods, diagramming data structure yields an Entity-Relationship Diagram and diagramming data process yields a Data Flow Diagram that are Zachman primitives in that they are fundamentally different in both symbology and use. If one were to find a way to combine them into one diagram, this would yield what Zachman calls a "composite" EA documentation product.

The design of the *Living Enterprise*™ EA repository is similar in that it uses hierarchical rows and functional columns. However, it is different in that (1) it is based on a separate meta-framework (the EA³ framework); (2) it uses three hierarchical levels; (3) the functional columns are not based on basic interrogative questions; (4) the cells of the matrix are changeable and are often populated with EA documentation that represents composite views of several types of primitive products; (5) it has areas for additional information on the EA program; and (6) it is designed to be implemented as a website and therefore has navigation and version control features. This overall design for an EA repository is referred to as the *Living Enterprise*. This EA repository is linked to EA software tools and a database to store EA data and artifacts, as is shown in Figure 10 on the next page.

In implementing the *Living Enterprise* approach to a web-based EA repository, it is recommended that enterprises stay with the six columns, because they directly relate to the levels of the EA³ framework, which also guides the type of EA artifacts that go in each column and cell. If another framework is needed, the number of rows and columns can be changed, along with the names of the cells. It should be noted that the amount of time, money, and effort to complete additional perspectives (rows) of EA component documentation will be significant, which is one reason that only three perspective rows were chosen for this format. Three rows provide distinct perspectives that are analogous to executive, manager, and support staff views.

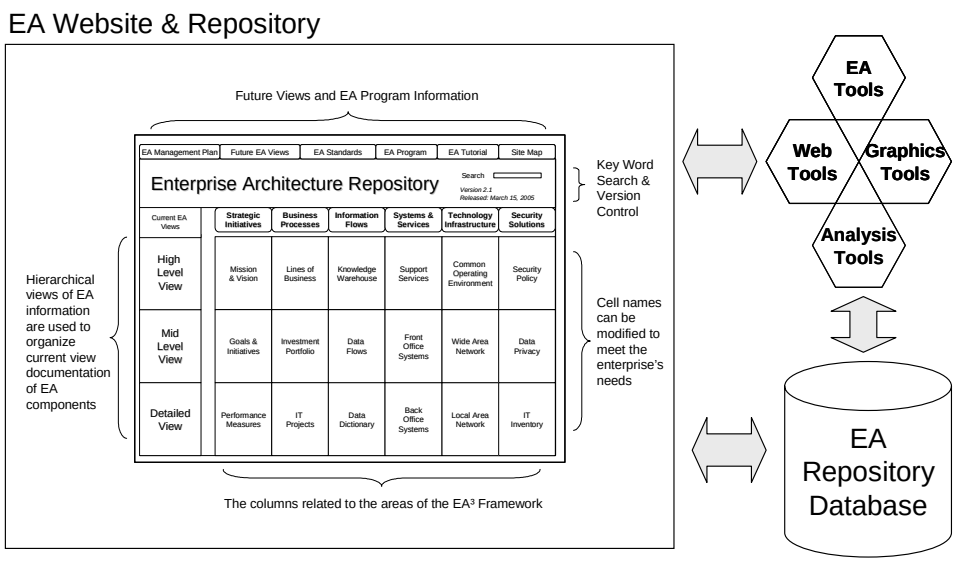

Figure 10. Databases and Tools Support the Living Enterprise EA Repository

One of the valuable aspects of having this approach to an EA repository is that the different levels of the enterprise can view complete perspectives of business and technology, which they otherwise might not be able to see. If limits to access are desired, then particular cells or groups of cells can be password protected.

One of the flexible features of *Living Enterprise*™ is that the purpose and names of the cells in each framework column can be changed to fit the particular needs of the enterprise. For example, the middle cell in the Business Process column can be changed from Investment Portfolio to "Customer Relationship Management" if that is more important and/or appropriate.

EA Element #6: Best Practices. Best Practices are those methods and approaches to strategic, business, and technology planning that have been developed over the years independent of EA yet are valuable in some aspect of developing or using the EA to improve the agility and competitiveness of large, complex enterprises.

Not every best practice to strategic, business, and technology planning is needed for EA implementation, and the group of best practices that are selected for use as part of, or in support of an EA program will vary from enterprise to enterprise. Figure 11 below provides examples of best practices that may be considered for incorporation into an EA program.

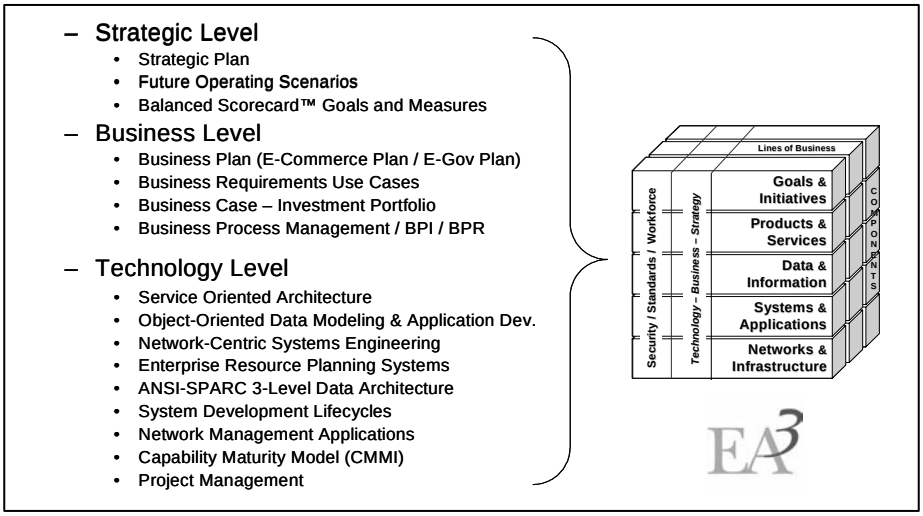

Figure 11. Examples of Best Practices That May Be Part of an EA Program

THE ROLE OF THEORY IN UNDERSTANDING ENTERPRISES

Best practices are not replacements for theory and one of the challenges for EA to continue to grow as a recognized method for planning and documenting large, complex enterprises is to ground these best practices in proven theory from the social and physical sciences, primarily organization theory and systems theory. Using the EA^3 approach as an example, the top two levels of the Cube Framework (strategy and business) primarily draw their legitimacy and understood relationships from sociological studies on how people organize, accomplish goals, and plan and do work (e.g., Perrow, 1986; March and Olson, 1989; Weick, 1995). The "middle" level of the Cube Framework (information/data) is a middle ground, in that it is influenced by both the social and physical sciences… why and how people share information to accomplish goals and tasks, as well as influences from the physical sciences… information theory, database theory (Martin, 1986). The bottom two levels of the Cube Framework (systems and networks) are largely influenced by the physical sciences: software engineering, computer science, physics, etc.

EA is fundamentally an evaluation and depiction of people, processes, and resources. Some of the areas of practice and theory that have influenced the emerging discipline of EA include business administration, public administration, operations research, sociology, organizational theory, management theory, information science, and computer science. Understanding the mission, goals, and culture of an enterprise is as important to implementing an EA as the selection of analytic methods and documentation techniques. The EA approach described in this book is article on theories of how social organizations (including enterprises) are structured and how systems and activities function within these enterprises. Figure 12 below shows the academic fields and areas of theory and practice that influence EA and the emerging concepts that EA provides context for (Bernard, 2005).

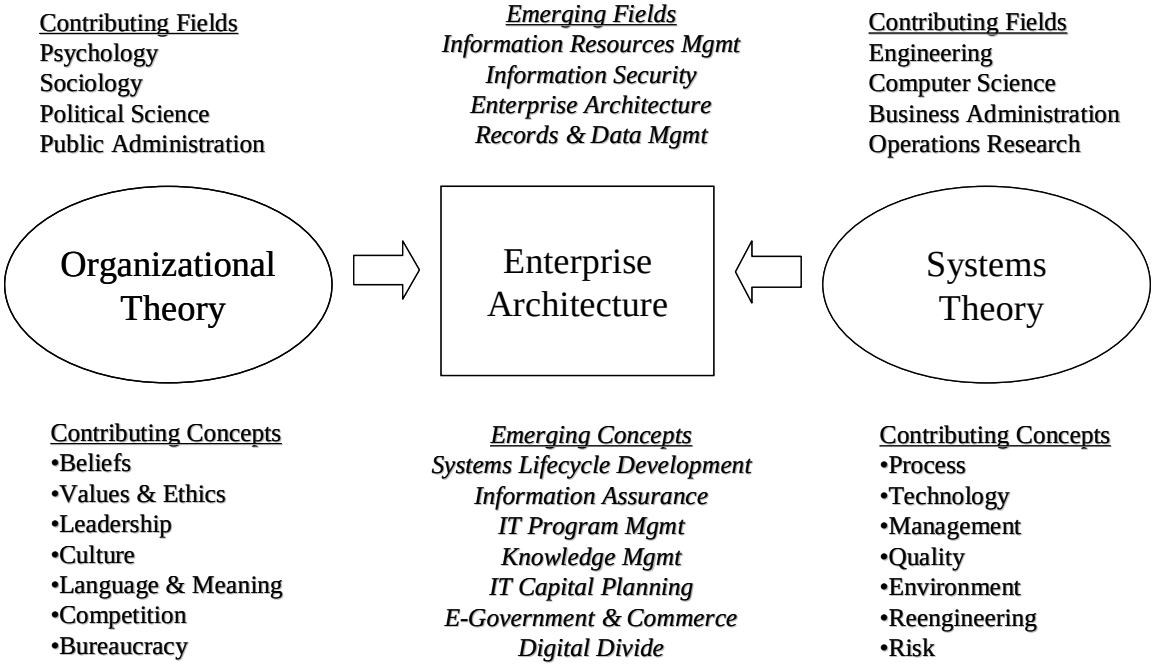

Figure 12. Influences on the Field of Enterprise Architecture

The concepts of organizational theory also apply to enterprises because they are types of social organizations. Organizations and enterprises are essentially complex social systems, which regardless of mission, share many similarities in their basic structure and functions. One of the

more mature models of general organizational structure is a three-level view that was originally envisioned by sociologist Talcott Parsons in the 1950's and further developed by sociologist James Thompson in the 1960's (Bernard, 2001). Parsons' research identified three general levels that are common to most social organizations (technical, managerial, and institutional), based on the observation that different types of activities occur at each level (Thompson, 1967). Thompson built on Parsons' ideas by further identifying the different types of activities that occur at each level. Table 2 below summarizes the Parsons/Thompson Model of how social organizations are structured and how they function at each structural level.

Organizational Level	**Structure** *Parsons - Purpose of Each Level*	**Function** *Thompson - Activities at Each Level*
Institutional	Where the organization establishes rules and relates to the larger society as it derives legitimization, meaning, and higher-level support, thus making possible the implementation of organizational goals.	The organization is very open to the environment in order to determine its domain, establish boundaries, and secure legitimacy.
Managerial	Where mediation between the organization and the immediate task environment occurs, where the organization's internal affairs are administered, and where the organization's products are consumed and resources supplied.	A dynamic of mediation occurs where less formalized and more political activities occur.
Technical	Where the actual "product" of An organization is processed.	The organization is "rational" as it carries on production (input/output) functions and tries to seal off those functions from the outside to protect them from external uncertainties as much as possible.

Table 2. The Parsons / Thompson Model of Organizational Structure and Function

The geometry of the Parson/Thompson Model has been adapted by the author to resemble a series of concentric circles. This may provide a more useful image for depicting a social organization that interacts with its environment via the model's Institutional Level, facilitates internal resources via the Managerial Level, and protects a "core" of essential processes and resources at the Technical Level. Figure 13 below shows this spherical version of the Parsons/Thompson Model, which also is more useful in relating it to how an EA framework can document organizational functions (Bernard, 2005).

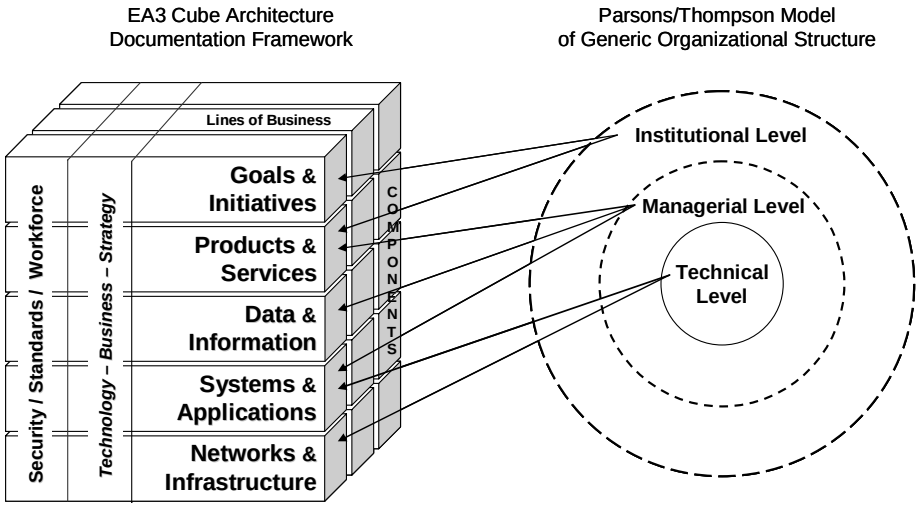

Figure 13. Relating Two Models of Organizational Structure and Function

The value of the Parsons/Thompson Model is its use as an authoritative reference for developing EA views of structure and process for an organization. Regardless of the model's wide acceptance in academia, the question of whether this fifty year old view would be relevant and useful to understanding the structure of current public and private sector organizations is answered by observing that many large and medium sized corporations and government agencies continue to be hierarchical, rule-based, and goal-oriented. These were some of the primary characteristics of the "rational" organization that Parsons and Thompson originally studied. Evidence of this still being a valid model is also seen in the rational nature of organizational charts, mission statements, strategic plans, operational plans, and business services of these types of organizations.

However, there are new types of organizations that have emerged due to technology-based changes in how people communicate and work. Global telecommunications and the Internet have made location a largely irrelevant factor in terms of where some types of work are being done (e.g., knowledge work and on-line services). Two primary changes related to organizational structure and function have resulted. First, more organizations are becoming regional or global in nature, and are relying on remote sub-groups to do significant amounts of the work. Second, more people are becoming self-employed knowledge workers who contract their services remotely to various enterprises depending on their interest, skills, and availability. Examples include people who process digitized health care forms, software developers, web site developers, distance learning instructors, financial traders, insurance salespeople, and telemarketers. Because these organizations can get certain functions accomplished remotely, their structure may become less hierarchical and more collaborative.

While it can be argued that these new networked organizations exhibit many of the structural and functional characteristics found in the Parsons/Thompson Model, there are enough differences to merit discussion of a variation of that model which may better describe how organizations operate in a more global on-line business environment.

THE ORGANIZATIONAL NETWORK MODEL

New types of organizations and enterprises are appearing which are based on cooperative networks of local and remote individual workers and semi-autonomous teams who carry out key functions. In these enterprises, greater cost efficiency and more mission flexibility are achieved by removing layers of management that are not needed in a decentralized operating mode. These teams are actually sub-groups that have their own management level and technical level with core processes, and therefore will still exhibit some of the characteristics of the Parsons/Thompson Model. The difference presented here is that the organization/enterprise's structure is based on these teams and remote workers, whose goals and functions may change depending on internal and external influences.

Called the Organizational Network Model (ONM), an *Executive Team* sets policy and goals, approves resources, and evaluates results, while semi-autonomous *Functional Teams* and *Independent Workers* manage ongoing programs/lines of business, new development projects, and team-specific resources (Bernard, 2005). The Functional Teams and Independent Workers receive policy, goals, and general direction from the Executive Team, yet carry out organizational functions in an independent and/or cooperative manner, depending on the goal(s). Figure 15 on the next page provides an illustration of the ONM and how it relates to the EA^3 Cube Framework.

Being less hierarchical, these "flatter" and more flexible ONM organizations can respond to changing requirements more quickly by creating, modifying, or eliminating Functional Teams and/or adjusting the number and type of Independent Workers. These types of ONM organizations and enterprises can also exist as extended supply chains or networks of teams from inside and outside the traditional organizational boundary. This includes trusted business partners and independent consultants who are allowed to share sensitive information and key resources with the enterprise as part of the activities of the Functional Teams and Independent Workers. Figure 14 on the next page shows how Functional Teams in ONM organizations can be related to an enterprise's Lines of Business (LOBs) in the EA^3 Cube Framework.

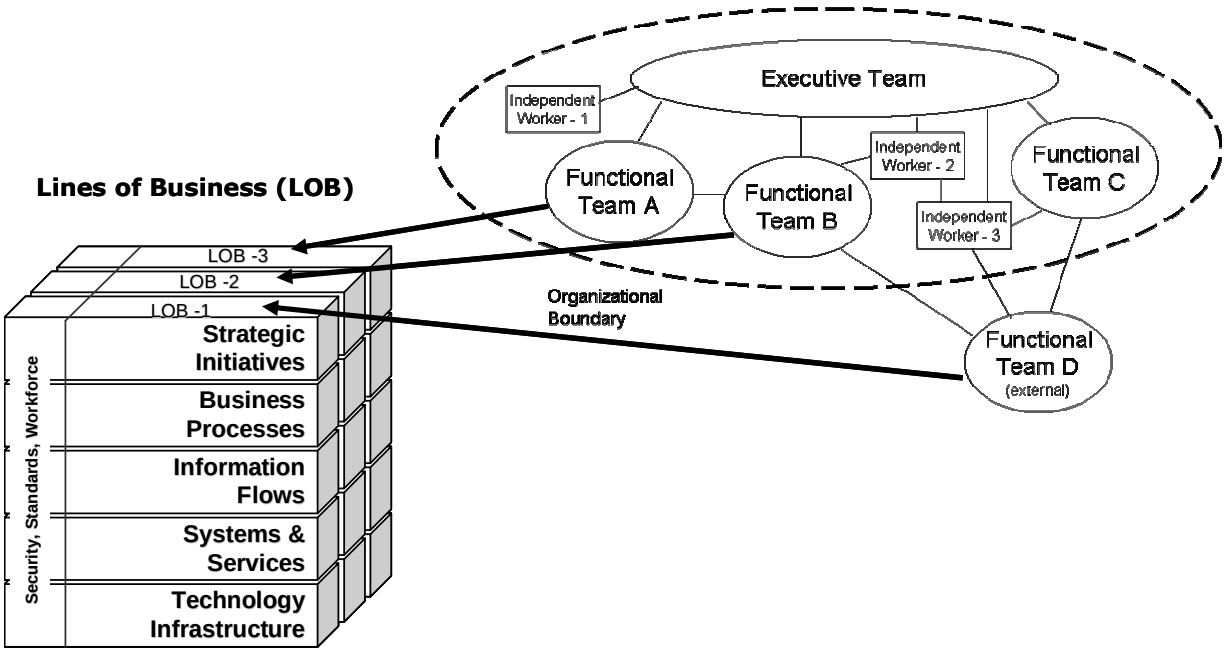

Figure 14. The EA[3] Cube Framework and Relationship to the Organizational Network Model

CONCLUSION

EA is an effective way to develop current and future views of the entire enterprise, or parts of the enterprise, on an ongoing basis. EA does this primarily by integrating the processes for strategic, business, and technology planning in a way that also integrates with other business and technology governance processes. EA also provides a detailed, repeatable, and scalable methodology for documentation and analysis that utilizes an organizing framework, documentation artifacts, a repository, and best practices.

EA is unique among existing management practices in that it is *the* "meta-approach" that provides a way to abstract and understand large, complex enterprises in their entirety, and is increasingly being used on a global basis in the public and private sectors to support planning and decision-making at the executive, management, and staff levels of the enterprise, as well as to guide the selection and implementation of projects to achieve strategic and tactical goals. In summary:

- EA successfully integrates strategic planning, business planning, and technology planning… making the enterprise more **focused**
- EA is the authoritative source for reference documentation and standards, making governance more **effective**
- EA is a repeatable, scalable methodology, making the enterprise more **agile**
- EA helps to manage and drive change, in alignment with strategic and business goals, making the enterprise more **successful**

EA = S + B + T

AUTHOR BIOGRAPHY

Scott Bernard has over twenty years of experience in information technology (IT) management, including work in the academic, federal, military, and private sectors. Dr. Bernard has held positions as a Chief Information Officer (CIO), management consultant, line-of-business manager, network operations manager, telecommunications manager, and project manager for several major IT systems installations. He has developed

enterprise architectures for public, private, and military organizations, started an EA practice for an IT management consulting firm, developed his own consulting practice, and taught EA at a number of universities, businesses, and government agencies. He is currently serves as the Deputy CIO and Chief Architect of the Federal Railroad Administration in Washington DC.

Dr. Bernard's areas of practice, research and teaching include IT-related leadership, policy development, strategic planning, enterprise architecture, systems analysis and design, IT project management, and capital planning. In 2002, Dr. Bernard created the EA3 Cube™ framework and methodology that is featured in his 2005 book *An Introduction to Enterprise Architecture: 2nd Edition*, as well as the design for an on-line EA repository that is called "Living Enterprise ™."

Dr. Bernard is an Assistant Professor for the School of Information Studies at Syracuse University, and is a Senior Lecturer at the Institute for Software Research International at Carnegie Mellon University's School of Computer Science. Dr. Bernard is the founding editor of the *Journal of Enterprise Architecture*.

Dr. Bernard earned his PhD in Public Administration and Policy at Virginia Tech; a master's degree in Business and Personnel Management from Central Michigan University, a master's degree in Information Management from Syracuse University, and a bachelor's degree in Psychology from the University of Southern California. He is a graduate of the Naval War College, and earned a CIO Certificate and an Advanced Management Program Certificate from the National Defense University. Dr. Bernard is also a former career naval aviator who served onboard aircraft carriers and with shore squadrons, led IT programs, and was the Director of Network Operations for the Joint Chiefs of Staff at the Pentagon. He resides in Falls Church, Virginia with his family and enjoys gardening, traveling, and sport cars.

REFERENCES

Boar, B. (1999). Constructing Blueprints for Enterprise IT Architectures. John Wiley & Sons. ISBN: 0-471-29620-1.

Bernard, S. (2001). Evaluating Clinger-Cohen Compliance in Federal Agency Chief Information Officer Positions. Doctoral Dissertation, Virginia Polytechnic Institute and State University, Blacksburg, VA.

Bernard, S. (2005). An Introduction to Enterprise Architecture (2nd Ed.). AuthorHouse, Bloomington, IL. ISBN: 1-4208-8050-0.

Cook, M. (1994). Building Enterprise Information Architectures, Reengineering Information Systems. Prentice-Hall, Inc. ISBN: 0-13-440256-1.

United States Department of Defense (2004). DoD Architecture Framework v 1.0 Deskbook, http://www.defenselink.mil/nii/doc/DoDAF_v1_Deskbook.pdf

Hammer, M. and Champy J. (1993). Reengineering the Corporation. HarperBusiness. New York, NY. ISBN: 0-88730-640-3.

March, J. and Olson, J. (1989). Rediscovering Institutions. MacMillan – Free Press, New York, NY. ISBN: 0-02-920115-2

Martin, J. (1986). Information Engineering. Savant. ISBN: 0-9067-7443-8

Ross, J., Weill, P., and Robertson, D. (2006). Enterprise Architecture as Strategy. Harvard Business School Press. Boston, MA.

Schekkerman, J. (2004). Surviving in the Jungle of Enterprise Architecture Frameworks. Trafford. ISBN: 1-4120-1607-x

Sowa, J. and Zachman, J. (1992). Extending and Formalizing the Framework for Information Systems Architecture. *IBM Systems Journal*, Volume 31, Number 3.

Spewak, S. and Hill, S. (1992). Enterprise Architecture Planning. Developing a Blueprint for Data, Applications and Technology. John Wiley and Sons, Inc. New York. ISBN: 0-471-599859.

Thompson, J. (1967). Enterprises in Action. New York: McGraw-Hill.

Weick, K. (1995). Sensemaking in Organizations. Sage Publications. London.

Zachman, J. (1989). "A Framework for Information Systems Architecture." *IBM Systems Journal*. Volume 26, Number 3.