THE GUIDE TO CAREERS IN ENTERPRISE ARCHITECTURE

Prepared by

Federation of Enterprise Architecture Professional Organizations

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Abstract

The Guide to Careers in Enterprise Architecture provides an overview of the various architecture roles commonly recognized in organizations. The document does not describe what an Enterprise Architect does, which is multi-faceted, overlapping Business, Application, Information, Technology, Security and other areas, but rather what skills Architects are expected to have, and how to hire and develop them. The journey towards each role and interactions between various roles are discussed along with information on how the structure of the Enterprise Architecture function affects the skills needed by the Architects. The Guide *ends with sample questions for recruiting Architects.*

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The Guide to Careers in Enterprise Architecture

Contributors

The information contained in this publication was contributed by thirteen (13) organizations and endorsed by eleven (11). IIBA and DAMA-I do not endorse this version or assume any responsibility for the accuracy, completeness, or quality of this version, as stated below.

Charles Martin, Board of Director, International Institute of Business Analysis (IIBA) "Though we support the direction and intent of the Guide, we find that the current version does not provide a balanced view of the various paths on which an individual may follow to become an effective Enterprise Architect. IIBA votes not to approve this version release. The IIBA will continue as a contributor to the Guide, which will be an important tool for the development of high-performing enterprise architects."

Sue Guens, President DAMA International (DAMA-I) "As a result of the quality and inconsistencies within the Guide, DAMA-I votes not to approve this version release. DAMA-I recommends the latest DMBOK version as well as FEAPO Taxonomy genre definition be aligned to this Guide. DAMA-I hopes to collaborate on a future version release that better represents our Data Architecture community."

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Brief Overview

The field of Enterprise Architecture (EA) has grown steadily over the past 30 years. It is no longer difficult to find two people who both have the title of "Enterprise Architect" on their resume. What has emerged as the next-order problem for organizations hiring an architect is simple: two resumes are highly unlikely to contain similar descriptions of the jobs performed, even though they have the same title. In addition, some of the most qualified candidates for jobs in Enterprise Architecture have never held that title.

This diversity of needs and qualifications, all under the title of "Enterprise Architect", creates an issue for organizations and companies trying to implement a mature EA program. Now that many companies have decided that they want to either hire or develop Enterprise Architects, there's no standard description of what an Enterprise Architect should know.

The recently released Federation of Enterprise Architecture Professional Organizations (FEAPO) white paper characterizes enterprise architecture as "a well-defined practice for conducting enterprise analysis, design, planning, and implementation, using a holistic approach at all times, for the successful development and execution of strategy. Enterprise architecture applies architecture principles and practices to guide organizations through the business, information, process, and technology changes necessary to execute their strategies. These practices utilize the various aspects of an enterprise to identify, motivate, and achieve these changes."[1]

Many large organizations have reached out to FEAPO to create guidance. These companies and agencies have sought clarification on the skills, roles, and responsibilities that the members of an Enterprise Architecture team should demonstrate. To meet this challenge, the member organizations of FEAPO, representing over one million technical professionals worldwide, chartered this *Guide* and collaborated on its contents.

The audience for this *Guide* is fourfold.

- We expect the *Guide* to be used by hiring managers and chief architects to establish minimum knowledge standards and criteria for their staff and to assist them in organizing their teams.
- We expect architects and aspiring architects to review the requirements for the various roles in Enterprise Architecture and chart a path towards gaining employment and increasing their proficiencies in these professions.
- We hope that senior executives who are interested in building an Enterprise Architecture program will be able to refer to this *Guide* for an understanding of the skills they should look for in their architecture team.
- Lastly, we encourage recruiters and HR professionals to use this material to assist in the process of identifying qualified Enterprise Architecture candidates.

Over the course of several iterations, FEAPO intends to produce reports concerning EA career path guidance that spans the entire range of common EA practice. Given that range, this initial version of the *Guide* focuses on aspects of EA practice that are best known to a majority of the FEAPO members participating in this first iteration. A primary objective is to establish a framework for subsequent iterations that expands the range of EA career guidance to include the entire spectrum of EA practice

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[1] FEAPO, "A common perspective on enterprise architecture," in *Architecture & Governance*, volume 9, issue 4, 2013.

among FEAPO members. Fortunately, the framework created, the career roles identified, the competencies articulated, and the skill levels required, have wide applicability and should benefit all EA practitioners to some extent.

This first version leans toward EA as an Information Technology (IT)-associated practice. This orientation results from both the large number of IT-focused participants from FEAPO member organizations that prepared this first version of the *Guide* and from the fact that EA in IT is, at this point in time, better defined as career roles than in other enterprise constituencies.

We expect that the content of this *Guide* will be refined and expanded with use. We encourage all readers and users of this *Guide* to offer feedback on the adequacy of the framework, roles, competencies, and skills to their particular situation so that FEAPO can improve the *Guide* and its career coverage going forward with future editions. Please visit the FEAPO website at http://feapo.org to provide feedback after this *Guide* is published.

Competencies, Competency Groups, and Roles

The *Guide* adopts much of the terminology of human resource managers for enterprise architecture. Specifically, this *Guide* will utilize the following terms.

Capability – An ability that an individual may exhibit.

Competency – A capability that an individual may exhibit to do something successfully. They may have developed that competency through formal education, work experience, mentoring, or a combination of sources. The *Guide* is not concerned with the different ways in which an architect may have come by their competency.

Competency Group – A grouping of competencies that helps to identify gaps and elicit specifics from hiring managers.

Role – A cohesive set of competencies that FEAPO members have found valuable in their day-to-day experiences. Multiple roles may share particular competencies; overlap of roles is common. Note that a role is not a description of a person. Not only can a single person perform multiple roles, they can perform them simultaneously. In other words, it is perfectly appropriate for an architect to be performing the role of an information architect and a business architect at the same time, in the same conversation or meeting, or while creating a single deliverable for stakeholders.

Level – The degree to which an individual is proficient in a competency. In order to describe the competency of an enterprise architect, it is not enough to say that a particular architect "has" a competency; an individual must be able to illustrate the level of proficiency in that competency for a given role.

The relationship between these concepts is illustrated in Figure 1.

	Role	Role	Role
Competency Group			
Competency	Level	Level	Level
Competency	Level	**Level**	Level
Competency	Level	Level	Level
Competency Group			
Competency	Level	Level	Level
Competency	Level	Level	Level
Competency	Level	Level	Level

Figure 1: Competencies, Groups and Roles.

Roles in Architecture

In numerous discussions with various international organizations, FEAPO has found a wide array of "architect roles" described. This creates some confusion, since these roles are inconsistent between organizations and even within a single enterprise. There is a clear challenge: *How can FEAPO provide guidance on the competencies of an architect if we cannot agree, as an industry, on what kinds of architects actually exist?*

There are many different perspectives on what an Enterprise Architect is among the working corps of architects. After discussions among a wide array of individual architects and their managers, gaining consensus was challenging. FEAPO has found that the original model proposed by the National Institute of Standards and Technologies (NIST) in 1989 still works with a little modification.[2]

NIST described Enterprise Architecture at its earliest stages. At that time, EA was described as being composed of a "stack" of roles. The modern version of that stack, popularized by The Open Group architecture framework, is often called the "BAIT" model, referring to Business + Applications + Information + Technology. FEAPO determined that this model should not be illustrated as a "stack" but as a group of collaborating roles. To make this relevant to modern requirements, we added a critical role that was not top of mind in 1989, Security. This *Guide* refers to this model as "BAIT+S". Note: FEAPO is not suggesting that Security is the *only* additional area of concern facing Enterprise Architecture. This is simply the scope chosen for this version of the *Guide*.

The remainder of the *Guide* will refer to these parallel roles and the competencies required for each. The role labeled "Enterprise Architect" overlaps these architecture roles. This reality is one of the most important concepts in building an understanding of what it means to be an Enterprise Architect. See Figure 2.

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2 *Information Management Directions: The Integration Challenge*, E.N. Fong and A.H. Goldfine editors, NIST Special Publication 500–167, http://www.itl.nist.gov/lab/specpubs/NIST%20SP%20500-167.pdf, 1989.
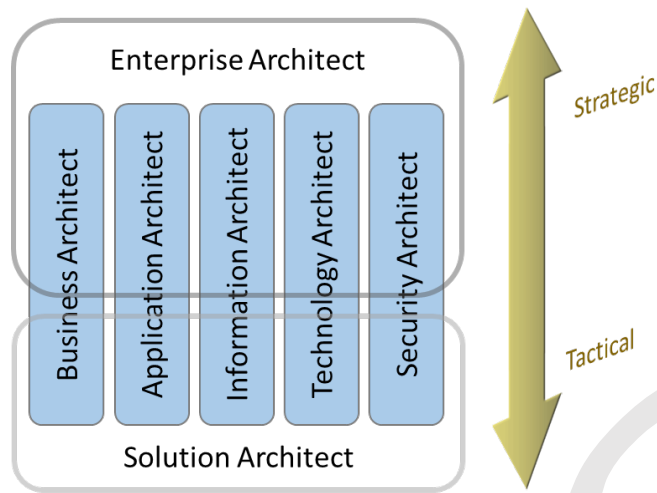
Figure 2: Overlapping roles.

The relationship between an Enterprise Architect and a Solution Architect is not so much a distinction between jobs as it is an understanding of the scope of each architect's work. Whereas the Enterprise Architect's focus is on *formulation of strategy*, the focus of the Solution Architect is on *execution* of that strategy to solve a particular, tangible, problem. The Solution Architect will often have a single, clear business leader whose metrics are driving the need for change. An Enterprise Architect often has to work with many senior business and technology stakeholders, and many competing measures of success. This *Guide* primarily focuses on an Enterprise Architect while recognizing that it is quite common for a Solution Architect to grow into an Enterprise Architect. See The Enterprise Architect's Journey.

An effective Enterprise Architect must be able to perform in *each* of these roles at a "surface" level, and with depth in at least one. While Scott Ambler, in his book "Agile Modeling" refers to this concept as a "generalizing specialist".[3] The Open Group cited human resource managers referring to this concept as a "T-shaped" or "V-shaped" architect".[4] Why "V-shaped"? Because the result is a person whose skills may appear similar to those in Figure 3 below, with some skills going far "deeper" than the others. Note that the "deep" skill can be in any of the architecture roles in the BAIT+S model.

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[3] Scott Ambler, *Agile Modeling: Effective Practices for Extreme Programming and the Unified Process*, John Wiley & Sons, 2002.
[4] "T-shaped people". The Open Group blog, http://blog.opengroup.org/2011/02/17/t-shaped-people/, 2011.
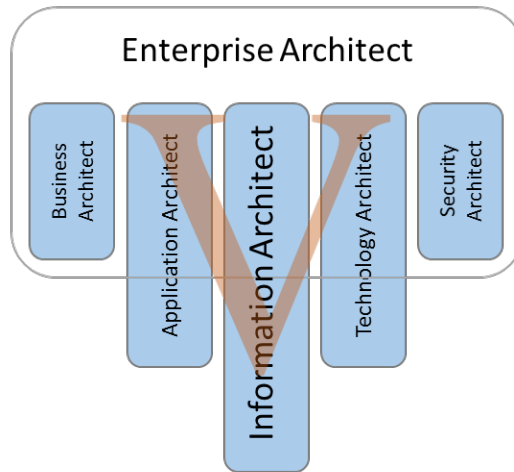
Figure 3: The V-shaped architect.

It has been pointed out that the term "Technology Architect" is more of a generalization than an actual role. In practice, a technology architect is likely to have a title related to their technology focus such as "network designer" or a product-specific architect.

The challenge of the BAIT+S model is that it appears to focus heavily on technology-relevant skills, but this is not entirely true. While the roles may differentiate among technology-relevant skills, these roles are useful because they are relevant to *any* group within an enterprise that must cope with change. Information technology is simply a place where change happens frequently so sophisticated models began there. However, these same concepts of leading and guiding change occur in *all* business areas to understand:

- why a change is needed (business architecture);
- how information moves (information architecture);
- how systems deliver services (application architecture);
- how systems interact (integration architecture);
- how technologies support them all (technology architecture); and
- the management of security throughout (security architecture).

The reader is encouraged to bear with the "dated" terms inherent in the BAIT+S model. An understanding of the roles needed to support organizational and strategic change should emerge below.

The Enterprise Architecture Competency Model

This section identifies and details the competencies that a fully qualified Enterprise Architect would exhibit, the expected levels for each competency, and how those levels vary across different BAIT+S roles. This set is called the *Enterprise Architecture Competency Model*.

Competency Descriptions

This section provides a brief overview of specific competencies, and describes a convenient grouping of those competencies. This is not a hierarchy, just an easy way to break down the list of competencies. Note that the full descriptions of the competencies themselves can be found in Appendix B – EA Competency Model.

Analytical Thinking

While this group focuses on such topics as systems thinking and strategic thinking, the key here is to find individuals who are able to bring a critical and innovative approach to analyzing the problems faced by the organization.

Architecture

Architecture competencies are essential because, in many ways, they differentiate an Enterprise Architect from any other kind of senior strategic leader in an organization. An Enterprise Architect rigorously integrates architectural skills into an approach to leadership, creativity, and problem solving. Architecture skills are the central focus of the value proposition of an Enterprise Architect.

Finance

While an Enterprise Architect is expected to have a generally good understanding of business, finance capabilities are focused on specific competencies involved with creating artifacts using financial information. Finance skills are important in allowing Enterprise Architects to collaborate effectively with a wide array of business professionals. Skilled Enterprise Architects consider the long term, end-to-end costs and benefits of a system, not only the immediate costs or benefits that are incurred within the bounds of a typical change program or project. These shorter-term costs and benefits are typically the focus of the Solution Architect involved in the design and delivery of a particular project or program. These shorter-term costs will be guided by the longer-term vision defined by an Enterprise Architecture framework and strategic design.

Management

As most Enterprise Architects are individual contributors, one may ask why an EA needs competency in management. However, the management competencies in this group have proven to be useful for EA practitioners as they work with other managers regarding resources. The stakeholders of Enterprise Architecture deal with management challenges daily. Management capabilities open up lines of effective communication with Enterprise Architecture stakeholders.

Influence without Authority

Following on to Management capabilities, Influence is another capability requiring high levels of competency. Most Enterprise Architects work with other teams, but have no authority. Therefore, Enterprise Architects must be able to convince or positively influence other people into cooperation or compliance with recommendations. There are no sticks, only carrots.

Communication

The skills involved in effective communication differentiate the role of an Enterprise Architect from most other architecture-focused roles. Enterprise Architects are frequently called upon to "make sense" of a highly complex collection of systems. While some key skills are purely architectural, the ability to create excellent models and designs will be wasted if the architect is unable to communicate effectively.

Interpersonal Skills

Throughout EA, it is clear that the actual value of an Enterprise Architect comes from going beyond "hard" skills to influence negotiation, conflict resolution, and political savvy. EA decisions can become personal to their stakeholders. Often, two or more business leaders, each with their own "measure of success", are pulling on an initiative: creating subtle conflicts in scope, cost, and expectations. Conflicts such as these have the effect of grinding progress to a halt. Enterprise Architects typically are involved in assuring the strategic design alignment is managed within the context of the many solutions being undertaken, working with Solution Architects to manage contention between projects/solutions when

such arise to negotiate win-win outcomes for the Enterprise. A skilled Enterprise Architect is a negotiator. He or she must have the skills to find a win-win situation for the enterprise. Not to underestimate the other competencies, any Enterprise Architect lacking in interpersonal skills is unlikely to succeed, regardless of their ability to understand and communicate complex systems.

Leadership

Enterprise Architects are catalysts of change, and people don't change without leadership. The competencies in this section are essential to support the role that Enterprise Architects perform in making organizations change, grow, adapt, and focus on their most important and strategic business areas. Enterprise Architects provide leadership in defining the enterprise code of development and design that the solution architects will work within.

Competency Levels

The following levels of understanding and ability have been used to provide guidance to EA practitioners, management and HR professionals placing resources in the roles defined within this *Guide* and generally within the EA domain. See Table 1. It is worth noting the level needed for competency will depend on the architecture role being performed.

Table 1: Competency Levels (source: SFIA).

Level	Descriptor	Ability
1	**Follow**	Basic capability to complete tasks under close supervision. Not expected to use much initiative. Should be organized.
2	**Assist**	Uses some discretion and has a wider circle of interaction than level 1, especially in their speciality. Works on a range of tasks, and proactively manages personal development.
3	**Apply**	Completes work packages with milestone reviews only. Escalates problems under own discretion. Works with suppliers and customers. May have some supervisory responsibility. Performs a broad range of tasks, takes initiative, and schedules own and others work.
4	**Enable**	Works under general direction in a framework. Influence at account level, works on a broad range of complex activities. Good level of operational business skills.
5	**Ensure and Advise**	Broad direction, supervisory, objective setting responsibility. Influences organization. Challenging and unpredictable work. Self-sufficient in business skills.
6	**Initiate and Influence**	Authority for an area of work. Sets organizational objectives. Influences policy, significant part of organization, and customers and suppliers at a high level. Highly complex and strategic work. Initiates and leads technical and business change.
7	**Set strategy, inspire, and mobilize**	Authority includes setting policy. Makes decisions critical to organization, influences key suppliers and customers at top level. Leads on strategy. Full range of management and leadership skills.

These levels are adapted from SFIA (*The Skills Framework for the Information Age*, version 5).[5] SFIA is a framework that describes professional skills needed for IT-related roles. SFIA version 5 contains the definition of 96 IT-related skills, organized into categories and sub-categories for convenience, with each skill defined at one or more of the 7 levels. Note: Organizations choosing to adopt this model for competency levels, or for use of SFIA in a commercial setting, should apply for a license at http://sfia-online.org.

Some models of competency have fewer levels and many HR organizations use a different framework for describing the levels of competency for an individual. FEAPO chose the reference model above for two reasons: for consistency with Bodies of Knowledge being developed across the industry, and to enable a domain-neutral approach to describing competency.

While the levels are adapted from SFIA, the actual list of competencies extends beyond IT-oriented frameworks into management, operational, and financial areas. In a future version of the *Guide to Careers in Enterprise Architecture*, there will be an appendix demonstrating alignment with competency terms and definitions used in the educational research and curriculum guideline communities for post-secondary education.

Recommended Competency and Ability Levels

The following table recommends the levels needed to perform as a "mid-career" Enterprise Architect (i.e. 10–15 years in the IT industry and 4–5 years in EA) in each of the roles identified as typical within the EA domain. See Table 2. Detailed descriptions of each competency are in Appendix B – EA Competency Model.

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[5] http://www.sfia-online.org/about-sfia/sfia-and-grading/

Table 2: Expected Competency Levels.

Ref	Competency & Breakdown	Senior Role	Roles at mid-career					
		Chief Architect	Enterprise Architect	Business Architect	Information Architect	Application Architect	Technology Architect	Security Architect
	Analytical Thinking							
AT-1	Creative thinking	4	5	5	5	5	5	5
AT-2	Critical thinking	5	5	5	5	5	5	5
AT-3	Problem solving	5	5	5	5	5	5	5
AT-4	Strategic thinking	6	6	5	5	5	5	5
AT-5	Systems thinking	6	6	5	5	5	5	5
AT-6	Abstraction	5	5	5	5	5	5	5
	Architecture							
AR-1	Design	5	5	5	4	4	5	5
AR-2	Information analysis	5	5	4	6	5	5	5
AR-3	Modeling	5	5	6	3	3	5	4
AR-4	Process Improvement	7	5	N/A[6]	3	4	4	4
AR-5	Road Map Development	7	6	5	4	4	4	4
AR-6	Scenario Building	6	6	6	4	5	4	4
AR-7	Standards Development	6	6	5	6	4	4	5
AR-8	System Development	4	4	3	3	5	3	3
AR-9	System Integration	4	4	5	5	4	4	5
	Communication							
CO-1	Elicitation	5	6	6	5	5	5	4
CO-2	Facilitation	6	6	6	5	4	4	4
CO-3	Oral Presentations	6	5	6	4	4	4	4
CO-4	Written Communication	7	6	5	4	4	4	4
	Finance							
FI-1	Budgeting	7	4	4	3	4	4	4
FI-2	Cost benefit analysis	6	5	5	3	3	3	3
	Interpersonal Skills							
IS-1	Conflict resolution	6	6	5	4	4	4	4
IS-2	Emotional Intelligence	6	5	4	4	4	4	4
IS-3	Influence	7	6	6	5	4	4	4
IS-4	Integrity	5	5	5	5	5	5	5
IS-5	Negotiation	7	6	5	4	5	5	5
IS-6	Political savvy	7	5	5	5	5	4	5
IS-7	Relationship Building	7	6	6	6	5	5	5

3 = Apply, 4 = Enable, 5 = Ensure and Advise (supervisory), 6 = initiate and influence (organizational), 7 = set strategy, inspire, and mobilize

(Table 2 continues on next page)

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[6] The Business Architecture Guild does not regard Business Process as an architecture competency, please see remarks on the front of the document

(Table 2, Expected Competency Levels, continued)

Ref	Competency & Breakdown	Senior Role	Roles at mid-career						
		Chief Architect / VP	Enterprise Architect	Business Architect	Data Architect	Information /	Application Architect	Technology Architect	Security Architect
	Leadership								
LE-1	Cyber/Information Security	6	3	3	3	3	3	6	
LE-2	Emerging Technology Monitoring	6	6	5	5	5	6	6	
LE-3	Enterprise Change Management	7	6	5	4	5	4	4	
LE-4	Information assurance	5	5	4	5	4	4	5	
LE-5	Inspirational Direction	7	5	5	4	4	4	4	
LE-6	Policy/Governance	7	5	4	4	4	4	5	
LE-7	Project Management	6	5	5	4	4	4	4	
LE-8	Strategic Planning	7	6	5	5	5	5	5	
LE-9	System Quality Assurance	6	6	6	6	7	6	6	
LE-10	Technology Governance	7	7	6	6	6	6	6	
	Management								
MA-1	Asset Portfolio Management	5	5	4	3	3	3	3	
MA-2	Coaching and Mentoring	6	5	4	4	4	4	4	
MA-3	Decision making	7	5	5	5	5	5	5	
MA-4	Industry Regulation & Compliance	7	6	7	6	6	6	6	
MA-5	Information Management	5	5	4	6	5	5	5	
MA-6	Life Cycle Management	6	6	5	4	4	4	3	
MA-7	Performance Management	6	4	6	4	4	4	4	
MA-8	Project Portfolio Management	6	5	5	4	4	4	4	
MA-9	Risk Management	6	6	5	6	5	5	6	

3 = Apply, 4 = Enable, 5 = Ensure and Advise (supervisory), 6 = initiate and influence (organizational), 7 = set strategy, inspire, and mobilize

The Enterprise Architect's Journey

Enterprise Architects grow out of many different functional roles within organizations. Some Enterprise Architects emerge from one of the traditional IT roles listed in the BAIT+S model, but many others enter the EA profession from such diverse fields as manufacturing engineering, systems engineering, and health informatics, to name a few. Becoming an Enterprise Architect is not an overnight event. A good metaphor is that of a journey, starting with an array of familiar launching points.

There are a handful of "indicators" to look for, in one self, in team members, or in a candidate, that indicate an individual is on the journey towards Enterprise Architect:

- A love of structured analysis. This means using structured methods to draw out information, organize it, and help reach conclusions.
- A strong affinity for working with diverse people.
- A history of bringing together people and concepts across perspectives, such as different business units or products.

- A desire to see a bigger picture, and to understand how the entire enterprise is driven by its organizing principles (an organization's "DNA").
- When faced with a complex situation, a good candidate will seek out ways to create *well-placed abstractions*. A well-placed abstraction is a metaphor useful in a model that enables complex decision-making without involving every detail otherwise associated with a system or process.

Until recently, there were no college level courses or programs in Enterprise Architecture. However, with a number of universities offering courses in EA, and a handful offering bachelor's and master's degrees in Enterprise Architecture, it should become far easier in the future to find candidates who have the necessary prerequisite training to perform the role. Today, an Enterprise Architect can be hired who lacks certification or formal education, but as the profession matures, organizations can expect to hire candidates with university training. If the marketplace for candidates reaches a "tipping point" where sufficient numbers have been formally trained, existing Enterprise Architects may find that they are less in demand unless they return to college themselves.

As most existing Enterprise Architects rose out of technology ranks, it would be uncommon to find an Enterprise Architect without serious technical skills, typically in software development, systems operations, project management, or business analysis. However, the role of Enterprise Architect is often not a technical one, and very technical people may find that their deep technology skills will become less relevant while broad technical and organizational skills become more important.

It is generally accepted across the industry that the actual skills and experiences needed to be effective as an EA develop through experience over an extended period of time. Even with degree programs and certification courses, it would be exceptionally rare to find a person who is capable of switching from a non-BAIT+S role directly into Enterprise Architect. For folks who are not initially technical, a solid path to Business Architect may exist from a variety of business-technical roles.

Figure 4 illustrates *some* of the pathways that practitioners of Enterprise Architecture have seen in practice, primarily as it relates to roles in information technology. The idea being that a person in a role, would move to another role that is "closer" to Enterprise Architect, one step at a time. Movement between roles typically involves adding skills or increasing competency levels to those required in the target role. An example path is shown with arrows to demonstrate how to use this graphic. While the figure depicts a fairly common IT-based progression, it is intended to be neither comprehensive nor exclusive. Alternative paths are equally valid.
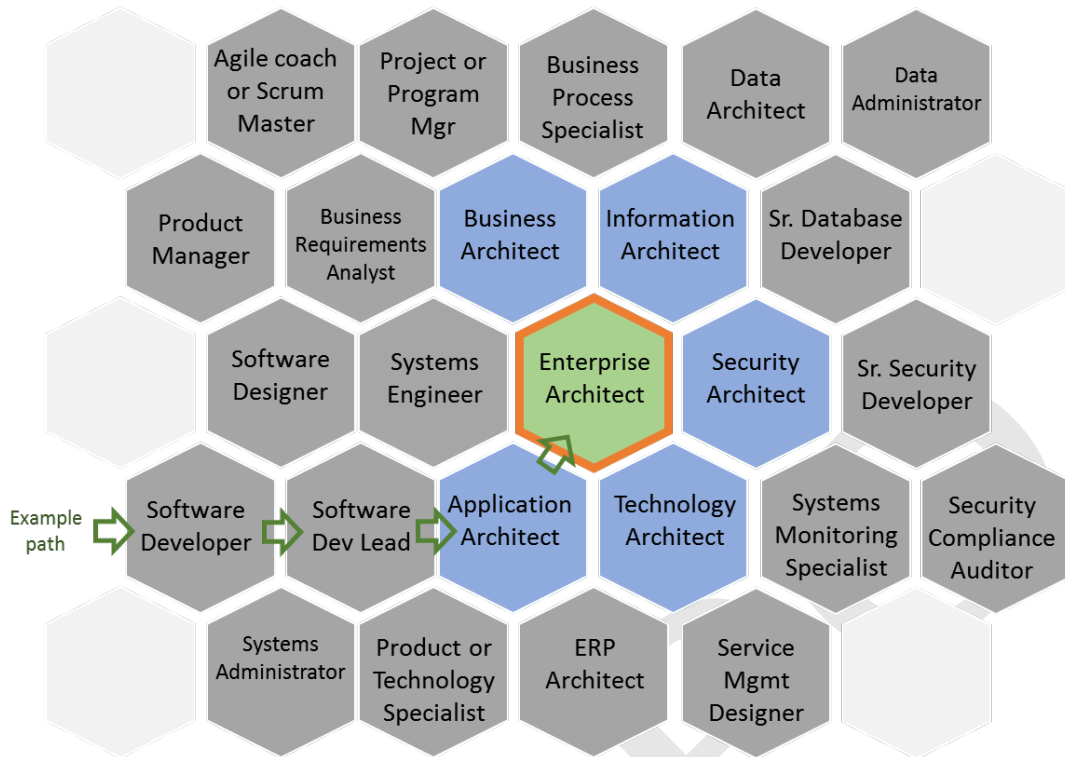
When moving from technical roles to architecture roles, the ability to succeed in the new role is highly dependent upon interpersonal skills and often leadership skills. For technologists, this is a frequent cause for struggle and retraining, as those skills are not often initially taught or required.

When moving from non-technical roles to architecture roles, the ability to succeed in the new role is highly dependent upon a broad technical grasp of issues such as integration, hosting, core data concepts, and software lifecycle. For non-technologists, this is a frequent cause for struggle and retraining.

Note that a person attempting to "move" through this matrix towards a role in Enterprise Architecture should expect to spend several years in a role in order to build proficiency before moving on. Also note that a person may hop between the "grey" areas throughout their career. This graphic is not intended to imply limitations, only to illustrate common approaches.

Relationships and collaboration points (architects to non-architects)

Every enterprise implements Enterprise Architecture in different ways, although some patterns occur frequently. Unfortunately, this diversity of interaction styles and methods makes it difficult to describe the common interactions between any particular architectural role and other roles in an enterprise. A key requirement for any Enterprise Architect is the ability to collaborate effectively with that role's unique stakeholders, set appropriate expectations, and build consensus towards a desired or intended solution.

Typically, the more technical roles such as application architect and technology architect spend most of their time working directly with other technologist roles such as project manager, software developer,

DevOps specialist, and system designer. More business-focused roles such as business architect and information architect need to have the skills and ability to work directly with non-technical stakeholders to build consensus without technical details.

Indirect collaboration, through shared documentation tools or team collaboration tools, is often a differentiating factor for the success of architecture roles. In addition, many Enterprise Architects report excellent results using EA repository tools, portfolio management tools, and software project tracking tools that encourage collaboration bridging traditional organizational "silos".

Certification and Education[7]

For an individual seeking an education in EA, some higher education institutions now offer EA courses, with a few offering full degree programs and certificates. Keeping abreast of changes in the profession requires continuing education and support for development through professional organizations. See Appendix D – Organizations involved with Enterprise Architecture for a list of relevant professional organizations in the Enterprise Architecture space.

Professionals looking to improve their skills in this new field, without the overhead of taking a full degree, can opt for certificate programs. Nearly every university that offers a degree in EA also offers a certificate program for professionals. Commercial training companies also offer courses for professionals, usually framed around a single framework, process or method.

The development of common curricula for degrees in Enterprise Architecture is just beginning. A description of one course in EA was included in the Association for Computing Machinery (ACM) and Association for Information Systems (AIS)'s Curriculum for Information Systems as one of six core courses.[8]

Articles on Enterprise Architecture can be found in the *Journal of Enterprise Architecture*, published by the Association of Enterprise Architects (AEA). The most notable Enterprise Architecture research conference in the field is the IEEE International Enterprise Distributed Object Computing Conference (EDOC), held annually. Proceedings from the EDOC conferences are published by IEEE.

Patterns of Enterprise Architecture Team Structure

There are many ways in which the Enterprise Architecture functions can be structured within a company. Smaller companies, or companies with limited appetites for change, may have a single architect with the title of "strategy architect" or "chief architect" who performs a "generalist" Enterprise Architect function. Other companies may go deeper and hire, or position, a group of architects to perform these functions.

The specific team structure used will affect the kind of person that is appropriate to fill that role. Different team structures place different demands upon people, and their abilities and competencies need to be tailored to match. This section will introduce four "team structure patterns" to help differentiate these impacts.

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[7] Future editions will elaborate on this topic.
[8] Association for Computing Machinery (ACM) and Association for Information Systems (AIS), *IS 2010: Curriculum Guidelines for Undergraduate Degree Programs in Information Systems*, https://www.acm.org/education/curricula/IS%202010%20ACM%20final.pdf, 2010.

Note that we are not suggesting that these are the only ways to structure and staff an Enterprise Architecture team. There are likely to be more. Some will be variations on these patterns, while others will be unique. Nor does FEAPO suggest that one is necessarily more appropriate or mature than others. The team structure that a company or agency selects will depend upon their particular needs. The goal here is simply to show how the team structure can affect the job requirements for the individuals involved.

The patterns described here are not specific to the location of the architecture team within the organization. Some teams report to the Chief Information Officer (CIO), while others report to a Chief Operating Officer (COO) or other non-technology executive. Some FEAPO members recommend paying close attention when deciding which executive should oversee and "own" Enterprise Architecture. In some organizations, Business Architects report to the Chief Finance Officer (CFO) to closely link what they do with those who set the overall strategy for the organization.

Patterns Overview

The four patterns of architecture team structures are: organizing by project, organizing by domain, organizing by strategy, and organizing by segment. They are illustrated and compared in Table 3.

Table 3: Team structure patterns.

By Project	By Architecture Domain / Segment	By Business Strategy / Process	By Business Segment / Domain
Architecture virtual team with a tiny number of central resources primarily doing coordination, with all architects assigned to various projects and reporting to different managers.	Architecture team composed of domain architects: Information, Business, Solution, and Technology architects. In larger organizations, each domain is a unique team (e.g. IA team, SA team, etc).	Architecture team composed of enterprise architects, each assigned to a single high-level business strategy or goal. In larger orgs, strategies for primary value chain activities may be separated from supporting.	Architecture team composed of enterprise architects, each assigned to one domain (cohesive business area). Typically aligned to value chain areas. In larger orgs, primary value chain segments are separate from supporting segments.
Breadth: Med Alignment: Low Depth: Low Collaboration: Low Repetition: High	Breadth: Low Alignment: Low Depth: Med Collaboration: Med Repetition: High	Breadth: Med Alignment: High Depth: Low Collaboration: High Repetition: Low	Breadth: High Alignment: Med Depth: Low Collaboration: Med Repetition: High

Criteria for comparison of team patterns:

- **Breadth** – This criterion illustrates the likelihood that the Enterprise Architect will be effective at performing a broad EA role in this team structure. A rating of "low" indicates that an architect will likely "do what they know" and little else.
- **Alignment** – This criterion illustrates the likelihood that the team structure will deliver on the promise of alignment. A team structure rated "high" is likely to empower the architects to guide programs toward strategic alignment.
- **Depth** – This criterion illustrates an emphasis on "growing deep skills" by placing people together with similar skills. The intent is to encourage cross training and skill sharing as well as allowing people to "balance the load" with teammates.

- **Collaboration** – This criterion illustrates an emphasis on collaboration and soft skills such as negotiation and political savvy. A team structure rated "high" will require the architect to not only excel at being collaborative, but at guiding others to be collaborative across "traditional" barriers in a business.
- **Repetition** – This criterion illustrates the likelihood that an architect who proves effective in a specific role will have the opportunity to keep repeating that success. A team structure rated "low" will test an architect to be highly flexible and adaptable, because the skills that got them into a team may not be the skills needed to be successful in that particular situation.

Impact on the role of the Enterprise Architect

The patterns described above have a substantial impact on the way that Enterprise Architecture is performed in the enterprise. Therefore, these patterns have an impact on the required mix of capabilities needed to fill the role. Some of these impacts are discussed in the remainder of this section. As noted, these four patterns are not intended to be an exclusive list of ways in which an Enterprise Architecture function is formed or engaged. Hybrids of these patterns occur frequently.

Project Architects – An Enterprise Architect assigned to work on a project is often seen as a senior member of a delivery team. They will be expected to be deeply skilled in one or more of the architectural domains as well as knowledgeable about the delivery lifecycle of projects. While not all enterprise architects are IT focused, companies that assign their EAs to project teams often focus their architecture efforts on IT concerns such as information management, system modeling, and technology selection.

It is unusual to see a business architect assigned to a project team and EAs assigned in this manner rarely develop business architecture skills. If an organization or company uses this structure, the focus should be on hiring architects that have deep technical architecture skills with some depth in project management.

Domain Architects – An Enterprise Architect working in a domain team will likely carry the moniker of that domain: *information* architect, or *business* architect, etc. Domain architects are expected to have deep skills in their area, but may not be required to have anything more than cursory skills in other domains. Organizations that choose this pattern often do so because they have trouble finding qualified architects with a breadth of skills. Unfortunately, this team structure, while effective in the short term, does not encourage domain architects to build skills outside their own focus area.

Strategy Architects – An Enterprise Architect assigned to a corporate or divisional strategy team will require broad collaboration skills, excellent communication skills and a great deal of awareness of how leaders can work well with other leaders in the enterprise. Strategy teams may report to the CTO or these may be non-permanent assignments, although they can last for over a year at a time in large organizations. An Enterprise Architect in this role must have a broad range of skills, with serious depth in business architecture, strategic alignment, and innovative "out of the box" thinking.

Segment Architects – An Enterprise architect assigned to a segment is focused on a specific set of capabilities for the enterprise. This aligns with the notion of capability modeling rather well, but some companies apply this pattern to assign an Enterprise Architect to a specific business unit or function instead of a related group of capabilities. Either way, the Enterprise Architect has an opportunity to apply a broad range of business, technical, and leadership

skills. Organizations that choose this pattern often require their architects to have a background in business or technical consulting.

Building the Enterprise Architecture Team

The first step in building an Enterprise Architecture team is *not* to hire architects. While that can be one of the longest duration activities, building an Enterprise Architecture program from scratch can be a slow and difficult process without first establishing key success factors such as a clear charter, CxO level support, and a clear communication plan. A full discussion of the challenges of building an Enterprise Architecture practice is outside the scope of this paper. However, some elements specific to the careers of the architects themselves are covered in this section.

Positioning and Clarity of Role

The first step in building an Enterprise Architecture team is selecting a team leader. The team leader, like any good coach, is responsible for positioning the "players" in the team so they can maximize their productivity for the team. To position the architects well, the role of the Enterprise Architects should be focused around the right set of competencies (see Competency Descriptions above).

An Enterprise Architect is not a technical developer or an engineer and should not be assigned system or solution design responsibilities. The Enterprise Architect needs to ensure that the right principles are in place to optimize the short-term needs of a given initiative (project) while balancing the long-term concerns in accordance with the architecture principles and roadmaps for the enterprise. While the Enterprise Architect's role embodies a duality of short- and long-term concerns, it is rarely a technically focused one.

To make this work, the balance between competing expectations must be clearly described in any HR requisition or outside search effort. If the Enterprise Architect candidate is brought in and directed to focus on short-term technology concerns, without the ability to positively affect the long-term needs and/or the organization as a whole, then both the architect and the organization may be constrained (as well as any solutions that are implemented). That can be a "lose-lose" proposition.

The Enterprise Architect needs to have the ability, and authority, to collaborate with other architects as a dedicated team or as part of a federated (virtual) team to align on architecture concerns, principles, and roadmaps efforts. The Enterprise Architect needs sufficient autonomy to reach beyond any single project to analyze one or more portfolios of projects to maximize the value of a given initiative for the organization while minimizing rework.

In order to provide useful guidance on the job descriptions for an Enterprise Architect, FEAPO has created sample Job Descriptions for each of the architecture roles discussed in this Guide, and made them available on the FEAPO web site, http://feapo.org.

As the Enterprise Architecture team is built, keeping these aspects of positioning and clarity of role in mind can help to avoid expensive yet common hiring mistakes.

Locating and Recruiting Architects

Hiring managers need their recruiters to be a quality check in the hiring process. Before beginning a search for an architect, an expert recruiter will ensure that the position described is aligned to the team structure in which the architect will be deployed (see above). In addition, the recruiter can help avoid some common problems in the hiring process.

All too often, hiring managers are looking for overly specific technical experience to meet the challenges of a given technical position, while under-emphasizing architectural skills and talents. There are already skilled technology positions defined for individuals who support the IT Software Development Lifecycle (Design, Build, Test, Implement, & Support).

The architect's job is to make sure that the domain(s) within their purview support future state objectives for the enterprise while balancing the need to deliver continuous value within the scope of individual projects. A recruiter can add value by challenging the need for overly technical requirements and focusing on the ability to balance architectural concerns as well as communication skills.

Interviewing an Enterprise Architect

Interview questions are commonly used to assess technical capabilities and build a picture for the depth of experience a given candidate can bring to the position. However, the reliance on questions to evaluate an architect has limitations since the role requires more emphasis around visualization, expansive thinking, and the ability to socialize and sell the value of balancing the short-term with the long-term (not at the expense of either).

A successful Enterprise Architect needs to bring more to the table than simply ensuring solutions are compliant. They need to have the vision and reach across other projects, architecture disciplines, and domain knowledge to create a more holistic awareness about how a given solution needs to both fit and function. An open-ended discussion format is very helpful when exploring these capabilities with an architecture candidate.

In an open-ended discussion, the following practices have proven useful:

- Use scenarios to engage the candidate to gauge their envisioning process and have them walk through their approach for challenging situations where the business or technical areas are struggling to align on common ground for a solution.
- Ask the candidate to discuss some of the challenges they have encountered in other situations and have them walk through their approach for bringing a successful solution forward.
- Shaping the roadmap is where an Enterprise Architect contributes thought leadership on an enterprise level. During the interview, establish that the candidate can take the enterprise view, and not just bring a myopic perspective around their architecture discipline.

The discussion format should reveal the candidate's soft skills, thinking skills (including creativity and critical thinking, and design thinking), communication, negotiating, and collaboration skills (which in many cases prove more valuable than the easily measured technical skills).

There is a need to explore the technical skills, since the architect needs to have a solid foundation in modeling and standards, if for no other reason than to ensure solutions are compliant with regulations and standards. The architect needs to have a grounding (hands on and/or solid understanding) in relevant tools and technologies used to support their discipline (business, information, application, or technology architecture).

Note: An enterprise architect is someone who has a command of all of these disciplines and brings a practicum of experience in one or more architecture disciplines. Typically, this is where a more common set of questions can be useful as a starting point since these questions can go far and deep. Technology-focused questions should be carefully planned out with specific boundary points to keep the discussion on track and to ensure the candidate has the relevant experience to provide a positive effect on the current portfolio of initiatives and help shape the roadmap for one or more architecture disciplines.

Suggested Interview Questions

Below are sample questions for enterprise architects to differentiate them from various domain architects and unqualified applicants. The questions that are used to assess an architect candidate should address the position and the experience across more than one architecture discipline.

Enterprise Architect

- What background experience, from your past work history, is relevant to this position and why does it make you suitable for this position?
- What do you know about the industry(s) within which our organization operates?
- What are our industry's regulations and standards?
- What do you think are the two biggest problems facing the organization? How would you resolve them?
- What do you see as the biggest issues the industry will face in the future?
  (*not specific to the department interviewing, but the business and/or industry in general*)
- Enterprise Architecture is one of the approaches this organization uses as a governance tool. Do you find this approach valuable? Explain.
- How do you define enterprise architecture?
- Describe the same for Project and Program Management. Is there a value or lack thereof?
- Describe how you see Portfolio Management being used within the organization.
- Are there other frameworks and/or methods currently used within the organization that you see have value? Explain.
- Are there others we are not using that would help improve our processes?
- How would you address the request for architecture work and stakeholder concerns?
  (*This question could be modified to each specific architecture role below.*)
- Describe how you document baseline, reference and target architectures. Discuss the approach you used to have these accepted and implemented within the environment they were designed for.

Any of the questions below could be asked of a Chief Enterprise Architect as this position should have a deep understanding of all the architecture team roles listed.

Business Architect

Any or all of the questions above could be changed slightly to be aimed at this specific area of EA, as well as the questions below.

- How do you define business architecture?
- Which methods of the business architecture ecosystem are you experienced with?
  Answers: capability mapping, value stream mapping, information mapping, organization mapping, strategy mapping, initiative mapping, product mapping, stakeholder mapping, etc.
- What business architecture frameworks or methodologies have you used?
- In which scenarios have you applied business architecture (e.g. transformation, investment planning, M&A, etc.)? Describe the situation, actions, and results.
- How do you align business processes with analysis and requirements for technology projects?
- How does business architecture relate to the operating model elements of people, process and technology?
- What business architecture modeling and mapping tools have you used? What is the value of these tools to the enterprise architecture discipline?
- List some of today's current tools and emerging trends you would deploy.
  Answers:

- o Knowledge of IT related disciplines: Software Development Life Cycle (SDLC) including a basic understanding of various SDLC paradigms such as agile and waterfall and their appropriate usage.
  - o Knowledge of business approaches: business modeling, strategy mapping, capability mapping, value mapping, information mapping, organization mapping, event mapping, policy mapping, product mapping and initiative mapping.
- Describe a recent project or engagement where you used the framework of a business capability model to help deliver business outcomes.

Information Architect

Any or all of the questions above can be used as well as the questions below.

- How do you define information architecture?
- How would you develop the target data architecture that enables our business architecture and the IT architecture vision?
  Answers:
    - o Working within the enterprise architectural standards developed by the Enterprise Architect, develop the organization's data architectural standards and principles.
    - o Develop an end-to-end vision for the data assets. Assist the architecture team in documenting the organization's baseline architecture and target architecture: including metadata assets such as data definitions, data classification, data retention, data models and data flow diagrams.
- What tools and techniques have you used (or would you use) to manage enterprise data and data architecture artifacts?
  Answers:
    - o Developed data usability/quality proposals, such as, but not limited to, data cleansing tools, data dictionaries, master data management, data integration and data warehouses.
    - o Deep understanding of data architecture approaches (e.g., TOGAF), industry standards and best practices (e.g., DMBOK).
    - o Strong technical skills with all data technologies (e.g., Master Data Management, Enterprise Data Warehouses, Operational Data Stores, Database Management Systems, Business Intelligence).
    - o Practical experience with, and a strong understanding of, design approaches for Enterprise Data Warehouses.
    - o Expert data modeling skills (i.e. conceptual, logical and physical model design, experience with Operation Data Stores, Enterprise Data Warehouses and Data Marts).
    - o Must have an enterprise perspective to data and how the data drives business value.
    - o Familiarity with Data Warehouse Technologies.
    - o Experience with ETL concepts, Cognos and OBIEE tools.
    - o Experience with Master Data Management tools.

Application Architect

Any or all of the questions above can be used as well as the questions below.

- How do you define application architecture?
- This position requires an ability to analyze broad enterprise business requirements, and the ability to translate those requirements into the target applications architecture. Provide an example of a situation you performed this function?
- What process have you used and would you use in this environment to document the baseline architecture that exists today?
- How would you develop application systems governance

Answers:
- o Work with the enterprise architect team to develop application systems ownership and stewardship policies.
- o Develop policies and procedures for application systems architecture artifacts management.
- o Perform architecture reviews to ensure compliance with architecture standards and adherence to architectural principles.
- o Recognizing and identifying potential areas where existing policies and procedures require change, or where new ones need to be developed.
- o Work with the Security Architect to develop application system security policies and strategies.

Technology Architect

Any or all of the questions above can be used as well as the questions below.

- How do you define technology architecture?
- This position must have the ability to comprehend the functions, capabilities and importance of new IT systems management trends and emerging technologies. Describe some of these trends and emerging technologies affecting enterprise architecture today
  Answer:
  - o Virtualization, cloud or shared services, converged infrastructure, mobility enhancement (may be called "engineered systems").
- What tools and techniques would you deploy to create, manage, and deploy technical architecture artifacts?
  Answer:
  - o Includes, but not limited to, physical and logical architecture diagrams, deployment diagrams, site topology diagrams, network diagrams…
- As Technology Architect, what process would you use to achieve a target architecture defined by the IT architecture team?
  Answer:
  - o Achieve the target application systems architecture by identifying candidate architecture roadmap components based upon gaps between the baseline and target architectures.

Security Architect

Any or all of the questions above can be used as well as the questions below.

- How do you define security architecture?
- This position requires an ability to analyze enterprise security requirements, and the ability to translate those requirements into target architectures. Provide an example of a situation where you performed this function.
- What process have you used and would you use in this environment to document the baseline security architecture that exists today?
- How would you develop security governance?

Answers:
- o Work with the Enterprise Architect Team to develop security application ownership and stewardship policies.
- o Develop policies and procedures for security architecture artifacts management.
- o Perform architecture security reviews to ensure compliance with architecture standards and adherence to architecture principles.

- - Recognizing and identifying potential risk areas where existing policies and procedures require change, or where new ones need to be developed.
    - Work with the Application Architect and the Enterprise Architect to develop application system security policies & strategies.
- What tools and techniques would you use to evaluate the security profile of an organization?

  Answers:
    - IT Security Vulnerability Assessment and Risk Analysis
    - Privacy Impact Assessment
    - Identity Management Service evaluation
    - Intrusion Detection and Prevention tests
- Provide examples of where you applied these techniques and the business scenarios that resulted in the evaluations.
- List privacy and security legislation that is relevant to your jurisdiction.

  Answer:

  Canada:
    - Regulations like the Personal Information Protection and Electronic Documents Act (PIPEDA),
    - Personal Health Information Protection Act (PHIPA),
    - Payment Card Industry (PCI),
    - An example of the provincial privacy legislation in applicable province(s).
    - Review the Security certifications you have obtained and the value of each.

  USA:
    - The Privacy Act of 1974 (5 U.S.C. 552a)
    - Clinger-Cohen Act of 1996, (a.k.a. Information Technology Management Reform Act)
    - Computer Fraud and Abuse Act of 1986
    - Computer Matching and Privacy Protection Act of 1988
    - E-Government Act of 2002 (E-GOV)
    - Federal Information Security Management Act (FISMA) of 2002
    - Paperwork Reduction Act (PRA) of 1995
    - Rehabilitation Act of 1998 Section 508
    - Sarbanes-Oxley Act of 2002
    - Health Insurance Portability and Accountability Act of 1996 (HIPAA)

Appendix A – List of terms and acronyms

activity : activities, action, actions, task

apply : implement, implemented, realize, use, used , utilize, using

architecture : architectures, application-architecture, business-architecture, business-data-architecture, data-architecture, enterprise-architecture, enterprise-data-architecture, foundational-architecture, process-architecture, technology-architecture

boundary : boundaries, bounded, external, internal, scope, separate

business : businesses

collection : assembly, combination, set, subset

constraint : convention, limited, frame, rule, syntax

context : circumstance, environment, environmental-context, setting, surrounding, system-of-interest

create : creating, creation, created, establish, established, synthesis, synthesize

define : defines, ill-defined, well-defined

description : describe, descriptive, describing

design : pattern, structural-design, high-level-design

domain : domains, discipline, subject-areas

element : elements

enterprise : project, projects, undertaking/venture

function : functions, functional, cross-functional, functionality, functioning, serves

goal : goals, organization-goals

information

manage : managed, management, access-management, identify-management, master-data-management, risk-management, threat-management, vulnerability-management

methodology : method, methods, database, decomposition, functional-decomposition, how, means, procedures, prescribe-manner, technique, techniques, way, workflows

model : models, business-model, business-process-models, data-model, enterprise-data-model, modeling-type, predictive-models

objective : objectives

operation : operations, operate, operational, operating

organization : organizations, organizational, community, company, companies, department, division, group, reporting-structures, team

perform : performing, performance, performed, carry-out, conduct, execute, execution, do, does, did

process : processes, business-process, process-of-interest

product : products, construction, good, service, services

relationship : relationships, relationships-between, relationships-within, interrelationship, linkage

requirement : require, requires, requirements, data-requirements, demands, necessary, need, needs, needed

result : results, effect, end-result, outcome, output, solution, work-product

stakeholder : stakeholders, shareholder, shareholders, architect, architects, engineer, engineers, actor, builder, consumer, customer, end-user, human, manager, member, owner, party, people, person, planner, provider, roles, senior-management, sub-contractor, user, who

strategy : strategies, strategic

structure : structures, structured

system : systems, complex-systems, information-systems, organizational-system, process-systems

technology : technologies, technical, technological

Appendix B – EA Competency Model

The following table outlines the specific competencies referenced earlier in this guide.

Ref	Core Competencies	Definition of Competency
	Analytic Thinking	
AT-1	Creative thinking	The successful generation and productive consideration of new ideas; Application of new ideas to resolve existing problem; Willingness of stakeholders to accept new approaches.
AT-2	Critical Thinking	Disciplined, clear and rational thinking resulting in evidence based, reasonable judgments. This skill will include inquisitive thinking.
AT-3	Problem solving	The resolution (both reactive and proactive) of problems throughout the information system lifecycle, including classification, prioritization and initiation of action, documentation of root causes and implementation of remedies to prevent future incidents.
AT-4	Strategic thinking	The capability to recognize and exploit business opportunities (for example, the Internet), to ensure more efficient and effective performance of organizations, to explore possibilities for new ways of conducting business and organizational processes, and to establish new businesses. Includes design thinking.
AT-5	Systems thinking	Understanding of how a change to a component affects the system as a whole; Identification of reinforcing and compensating feedback loops; Understanding of how systems adapt to pressures and changes.
	Architecture	
AR-1	Design	The creation of a plan or convention for the construction of an object or a system that satisfies stated business objectives. The specification and design of information systems to meet defined business needs in any public or private context. The identification of concepts and their translation into implementable design. The design or selection of components. The retention of compatibility with enterprise and solution architectures, and the adherence to corporate standards and patterns within constraints of cost, security and sustainability.
AR-2	Information analysis	The investigation, evaluation, interpretation and classification of information, in order to define and clarify structures which describe the relationships between real-world entities. Such structures facilitate the development of software systems, links between systems or retrieval activities.
AR-3	Modeling	The production of abstract or distilled representations of situations to aid the communication and understanding of existing, conceptual or proposed scenarios. Predominantly focused around the representation of processes, roles, data, organization and time. Models may be used to represent a subject at varying levels of detail and decomposition. Central to the Business Architecture, this includes capability mapping, value stream mapping, information mapping, organization mapping. Advanced skills would include product

		mapping, stakeholder mapping, strategy, policy and initiative mapping.
AR-4	Process improvement	The identification of new and alternative approaches to performing activities. The analysis of processes, including recognition of the potential for automation of the processes, assessment of the costs and potential benefits of the new approaches considered. Where appropriate, this also includes management of change, and assistance with implementation of changes. It may include the implementation of a process management capability/discipline at the enterprise level. The identification of new and alternative approaches to performing business activities.
AR-5	Road Map Development	The creation, iteration, and maintenance of a guiding roadmap that embodies the key principles, methods and models that describe the organization's future state, and that enable its evolution. This competency typically involves the interpretation of business goals and drivers; the translation of business strategy and objectives into an "operating model"; the strategic assessment of current capabilities; the identification of required changes in capabilities; and the description of inter-relationships between people, organization, service, process, data, information, technology and the external environment.
AR-6	Scenario Building	The articulation of business stories in the order that it takes place, including the setting, background and context, from the viewpoint of the stakeholders for the purpose of highlighting the business drivers and the interactions with a system or groups of systems.
AR-7	Standards Development	The formation of the constraints, values and guiding principles necessary to define, assure and govern the business activities.
AR-8	System Development	The design, creation, testing and documenting of new and amended programs from supplied specifications in accordance with agreed standards. The provision of specialist expertise to facilitate and execute the installation and maintenance of system software such as operating systems, data management products, office automation products and other utility software. The provision of advice, assistance and leadership in improving the quality of software development, by focusing on process definition, management, repeatability and measurement. The facilitation of improvements by changing approaches and working practices, typically using recognized models such as the Capability Maturity Model Integration (CMMI), the Software Process Improvement and Capability determination Model (SPICE), Test Process Improvement (TPI) and Test Maturity Model (TMM).
AR-9	System integration	The incremental and logical integration and testing of components and/or subsystems and their interfaces in order to create operational services.
	Communication	
CO-1	Elicitation	Ability to understand and clearly articulate different participants' perceptions, concerns and perspective. Using a range of techniques, the participants are influenced to bring

		forward the information that they have. This competence also requires the gathering and sharing of information with the participants, emphasizing facts and provable information, highlighting areas of common "wisdom" and common perception. Being inclusive in sharing the information in a non-threatening way that that further promotes engagement and sharing of information.
CO-2	Facilitation	The capability to guide a group toward a shared goal within expected timeframes, maximizing focus on the goal and minimizing group effort to reach that goal, including the ability to perform elicitation in a group setting, effectively bringing forth information from each member of the group. This competency also includes the ability to effectively prepare for and run productive meetings and workshops.
CO-3	Oral Presentation	Can communicate effectively, through speaking and presentation, in a variety of situations to ensure understanding.
CO-4	Written Communication	The ability to communicate effectively, through writing, in a variety of situations to ensure understanding of various stakeholders. To visualize, plan and create presentations. The ability to effectively create and document EA artifacts, processes and methods.
	Finance	
FI-1	Budgeting	The oversight of projects, and the acquiring and utilizing the necessary resources and skills, within agreed parameters of cost.
FI-2	Cost Benefit Analysis	A systematic approach to estimating the strengths and weaknesses of alternatives that satisfy transactions, activities or functional requirements for a business. Determination, monitoring, and review of program costs, operational budgets, staffing requirements, program resources, inter-dependencies and program risk.
	Interpersonal Skills	
IS-1	Conflict resolution	Preventing, managing, and/or resolving conflict.
IS-2	Emotional Intelligence	The ability of an individual to read and understand the emotions of others and to interact with empathy. It also includes possession of awareness of one's own emotions and being able to self-regulate those emotions, to drive performance and successfully navigate social situations.
IS-3	Influence	The provision of advice and recommendations, based on expertise and experience, to address client needs. May deal with one specific aspect of IT and the business, or can be wide ranging and address strategic business issues. May also include support for the implementation of any agreed solutions.
IS-4	Integrity	Personal accountability and a dedication to ethics.
IS-5	Negotiation	Ensuring that participants in a discussion correctly understand one another's positions to reach a satisfactory agreement.
IS-6	Political savvy	Understands organizational culture, structure and impact on work efforts.
IS-7	Relationship Building	The ability to develop working relationships with a wide variety of individuals throughout an organization. Being able

		to nurture these relationships to affect change, provide a conduit for effective communication, and to facilitate positive communication within the organization.
	Leadership	
LE-1	Cyber/Information Security	The authorization and monitoring of access to IT facilities or infrastructure in accordance with established organizational policy. Includes investigation of unauthorized access, compliance with relevant legislation and the performance of other administrative duties relating to security management.
LE-2	Emerging Technology Monitoring	The identification of new and emerging hardware, software and communication technologies and products, services, methods and techniques and the assessment of their relevance and potential value as business enablers, improvements in cost/performance or sustainability. The promotion of emerging technology awareness among staff and business management
LE-3	Enterprise Change Management	The definition and management of the process for deploying and integrating new capabilities into the business in a way that is sensitive to and fully compatible with business operations. Includes organizational change, design and implementation of an integrated organization structure, role profiles, culture, performance measurements, competencies and skills, to facilitate strategies for change and for training to enable the change. The identification of key attributes of the culture and the key principles and factors for addressing location strategy.
LE-4	Information Assurance	The leadership and oversight of information assurance, setting high level strategy and policy, to ensure stakeholder confidence that risk to the integrity of information in storage and transit is managed pragmatically, appropriately and in a cost-effective manner.
LE-5	Inspirational Direction	Inspirational Direction is about energizing and creating a sense of direction, purpose, excitement and momentum for change. It involves energizing individuals to strive towards a compelling vision of the future by embracing and embodying the organizations values. It includes offering clarity around goals and objectives and ensuring collaborative work towards a shared purpose.
LE-6	Policy/Governance	The establishment and oversight of an organization's approach to the use of Information and IT, including acceptance of responsibilities in respect of both supply of, and demand for, IT; strategic plans for IT, which satisfy the needs of the organization's business strategy; IT acquisitions with appropriate balance between benefits, opportunities, costs, and risks; provision of IT services, levels of service and service quality which meet current and future business requirements; policies and practices for conformance with mandatory legislation and regulations, which demonstrate respect for the current and evolving needs of all stakeholders. The specification and design of engagement strategies, motivations and approaches that are needed for effective use of the systems by collaborating systems. This may affect user design and user experience, or may include the machine-to-machine learning capabilities for smart devices, e-procurement or messaging ecosystems.

LE-7	Project Portfolio Management	The development and application of a systematic management framework to define and deliver a portfolio of programs, projects and ongoing services in support of specific business strategies and objectives. Includes the implementation of a strategic investment appraisal and decision-making process based on a clear understanding of cost, risk, inter-dependencies, and impact on existing business activities, enabling measurement and objective evaluation of potential changes and the benefits to be realized. The prioritization of resource utilization and changes to be implemented. The regular review of portfolios.
LE-8	Strategic Planning	Ensure the alignment of the proposed solution to the overall business strategies, and that the architecture framework will support the desired business outcomes
LE-9	System Quality Assurance	The application of techniques for monitoring and improvement of quality to any aspect of a function or process. The achievement of and maintenance of compliance to, national and international standards, as appropriate, and to internal policies, including those relating to sustainability and security.
LE-10	Technology Governance	The establishment and oversight of an organization's approach to the use of Information and IT, including acceptance of responsibilities in respect of both supply of, and demand for IT; strategic plans for IT, which satisfy the needs of the organization's business strategy (which, in turn, takes into account the current and future capabilities of IT); transparent decision making, leading to valid reasons for IT acquisitions with appropriate balance between benefits, opportunities, costs, and risks; provision of IT services, levels of service and service quality which meet current and future business requirements; policies and practices for conformance with mandatory legislation and regulations, which demonstrate respect for the current and evolving needs of all stakeholders.
	Management	
MA-1	Asset Portfolio Management	This competency includes that ability to effectively leverage the assets of an organization, to support the business strategies and objectives. Assets can be physical or virtual. This competency includes the implementation of proper controls and precautions for the management and handling of each asset.
MA-2	Coaching and Mentoring	Apply a systematic process to improve others' ability to set goals, take action, and maximize strengths.
MA-3	Decision making	Identifying and understanding issues, problems, and opportunities; using effective approaches in choosing a course of action or developing appropriate solutions; taking appropriate action.
MA-4	Industry Regulation and Compliance	Understanding of the regulations of the industry being operated under, and where these regulations have a material impact on the enterprise boundaries. Constraints caused by regulations and compliance must be understood especially in heavily regulated industries such as Healthcare and Finance. This competency also includes the evaluation and inclusion

		of political, legislative, economic, social and technological factors in the forming of corporate roadmaps and strategies.
MA-5	Information Management	The overall management of the use of all types of information, structured and unstructured, whether produced internally or externally, to support decision-making and business processes. Encompasses development and promotion of the strategy and policies covering the design of information structures and taxonomies, the setting of policies for the sourcing and maintenance of the data content, and the development of policies, procedures, working practices and training to promote compliance with legislation regulating the management of records, and all aspects of holding, use and disclosure of data.
MA-6	Life Cycle Management	The management of the processes and activities concerned with the evolution of a system, product, service or project from conception to retirement. The ability to manage the life cycle processes is critical to systems engineering and IT Service Management.
MA-7	Performance Management	The ability to identify appropriate metrics and activities for people or teams of people. To be able to deliver performance of managed teams and individuals against the defined measures and goals. To be able to tie measures and goals into the overall strategic plan for the organization, so that operational goals are in support of the business strategy.
MA-8	Project Management	The management of projects, typically (but not exclusively) involving the development and implementation of business processes to meet identified business needs, acquiring and utilizing the necessary resources and skills, within agreed parameters of cost, timescales, and quality.
MA-9	Risk Management	The planning and implementation of organization-wide processes and procedures for the management of risk to the success or integrity of the business, including those arising from the use of information technology, reduction or non-availability of energy supply or inappropriate disposal of materials, hardware or data.

Appendix C – Further Reading

Enterprise Architects and others seeking to become enterprise architects may want to avail themselves of useful reference material. This section is a compilation of books and reference materials that the authors of this paper found useful in their own development and would like to share with the generation to follow.

Useful Books

Ambler, Scott (1998). *Process Patterns: Building Large-Scale Systems Using Object Technology.* Cambridge University Press/SIGS Books.

Cook, Melissa (1996). *Building Enterprise Information Architectures: Reengineering Information Systems.* Prentice Hall.

Date, C.J. (2003). *An Introduction to Database Systems.* 8th ed. Pearson.

Davenport, Thomas H., ed. (2012). *Enterprise Analytics: Optimize Performance, Process, and Decisions Through Big Data.* Pearson Education.

Evans, Sharon C. (2010). *Zoom Factor for the Enterprise Architect: How to Focus and Accelerate Your Career.* Firefli Media.

Franz, Peter and Mathias Kirchmer (2013). *Value-Driven Business Process Management: The Value-Switch for Lasting Competitive Advantage.* McGraw-Hill Education.

Gamma, Erich et al. (1994). *Design Patterns: Elements of Reusable Object-Oriented Software.* Addison-Wesley.

Goffee, Rob and Gareth Jones (2009). *Clever: Leading Your Smartest, Most Creative People.* HBR Press.

Harada, Takehiko (2015). *Management Lessons from Taiichi Ohno: What Every Leader Can Learn from the Man who Invented the Toyota Production System.* McGraw-Hill Education.

Have, Steven ten et al. (2002). *Key Management Models.* Financial Times/Prentice Hall.

Hofmeister, Christine, Robert L. Nord, and Dilip Soni (2000). *Applied Software Architecture.* Addison-Wesley.

Kowalkowski, Frank, Gil Laware, and William Ulrich (2015). *Business and Dynamic Change: The Arrival of Business Architecture*. Future Strategies Inc.

Liker, Jeffrey (2004). *The Toyota Way: 14 Management Principles from the World's Greatest Manufacturer.* McGraw-Hill Education.

Lirov, Yuval (1997). *Mission Critical Systems Management.* Prentice Hall.

Maxwell, John C. and Stephen R. Covey (2007). *The 21 Irrefutable Laws of Leadership: Follow Them and People Will Follow You.* 2nd ed. Thomas Nelson.

Modell, Martin E. (1988). *A Professional's Guide to Systems Analysis.* McGraw-Hill.

Murphy, James D. (2003). *Flawless Execution: Use the Techniques and Systems of America's Fighter Pilots to Perform at Your Peak and Win the Battles of the Business World.* Harper Business.

O'Rouke, Carol, Neal Fishman, and Warren Selkow (2003). *Enterprise Architecture Using the Zachman Framework.* Course Technology.

Osterwalder, Alex and Yves Pigneur (2009). *Business model generation.* (self-published).

Osterwalder, Alex et al. (2014). *Value Proposition Design: How to Create Products and Services Customers Want.* Wiley.

Palmes, Paul C. (2009). *Process Driven Comprehensive Auditing: A New Way to Conduct ISO 9001:2008 Internal Audits.* 2nd ed. ASQ Quality Press.

Patterson, Kerry et al. (2002). *Crucial Conversations: Tools for Talking When Stakes Are High.* 2nd ed. McGraw-Hill.

Patterson, Kerry et al. (2013). *Crucial Accountability: Tools for Resolving Violated Expectations, Broken Commitments, and Bad Behavior.* 2nd ed. McGraw-Hill Education.

Porter, Michael E. (1998). *Competitive Strategy: Techniques for Analyzing Industries and Competitors.* Free Press.

Ross, J. W., Weill, P., & Robertson, D. (2006). Enterprise architecture as strategy: Creating a foundation for business execution. Boston, MA: Harvard Business Review Press.

Sinek, Simon (2011). *Start with Why.* Portfolio.

Soin, S. Singh (2013). *Winning With Operational Excellence.* lulu.com.

Tiwana, Amrit (2000). *The Essential Guide to Knowledge Management: E-Business and CRM Applications.* Prentice Hall.

Ulrich and McWhorter (2011). *Business Architecture: The Art and Practice of Business Transformation*. MK Press.

Whelan, Jonathan and Graham Meaden (2012). *Business Architecture: A Practical Guide.* Gower.

Wijegunaratne, Inji and George Fernandez (1998). *Distributed Applications Engineering: Building New Applications and Managing Legacy Applications with Distributed Technologies.* Springer.

Useful Reference Works (Standards and Bodies of Knowledge)

Business Architecture Guild (2015). *A Guide to the Business Architecture Body of Knowledge™* (BIZBOK® Guide), 4.5. http://www.businessarchitectureguild.org/.

BKCASE. *The Guide to the Systems Engineering Body of Knowledge* (SEBoK®), http:// www.sebokwiki.org.

DAMA International (2013). *DAMA Guide to the Data Management Body of Knowledge* (DAMA-DMBOK), version 2. http://www.dama.org/.

IEEE Computer Society (2014), *The Guide to the Software Engineering Body of Knowledge* (SWEBOK), V3.0 http://www.computer.org/web/swebok/.

ISO/IEC/IEEE 42010:2011, *Systems and software engineering — Architecture description*.

ISO 15704:2000, *Industrial automation systems — Requirements for enterprise-reference architectures and methodologies*.

The Open Group (2011). TOGAF® 9.1. http://www.opengroup.org/togaf/.

Appendix D – Organizations involved with Enterprise Architecture

When attempting to recruit an Enterprise Architect, the first challenge is simply to find them. When starting a search, a recruiter may want to leverage some of the organizations where architects tend to participate (not just congregate). These organizations and sites often have published information and articles from members. They often provide and/or welcome posts of opportunities for their members.

Here is a starting point for a search, broken out by the respective disciplines:

Role	Example Domain-related Organizations	Example Cross-domain organizations and National organizations
Enterprise Architect	• Federation of EA Professional Organizations (FEAPO) • Association of Enterprise Architects (AEA) • Institute for EA Development • International Association of Software Architects (IASA) • Netherlands Architecture Forum • BCS Enterprise Architecture Specialist Group • Center for the Advancement of the Enterprise Architecture Profession (CAEAP)	• IEEE Computer Society • International Council on Systems Engineering (INCOSE) • British Computer Society (BCS) • Australian Computer Society (ACS) • Canadian Information Processing Society (CIPS) • The Global IT Community Association • Institute of Information Technology Professionals New Zealand • The International Federation for Information Processing – International Professional Practice Partnership (IFIP IP3) • The National Association of State Chief Information Officers • Association for Computing Machinery (ACM)
Business Architecture	• Business Architecture Guild • Business Architecture Society • Object Management Group – Business Architecture Special Interest Group (BASIG) • International Institute of Business Analysis (IIBA)	
Information and Data Architects	• Data Management Association (DAMA) • Association for Enterprise Information • Information Architecture Institute • Association for Information Science & Technology (ASIS&T) • Data Governance Institute (DGI) • IBM Data Governance Council	
Application Architecture	• Software Engineering Institute (SEI) • Society for Information Management • SOA Institute	
Technology Architecture	• The Network Professional Association • Association of IT Professionals (AITP)	
Security Architecture	• Information Systems Audit and Control Association (ISACA) • International Information System Security Certification Consortium (ISC)^2	

During the collection of the above list, FEAPO members also suggested some professional organizations that are relevant to Enterprise Architecture skills and capabilities without being focused on Enterprise Architecture as a field or profession. Some relevant organizations are listed below.

Example related professional organizations
• Business Relationship Management Institute • Project Management Institute • International Project Management Association • Society for HR Management • Association for Strategic Planning • Association of Change Management Professionals

Finding an Enterprise Architecture consultant can be a different problem altogether. While this is not typically a problem that human resources has to cope with, it is relevant to career paths for two reasons. First, many companies learn about new capabilities through engaging with skilled people from consulting organizations. Secondly, the best employees may be sourced from companies that already do the work.

The marketplace of these companies changes quickly. Rather than list specific vendors, and risk creating a document that acts as advertising for various companies, FEAPO provides the following list of search terms that may be useful to locate consulting companies and organizations where consultants can be found.

Example search terms to find consulting companies				
Business	**Application**	**Information**	**Technology**	**Security**
"alignment" "business value delivery" "business capability"	"SOA consulting" "systems development"	"data governance" "information modeling" "data strategy"	"cloud technologies" "system management"	"security assurance" "intrusion detection"

In addition to locating consulting companies that can assist with specific domain activities, there is often a need to locate companies that can help an organization build the enterprise architecture program or specific architectural capabilities. To find these companies, FEAPO members suggest using the following search terms.

People	**Process**	**Governance**	**Architecture support**	**Security**
"architecture assessment" "assessing architects"	"architecture maturity" "architecture model" "architecture framework" "capability maturity" "architecture value" "architecture reuse"	"architecture governance models" "enterprise governance" "architecture metrics"	"artifact manager" "artifact librarian" "architecture methods" "architecture standards"	"architecture assurance" "architecture audit"

	"reference architecture"		"architect mentor"	