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AN EXAMINATION OF ENTERPRISE ARCHITECTURE FRAMEWORK USAGE PATTERNS

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ABSTRACT

Organizations use enterprise architecture to better align IT and business strategy, provide a comprehensive view of their IT systems, and lower the costs of future integrations. The introduction of the Zachman framework by John Zachman in 1987 ushered in a multitude of enterprise architecture frameworks and methodologies, each with their own way of fulfilling these requirements. As these frameworks become more mature and accepted, research suggests that organizations now build their own hybrid frameworks by incorporating elements of several popular frameworks. However, little research has identified the use patterns related to the adoption of standard or hybrid enterprise architecture frameworks or the design process for hybrid frameworks. To better understand the recent surge in popularity of hybrid frameworks, enterprise architects from various industries and governments worldwide participated in a survey. Preliminary results of this survey show that several popular trends in the development of hybrid frameworks exist.

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Introduction

Perspectives on Enterprise Architecture

Despite extensive research and collaboration by industry associations and academic groups, no consenting definition of enterprise architecture exists because of its complex nature and focus on providing differing views of the architecture to each unique stakeholder group. Various research groups have published formalized definitions. For the purpose of clarifying the concept of enterprise architecture, several prominent definitions follow below.

Gartner defines enterprise architecture as:

“Enterprise architecture is the process of translating business vision and strategy into effective enterprise change by creating, communicating and improving the key requirements, principles and models that describe the enterprise's future state and enable its evolution. The scope of the enterprise architecture includes the people, processes, information and technology of the enterprise, and their relationships to one another and to the external environment. Enterprise architects compose holistic solutions that address the business challenges of the enterprise and support the governance needed to implement them.” (A. Lapkin, Allega, P., Burke, B., Burton, B., Bittler, R. S., Handler, R. A.,...Gall, N. , 2008)

The Institute of Electrical and Electronics Engineers (IEEE) in Std. 1471-2000 define architecture as:

“...the fundamental organization of a system, embodied in its components, their relationships to each other and the environment, and the principles governing its design

and evolution." ("IEEE recommended practice for architectural description of software-intensive systems," 2000)

Professor Peter Weill of MIT's Center for information Systems Research defines enterprise architecture as:

"The organizing logic for key business process and IT capabilities reflecting the integration and standardization requirements of the form's operating model."(Weill, 2007)

The Institute For Enterprise Architecture Developments defines enterprise architecture as:

"Enterprise Architecture is a complete expression of the enterprise; a master plan which "acts as a collaboration force" between aspects of business planning such as goals, visions, strategies and governance principles; aspects of business operations such as business terms, organization structures, processes and data; aspects of automation such as information systems and databases; and the enabling technological infrastructure of the business such as computers, operating systems and networks."("Enterprise architecture good practice guide first international open standard in EA," 2009)

These definitions clearly express that enterprise architecture exists as both a technical framework for the organization's information systems and methodology for developing and maintaining the aforementioned framework. These functions of enterprise architecture were developed from organizational needs to better understand and develop IT resources.

Why Use Enterprise Architecture?

The Value of Enterprise Architecture

Enterprise Alignment

Enterprise architecture developed in response to demands on IT from business leaders and the increasing complexity of IT. While each organization has a unique environment, they all use enterprise architecture as a tool to solve several problems. Enterprise architecture strives to better align the organization's IT assets with the strategy and mission of the business. Over 40% of organizations surveyed in 2008 by Infosys stated that IT-business alignment was their top enterprise architecture objective. (Obitz, 2009) Aligning IT and business strategy has been a major issue for organizations and refers to how well an organization's IT resources support their business functions. With the increasing complexity and service offerings in the IT realm, it has become more and more difficult to relate technological capabilities to the goals and missions of an organization and ultimately the bottom line. In using enterprise architecture, organizations hope to better relate IT resources to organizational needs. (Pereira, 2005)

Enterprise architecture attempts to bridge the gap between technology and organizational strategy by establishing standards based on business strategy. Through the development of the individual technical architectures and their periodic redesigns, members of the enterprise architecture team can interact with business executives to define a future state of the organization based on their strategy, missions, and goals. This connection to the strategy and mission links IT investments to the success criteria of the organization. After defining the architectures, one can use them to evaluate whether current or proposed IT systems align with organizational goals and strategy. By using enterprise architecture, organizations can draw

better conclusions about how well their IT systems support the business and use them as justification for future projects to bring IT into better alignment with the business.

Organizations can eliminate or correct misaligned IT systems and identify gaps where functionality developed. If a future state of the organization is defined by the enterprise architecture team, it will allow IT to prepare for projected shifts in the business strategy. All of these enterprise architecture tools remain extremely useful in the process of improving the alignment between IT and the business strategy.(Burton, 2009a)

A Comprehensive View of the Enterprise

Organizations use enterprise architecture frameworks to better define and communicate their architectures. Most major frameworks outline a method to model the architecture, but no universal standard for architecture modeling exists. Attempts to define a common modeling language, such as IEEE Std. 1471-2000, have not reached critical mass in their acceptance. ("IEEE recommended practice for architectural description of software-intensive systems," 2000) However, utilizing a framework will allow an organization to have internally consistent terminology and modeling techniques. Through the use of a common modeling scheme, organizations can better communicate the architecture both inside and outside of IT.(Jonkers, 2004)

The aspect of enterprise architecture modeling that makes it most effective is its ability to account for multiple stakeholder views. These views have existed since John Zachman's first published enterprise architecture framework. In his thesis, Xiaoxue Deng makes an analogy between enterprise architecture and a building blueprint. A blueprint containing all the elements of a building, while useful, can cause confusion for someone trying to locate or trace only a single element. In order to simplify the blueprint, building architects make separate

blueprints of the plumbing, electrical, and structural elements. These views are created especially for the plumbers and electricians with the information necessary to perform their roles. Enterprise architecture models function in the same way. They contain a single holistic view as well as several specialized views. The specialized views provide the information needed to complete the associated stakeholder roles by design.(Deng, 2006)

Models represent one of the most useful assets in communicating the architecture to the organization. For IT personnel, these models show how systems and standards are related and implemented. For business personnel, the models show how IT systems support business goals or how they have affected revenue, expenses, or profit. Without this communication, the implementation of the architecture could prove difficult if not impossible. If the architecture implementation cannot occur, enterprise architecture efforts will be ineffective. Thus, the stakeholder-based models provided by enterprise architectures are an invaluable asset in making sure the enterprise architecture efforts reach their maximum potential.(Jonkers, 2004)

Standardization of the Enterprise

According to Infosys' 2008 enterprise architecture survey, standardizing and improving business processes, enabling business and process flexibility, and simplifying technology and applications portfolios followed business-IT alignment as the most common top objective of enterprise architecture programs. IT standardization directly benefits these three objectives. Once developed, the individual architectures become standards for the IT throughout organization to use. Infosys identified enterprise technology standards as the second most common deliverable of enterprise architecture teams. (Obitz, 2009) A well maintained and governed set of IT standards can be a great asset to an organization.

As mentioned earlier, flexibility or agility is one of the primary benefits of standardization. The link between standardization and agility may not appear entirely clear at first. Organizations gain agility by means of IT standards in several ways, firstly through the consolidation of IT resources. By defining a common technology platform for the entire organization, standardized IT assets are more likely to be interoperable, reusable, and technologists should be able to support a larger percentage of the organization. Enterprise architecture accomplishes this by requiring future IT resources to be developed according to standard and adapting existing resources to fit the standards as needed. The agility is then realized through the ability of an organization to shift resources from area to another with fewer technological or staffing hurdles. The resources can be moved in this manner because they were developed under the same standard. A 2002 study by the Center for Information Technology Leadership estimated that the U.S. healthcare system could save \$87 billion annually or 5.86% of healthcare expenditures in the U.S. ("GDP-real (adjusted) United States," 2010; Hendrickson, 2004; Total health expenditures as % of GDP, 2002-2005 - Country rankings ", 2008) Consolidating IT resources through standardization allows organizations to spread their IT resources around more easily than if they were spread across multiple unrelated platforms. (Boh, 2007; G. A. James, 2005)

The Enterprise Architecture Value Proposition

While the benefits of enterprise architecture may be clear, there is still a question of value. In particular, how does an organization determine the value of enterprise architecture? Even with all of the above benefits outlined, it can still be difficult to draw a connection between capabilities delivered by enterprise architecture and their value to the organization. In order to

better understand the value stream of enterprise architecture, it is best to examine the situations that brought it forth in the first place.

One of the first business drivers of enterprise architecture was poor enterprise integration. In a fast-changing, conglomerate-merging world, many organizations were beginning to encounter problems handling their growing IT resources. Often, these resources were organized in silos, or single purpose architectures, and not suited for integration. (Grigouriu, 2007; Sessions, 2008) Organizations were beginning to discover that the information in these silos was redundant, inaccurate, incompatible with other systems, and had suboptimal accessibility. (Grigouriu, 2007) These IT systems had become extremely difficult to manage without some type of plan or strategy. The majority of IT systems were governed by their own management techniques with no organization-wide management in place. As a result, organizations were left with IT systems that were unreliable, inaccurate, needlessly complex, and unable to be easily integrated. These conditions hindered the business and it was unable to change or adapt quickly to market conditions. (Grigouriu, 2007; Haeckel, 1999; Sessions, 2008)

To exacerbate the problem even more, the gap between the business and IT stakeholders made any discussions about the issues and their solutions nearly impossible. Business stakeholders were unable to understand the technical aspects of the problems and IT stakeholders were unable to understand the business implications of their work. (Sessions, 2008) IT had built well-engineered systems that were efficient and effective. However, the business needed systems that agile. (Op't Land, 2009) It was as if the two groups were working towards two different goals. The correct diagnosis of this problem is that the organization was misinformed and misaligned. (Op't Land, 2009) Despite the efforts of enterprise architects around the world, organizational or enterprise alignment remains an issue to this day. For an

organization to succeed they need to have their business and IT stakeholders aligned and working toward common goals. (Schekkermann, 2005)

It is solutions to these problems from which enterprise architecture derives its value. In today's economy, speed to market and agility are two of the biggest competitive differentiators. (Grigouriu, 2007) Research has shown that enterprise architecture is able to help businesses realize these two benefits and many more. (Grigouriu, 2007; Haeckel, 1999; Malone T. W., 2003; Op't Land, 2009; Schekkermann, 2005; Sessions, 2008) Through the use of standards and architectures, organizations can build systems that easier to integrate. Easier integrations allow an organization to integrate systems faster and cheaper than otherwise possible. (Sessions, 2008) A faster integration would then lead to a faster time to market, better reliability, or improved service. All three of these benefits put the business in a better competitive position. (Chorafas, 2002) The value derived from these benefits would be the value of enterprise architecture to the organization.

Enterprise architecture draws value not only from pragmatic use, but also from strategic planning. The architecture building process places an emphasis on identifying business goals, missions, and strategies. Many enterprise architecture frameworks develop a "desired future state" of the organization. This future state, developed in cooperation with the business, is used to help define the architectures. These practices aid the IT stakeholders in understanding the needs of the business. If used correctly, IT resources developed under the defined architectures should be better aligned with the business. (Chorafas, 2002; IEEE recommended practice for architectural description of software-intensive systems," 2000; Schekkermann, 2005) Better aligned systems are more likely to provide value to the organization than systems developed otherwise. (Chorafas, 2002; Schekkermann, 2005) While it may be difficult to determine the

value provided by this improved alignment, enterprise architects can point to improved performance in areas defined in the architecture. Since these areas were defined as important to the business, improved performance in them should be easier for business stakeholders to identify. (Chorafas, 2002)

Enterprise architecture helps IT stakeholders better understand the business needs; it also helps business stakeholders better understand the resources of the organization, especially IT. (Chorafas, 2002; Op't Land, 2009; Schekkermann, 2005) The models and views presented by enterprise architecture allow stakeholders in both business and IT to understand the resources of the organization better. This additional information can aid decision making in several ways. It allows business leaders to view IT resources in much the same way that they view business resources. In doing this they can identify potential misalignments, areas of strength and weakness, inefficiencies, and ideas for future service or product offerings. With this information in hand, they are able to make decisions to correct problems or exploit organizational strengths. (Chorafas, 2002; Op't Land, 2009; Sessions, 2008) The value of any actions driven by information provided by enterprise architecture models or views can be attributed the enterprise architecture. (Chorafas, 2002)

Though not driven by business drivers or strategy explicitly, note the value derived from enterprise architecture governance. This report will discuss specifics of governance later, but organizations can realize value through proper enterprise architecture governance. Governance processes make sure that resources are created according to the specifications set forth by the architecture. Organizations can reduce risk and increase reliability through the use of a proper governance process. These benefits will lead to reduced costs further down the value stream. ("Architecture governance," 2006)

The value chain of enterprise architecture is not always clear or predictable. Reports from Gartner suggest that most organizations can only show “probable cause” for the value generated by enterprise architecture. (D. Weiss, Rosser, B., 2008) Despite this lack of definite connection, enterprise architecture has been shown to provide relief to several areas of business pain that have arisen as the value and complexity of IT resources have risen. (Chorafas, 2002; Grigouriu, 2007; Haeckel, 1999; Malone T. W., 2003; Op't Land, 2009; Schekkermann, 2005; Sessions, 2008) In response to the success of enterprise architecture, many organizations are looking to it to meet their needs as well. (Grigouriu, 2007)

Success Criteria

Organizations implement enterprise architecture because they want to see results. The most direct way to determine effectiveness of an enterprise architecture implementation is collecting data on its performance and effects on other areas of IT and business. A 2008 study showed that 71% of organizations collect some kind of enterprise architecture metrics. (Obitz, 2009) These metrics can be used for program improvement or justifying program costs. Defining metrics that accurately represent the effectiveness of the enterprise architecture program is an essential step in creating a complete and mature program. (Newman, 2007)

Selecting Success Criteria

The first step in developing an effective enterprise architecture measurement program is selecting appropriate performance metrics. No set of metrics will work universally, but best practices have been published. Most sources recommend choosing metrics linked to the goals, missions, and objectives of the organization or enterprise architecture program. Organizations design measurement programs to provide themselves with performance data, so they should be built with the information needs of the organization in mind. The Goal-Question-Metric method

allows the derivation of metrics from program goals. Organizations can start with a goal, state a question to assess the fulfillment of the goal, and develop a metric to answer the question. Repetition of this process applies to selecting metrics for all of the enterprise architecture program goals. Another measurement process commonly used is the Balanced Scorecard. Similar to the Goal-Question-Metric method, the Balanced Scorecard approach attempts to translate goals into measurable criteria. Organizations measure these criteria through the completion of scorecards during project implementation. Any method the organization prefers can be used to develop and collect metrics, but the metrics they collect must relate back to the goals, missions, and objectives of the enterprise architecture program and organization as a whole. (G. Leganza, Cullen A., Smilie K., 2007; Newman, 2007)

Today's enterprise architecture programs use a variety of metrics. Approximately 25% of organizations collect acceptance oriented metrics about the organization's awareness and acceptance of enterprise architecture. Approximately 39% of organizations collect activity oriented metrics about what the enterprise architecture team does. The collection of value oriented metrics about the monetary value created by enterprise architecture increased from 24% in 2007 to 39% in 2008. No one type of metric holds superiority to others and it may prove advisable to collect metrics from all three categories. Most importantly, the implementation of metrics remains essential to the justification of enterprise architecture programs. (Obitz, 2009)

Funding and Cost Justifications

When justifying the cost of enterprise architecture, collecting metrics is half the battle. In 2008, only 61% of organizations could cost justify their enterprise architecture programs. However, 69% of organizations collecting at least one category (acceptance, activity, or value) and 89% of organizations collecting all three categories of metrics could justify their costs.

Stakeholder communication also presents a problem in justifying costs. In these cases, enterprise architecture teams cannot articulate the business value to the rest of the organization. For an enterprise architecture team to find success in their cost justifications, they need to collect the appropriate metrics and communicate them in the appropriate way to the appropriate stakeholders. (G. Leganza, Cullen A., Smilie K., 2007; Newman, 2007; Obitz, 2009; Vollmer, 2007)

Foundational Enterprise Architecture Concepts

Core Concepts

In most cases, enterprise architecture exists in a top-down process. Organizations determine strategy and architecture at a high level, and these choices dictate lower level implementations. Because enterprise architecture operates at such a high level, it relies heavily on its foundational concepts. While the terminology and specifics of the concepts can vary from one framework or implementation to another, there are several common threads among them. For the sake of clarity, they follow below.

Stakeholders

The Cambridge Advanced Learner's Dictionary defines a stakeholder as "a person such as an employee, customer or citizen who is involved with an organization, society, etc. and therefore has responsibilities towards it and an interest in its success". ("Stakeholder," 2009) The IEEE Std. 1471 defines a system stakeholder as "an individual, team, or organization (or classes thereof) with interests in, or concerns relative to, a system". ("IEEE recommended practice for architectural description of software-intensive systems," 2000) These definitions highlight the fact that stakeholders are people who have responsibilities and more importantly

an interest in the outcomes of the enterprise architecture efforts. Most enterprise architecture frameworks group stakeholders based on their roles within organization. This does not emphasize the similarities within the group as much as it emphasizes the differences between the groups. The groups must determine the deliverables and information needed to complete their roles. Gene Leganza in his 2007 article stresses the importance of approaching communication with stakeholders groups with a “What’s in it for me?” mentality. (G. Leganza, Cullen A., Smilie K., 2007) Enterprise architecture requires communication, cooperation, and contribution from all areas of the business. Keeping track of stakeholder needs and requirements is a crucial step in making sure that these enterprise architecture processes run smoothly and effectively.

Views and Models

Enterprise architecture uses views and models to represent the state of an organization’s IT resources. The Open Group’s glossary of enterprise architecture terminology defines a view as “A representation of a whole system from the perspective of a related set of concerns” and a viewpoint or metaview as “A specification of the conventions for constructing and using a view. A metaview acts as a pattern or template of the view, from which to develop individual views. A metaview establishes the purposes and audience for a view, the ways in which the view is documented (e.g., for visual modeling), and the ways in which it is used (e.g., for analysis)”. (“Glossary,” 2000) According to these definitions, views may or may not include visual models. The importance of views in enterprise architecture comes from their ability to represent IT systems from multiple perspectives. Views in enterprise architecture often relate to stakeholder groups. To refer to the blueprint analogy from before, viewpoints are analogous to blueprints. Just as specifications exist for documenting the plumbing or electrical systems of

a structure, specifications for how to document the IT systems exist with enterprise architecture. Enterprise architecture teams develop the individual views with a specific role or purpose in mind similar to how blueprints are designed with plumbers and electricians in mind. Through the use of these views, enterprise architects can communicate more effectively with stakeholders, because each view contains only the information required by each stakeholder group. These views exist as the primary way that the architecture is communicated to the rest of the organizational stakeholders, making them invaluable to the process. (Deng, 2006)

Frameworks

Within enterprise architecture, the term “framework” has two definitions. The first refers to a classification methodology. The Cambridge Advanced Learner’s Dictionary defines a framework as “a system of rules, ideas, or beliefs that is used to plan or decide something”. (“Framework,” 2009) In this most general sense, a framework organizes objects to make them more actionable or usable. Frameworks stop short of defining how to use the objects. A framework is a passive support structure.

The second definition refers to organizational specifications for enterprise architecture. Enterprise architecture specifications are often referred to as frameworks despite the fact that they may be more or less than a framework as defined above. By this definition a framework may include methodologies, classifications or practices.

While these two definitions exist, the first definition is usually only used when comparing enterprise architecture specifications when the need to describe in detail what a specification provides exists. In most other situations, a framework usually refers to any enterprise architecture specification whether it meets the above definition or not. These organizational specifications are commonly known as enterprise architecture frameworks.

Similar to the framework, the taxonomy provides a defined system for classification, but lacks any sort of developmental guidelines. The Cambridge Advanced Learner's Dictionary defines a taxonomy as "a system for naming and organizing things, especially plants and animals, into groups which share similar qualities". ("Taxonomy," 2010) Taxonomies differ from frameworks as they do not provide guidance for developing the material to be classified. Some consider one of the most popular enterprise architecture frameworks, the Zachman framework, a taxonomy rather than a framework because it lacks instructions for developing the documents that it classifies. (Sessions, 2009) Despite the lack of guidance or direction from frameworks and taxonomies, they are still helpful in defining and supporting enterprise architecture efforts.

Methodologies

The Merriam-Webster Online Dictionary defines a methodology as "a body of methods, rules, and postulates employed by a discipline: a particular procedure or set of procedures". ("Methodology," 2010) A methodology within the IT realm refers to a repeatable process that can be performed to achieve desirable results. In software development, methodologies provide a structured approach to the development process. These methodologies use mechanisms to ensure that requirements are met and bugs are identified and removed. (Purcell, 2007) Within enterprise architecture, methodologies ensure that architecture principles are followed throughout IT. Methodologies are commonly employed by enterprise architecture to be used in systems development, but may also be used for the production of other deliverables. A 2004 Gartner report suggests that any framework implemented should include a methodology for developing an architecture. (A. Lapkin, 2004) Through the use of these methodologies, enterprise architecture increases its likelihood of success by increasing the likelihood that the IT systems developed under it will be compliant to their respective

architectures and that the architectures will be better aligned to the business' missions and goals.

To clarify, the term methodology also shares the same double meaning as the term framework. In addition to referring to a set of procedures, a methodology can refer to an organizational specification for enterprise architecture in a general sense. Despite the fact that these specifications may bear a greater resemblance to a framework, the term methodology is used in a general catch-all sense.

Architectures

According to the TOGAF glossary, an architecture is "a formal description of a system, or a detailed plan of the system at component level to guide its implementation, " or "the structure of components, their interrelationships, and the principles and guidelines governing their design and evolution over time". ("Glossary," 2000) For the purposes of this discussion, the term architecture will refer to an implementation of enterprise architecture in a specific technology domain. In the analogy of the building plan, architectures are the plumbing and electrical blueprints. Organizations commonly define architectures for the data, technology, application and business domains. These architectures contain the technical specifications developed in accordance with the organization's goals and missions. By following the architecture's specification in developing technology resources, an organization can be more certain that the resource will directly support the organization's goals. The sum of these individual architectures, along with the methodologies for their creation and revision, make up an enterprise architecture implementation. ("Core Concepts," 2009)

Organizational Roles

Success depends upon an enterprise architecture team just as much as the chosen enterprise architecture framework. While teams vary from one organization or framework to another, there are several roles common to many of them. These roles are discussed below.

Chief Architect

The leader of the enterprise architecture program, the chief architect, has the responsibilities of setting the strategy, direction, and approach of the enterprise architecture program for the organization. Chief architects usually report to an executive and must understand the business strategy in order to develop an effective enterprise architecture. Once an initial architecture is in place, they must identify changes in the organization or environment and make the appropriate adjustments to the enterprise architecture program. In short, the chief architect is the CEO of the enterprise architecture program of an organization. (R. A. Handler, 2008)

Domain Architects

Subject matter experts, called domain architects, oversee the individual architectures such as business, technology, or data. These people must hold expertise in their particular field. More importantly, they must be able to understand the trade-offs involved in the choices they make and relate them to organizational strategy. Domain architects usually report to the chief architect and may have architects working under them to handle the workload. They may also need to communicate with other domain architects when developing and architecture as a single issue or decision may have consequences in several other domains. In short, domain architects are vice presidents of the enterprise architecture program with each one in charge of

a different domain. (Bittler, 2005; R. A. Handler, Burton, B., 2008; R. A. Handler, Newman D., 2008; R. A. Handler, Roberson, B., 2008b; Josey, 2009)

Solution Architects

Solution architects exist at the intersection of the architecture domains. These people leverage all of the architectures to implement a system that that complies with the architectures and solves a problem the organization is having. While not as knowledgeable about a single domain as a domain architect, a solution architect has baseline knowledge in all of the architectures and is used in the development of systems for implementation. If domain architects are vertical silos of information, solution architects are a horizontal trough. They can function either at the enterprise level where they create a generic template for designing solutions or at the project level where they create solutions specific to that implementation. Solution architects will work closely with the domain architects, referring to them as subject matter experts, and with project teams acting a consultant. In short, the solution architect is the jack of all trades, master of none. (R. A. Handler, Roberson, B., 2008a; Josey, 2009)

Other Roles

Other roles may exist within the enterprise architecture team. These roles often support the core enterprise architecture function. For example, the financial assistant aids the enterprise architecture team in developing their cost justifications for both proposed projects as well as the enterprise architecture program itself. Having someone with experience in creating cost justifications is a useful resource for enterprise architecture teams, especially those with a heavy technical focus. Studies have shown that many teams have trouble justifying their enterprise architecture efforts; having a financial assistant makes this task much easier. (Hoppermann, 2008; Rosser, 2006)

Importance of Fundamental Concepts

These concepts, which form the building blocks of enterprise architecture, contribute to enterprise architecture on several levels. At the highest level, enterprise architecture can develop domain architectures and IT strategy as well as use those architectures to identify and plan future technology solutions. At the lower levels, enterprise architecture standards can ensure developments support the business objectives, and governance processes make sure the standards are adhered to. The roles of the aforementioned concepts in these processes are discussed below.

Guiding IT Strategy

As discussed earlier, enterprise architecture can help to align business objectives and IT investments as well as present the current or future states of the organization's information systems to a variety of stakeholders. Enterprise architecture can help to achieve these objectives because it accounts for multiple interests and realizes that one model or view will not satisfy all of the stakeholders. The frameworks and methodologies used by enterprise architects allow them to manage the demands and requirements of the stakeholders and deliver them information that is relevant to their interests. (G. Leganza, Cullen A., Smilie K., 2007) By creating effective means of stakeholder communication and management, enterprise architecture allows teams to better understand the needs of the organization and in turn develop an architectures to better meet those needs. In this situation, enterprise architecture is the key component in translating business needs into technology offerings. Stakeholders around the organization can understand how their roles are affected by the enterprise architecture. The architectures and strategies developed at this level are then used to develop future technology solutions. (Babu K,

2008) The structured approaches of enterprise architecture frameworks and methodologies are what make this translation possible.

Guiding IT Development

Enterprise architecture begins to assist IT operations at the modeling level. Through the use of models, enterprise architects are better able to analyze the current state of IT resources and analyze the steps needed to reach the target future state. By performing a gap analysis, an enterprise architect can identify what new resources must arise in order to support the business in its future state. Teams can identify bottlenecks or other poorly aligned resources and deal with them as well. (Federal Architecture Working Group, 2001) After identifying the work agenda, the standards put in place by the architecture come into play.

Enterprise Architecture Standards

Architectures set a number of IT standards to follow within the specified technology domain. An architecture must be followed in order to be effective. A process known as governance is responsible for ensuring compliance and will be discussed in greater depth later. The standards defined in the architecture are tied to the business goals and designed to ensure that any IT resources developed under the architecture will support the aforementioned goals. In addition to supporting the business initiatives, standards also serve to make IT resources more agile. Common terminology and technology platforms allow IT resources to be shared, reused, and more easily and cheaply integrated. Due to these benefits, organizations can adapt to change faster, be more competitive, and save money during the development process. Enterprise architecture functions at all levels of the organization to ensure that intentions and principles at the highest level are implemented at the lowest levels to maximize the chances of achieving the organization's goals. (Boh, 2007; Friedman, 2009; G. A. James, 2005)

Enterprise Architecture Governance Structures

Governance is the process organizations use to ensure that their architectures are being followed. ("Architecture governance," 2006) As stated earlier, an architecture is useless unless it is used and followed by the organization. A 2007 survey shows that enterprise architects rated governance with 79 out of 100 points as a part of a future-proof enterprise architecture.

(Feurer, 2007) The process for handling governance differs between frameworks and organizations and is usually accomplished through a review process. Many organizations require architecture compliance reviews before a project is approved and at various completion intervals. (Hoppermann, 2008) At these reviews, architecture issues can be identified and fixed before they become a problem. In order to make the governance process simpler for project managers, organizations such as PNC Bank have created enterprise architecture repositories. Project planners can use the repository to gain access to materials documenting the architecture. (Scott, 2008) They can then use this information to design their project according to the specifications laid out by the architecture. Governance information is often organized by stakeholder group and allows the information to be targeted to relevant audience. In addition to architecture information, the repository also contains instructions on what is required for any compliance reviews. The repository is a crucial piece of making enterprise architecture more practical and useful in the organization.

Despite its usefulness, governance can become more of an obstacle if not used correctly. In the same way that governance is ineffective if it is too lenient, it can also be ineffective if used too strictly. Governance can not only stall projects with reviews and restrictions, it can also create a negative image for the enterprise architecture program if the governance team is difficult to work with or are viewed as obstacles to productivity. Reports

from Gartner Research warn that overstandardization and excessive governance techniques can lead to a lower level of compliance and project teams avoiding the review process as much as possible. (P. Allega, 2006; Burton, 2009b) To avoid this, experts recommend setting only the necessary standards instead of locking down every aspect. With fewer standards, project teams have more freedom in developing their solution, and the review process has less to examine. Ruth Malan and Dana Bredemeyer support this point in their article “Less is More with Minimalist Architecture”. They suggest that organizations should focus on standardizing the elements with the highest organizational value and relinquish control of the other elements to the individual project teams. (Malan, 2002)

Another element that can aid in the governance process is the perspective of the governance team. Governance teams that work with project teams to improve the project and meet standards are more likely to be accepted and successful than those that take the role of standards police, continually rejecting projects and keeping them from progressing. The governance team at PNC Bank is so successful that many project teams submit to reviews voluntarily for the feedback. The governance process stands between projects and their completion, but it is up to the enterprise architecture team to decide how simple and effective the process can be. (Hoppermann, 2008; G. A. James, 2005; Scott, 2008)

Choosing an Enterprise Architecture Framework

An organization’s decision to utilize enterprise architecture is an important one. While any enterprise architecture is better than none at all, an organization can increase the effectiveness of their efforts by selecting a framework that fits the organization. To determine the fit of a framework, there are several questions that an organization must ask itself. The

most basic questions apply to the organization as a whole. The more advanced questions explore the scope of the potential enterprise architecture implementation. Many of these questions look to place an organization on a spectrum. The discussions below address both ends of these spectrums and which enterprise architecture frameworks are most appropriate for an enterprise in that position.

Fundamental Questions

The fundamental questions look to define where an organization stands. The information gained from the responses will identify the strengths and weaknesses of an organization and what types of enterprise architecture would be most effective. It is important to keep in mind that the responses to these questions are not absolute. Most organizations lie somewhere in the middle of a spectrum and need to analyze what their leanings mean to the suitability of an enterprise architecture framework.

Framework vs. Methodology

One of the first questions an organization needs to ask is whether they are looking for a framework or methodology. As discussed earlier, frameworks and methodologies work to accomplish the same goals in different ways. Frameworks work in a top down fashion. They provide a view of a finished product. This product is then able to support the enterprise architecture needs. Frameworks are a good choice for organizations that already possess the knowledge of building an enterprise architecture program and need a particular model to follow. The organizational structure offered by a framework allows organizations freedom in developing the deliverables however they want. Frameworks dictate the ends and allow the organization to choose the means as best fit. (Sessions, 2009)

Methodologies are in a way the opposite of frameworks. They provide the means for developing the architecture, but leave much of the high level design in the organization's hands. The step-by-step development processes are well suited for organizations that are not able to develop an architecture or deliverables on their own. These organizations are also likely to need the decision support that a methodology provides. It should be noted that while methodologies are useful for providing guidance, an organization must be careful not to lose sight of the intentions of the enterprise architecture program. A methodology is only a generalized set of instructions and will not always lead an organization to where they need to go if followed blindly. (Sessions, 2009)

Standardization

The next question that organizations will need to ask themselves is how they want to approach standardization. Organizations can make an effort to standardize every process or only the most necessary. In addition they can create internal standards, utilize external standards, or use a combination of both. Since the characteristics of standardization have been discussed in previous sections, this section focuses primarily on the advantages and disadvantages of the different types of standardization.

When an organization sets standards, they are enforcing a certain means of thinking on the organization. This assures a common set of ideals are being observed throughout. When these standards are tied to business principles, IT-business alignment can be achieved. The unfortunate trade-off in this situation is innovation and freedom. When setting standards organizations need to balance the reliability of standards with the free form of non-standardized processes.

Several experts agree that it is best to take a conservative approach to standardization when beginning an enterprise architecture program. (P. Allega, 2006; Burton, 2009b; Malan, 2002) This approach allows organizations to focus on a narrow spectrum that is expected to bring the greatest return. Attempting too much standardization during the early stages of enterprise architecture spreads resources too thin and becomes an obstacle to acceptance by the rest of the organization. Further standards can be introduced once the enterprise architecture program has become more mature. The increased level of maturity will help better identify effective standards that will be accepted throughout the organization.

As for which standards to adopt, the emphasis should be on which standards will be most beneficial to the organization. The National Institutes of Health outline the decision drivers for selecting standards for their enterprise architecture as

“Architectural decisions will maximize the overall benefit to the NIH by balancing the following criteria: accessibility, consistency, cost, diversity of business needs, flexibility, functionality, manageability, precision, risk, scalability, security, supportability and value.”

and

“The NIH Enterprise Architecture supports leading edge technologies to meet mission-differentiating needs and requires mature, proven interoperable technologies in support of service environments. Technical diversity that does not tie to business needs is discouraged.” (Maoury, 2005)

These principles outline the criteria for selecting enterprise architecture standards. While many different organized standards exist, the selection decision should be based primarily on benefit to the organization with the prestige, maturity, and adoption as secondary criteria.

Enterprise Maturity

The maturity of an organization is another critical factor for organizations to consider when selecting an enterprise architecture framework. The definition of organizational maturity remains far from a consensus and can even differ from organization to organization. In most cases, the definition of organizational maturity stems from the mode used to measure it. Three of the more popular models include the Berkley Project Management Maturity Model, the Project Management Solutions Maturity Model, and the Capability Maturity Model Integration. (Cooke-Davies, 2004) The Software Engineering Institute in their Capability Maturity Model defines organizational maturity as “The extent to which an organization has explicitly and consistently deployed processes that are documented, managed, measured, controlled, and continually improved. Organizational maturity may be measured via appraisals.” (“CMMI glossary,” 2010) This definition of maturity centers on the extent to which processes are defined and documented. In the same manner this definition of maturity leads to debate, its effect on the success of information systems and enterprise architecture programs comes under much debate as well.

A 1980 study published in *MIS Quarterly*, one of the first studies of how organizational maturity affects information systems, presented data suggesting that generalist management skills were more useful than technical skills for IT managers. The study also showed generalist skills held higher value in more mature organizations. The study recommended to the ACM that “Emphasis should be put on course content which combines the knowledge of information

systems, organizational behavior and organizational development, which is concerned with the introduction of change and modification in organizations.” (Benbasat, 1980) These findings pioneered focusing on the differences between the needs of more and less mature organizations.

A later study done in 1985 studied the impact of organizational maturity on the perceived usefulness of information systems. Using Richard L. Nolan’s model, the study measured an organization’s maturity and satisfaction with their information systems. The study showed little evidence for a correlation between maturity and usefulness. The authors of the study interpreted that the results indicated the unsuitability of Nolan’s model rather than the lack of a relationship between maturity and satisfaction. (Mahmood & Becker, 1985) The unsuitability of Nolan’s model was suggested earlier in ACM communications, and his model holds little relevance today. (King & Kraemer, 1984) A more recent study done by Gartner in 2005, compared data received from their enterprise architecture maturity assessment tools with performance data. This study found a strong link between the maturity of an enterprise architecture program and its effectiveness. (G. A. James, Burke, B., 2005) These studies seem to indicate a link between maturity and enterprise architecture success.

An organization looking to start an enterprise architecture program should assess their current maturity level. This maturity level will help answer the framework vs. methodology question. A less mature organization will most likely need more guidance in the form of methodologies throughout the development and maturity of their enterprise architecture program than a more mature organization. More mature organizations may have some enterprise architecture elements already in place and will require more framework elements to organize their efforts. The maturity of the organization as a whole may strongly indicate the appropriate enterprise architecture approach to pursue at first. Finally, the maturity of an

organization may present the necessity of technical or managerial skills on the enterprise architecture team. (Benbasat, 1980; G. A. James, Burke, B., 2005)

Maturity Models

In addition to understanding the maturity of the organization as a whole, organizations must also understand the maturity of the enterprise architecture program. Enterprise architecture program maturity can be generalized as the degree to which the organization is aware of the program and how well the program is accepted and ingrained in the operations of the organization. Several industry associations have designed maturity models to aid organizations in measuring the maturity of their enterprise architecture program. Each of these models takes a different approach to assess the organization's current position and categorize it into a stage of growth. Three popular maturity models, the National Association of State CIO's EAMM, the U.S. Office of Management and Budget's EAAF, and the U.S. Government Accountability Office's EAMMF are described below.

EAMM

The National Association of State CIOs (NASCIO) created the Enterprise Architecture Maturity Model (EAMM) to assess the maturity levels of enterprise architecture programs run by state governments in the U.S. The model evaluates how well each program is utilizing the tools provided by NASCIO to create an effective enterprise architecture program. Organizations use this model to benchmark their program maturity and use that as a basis for growth. The model has six levels of maturity, and for each one, users evaluate the program on its administration, planning, framework usage, documentation, communication, compliance, integration, and involvement. A summary of the six levels is given below.

0. **No EA Program** - There is not a documented architectural framework in place at this level of maturity. While solutions are developed and implemented, this is done with no recognized standards or base practices. The organization is completely reliant on the knowledge of independent contributors.
1. **Informal Program** - The base architecture framework and standards have been defined and are typically performed informally. There is general consensus that these steps should be performed, however they may not be tracked and followed. Organizations with an Enterprise Architecture framework at this level are still dependant on the knowledge of individual contributors.
2. **Repeatable Program** - The base architecture and standards have been identified and are being tracked and verified. At this point in the program processes are repeatable and reusable templates are starting to be developed. The need for product and compliance components to conform to the standards and requirements has been agreed upon, and metrics are used to track process area performance.
3. **Well-Defined Program** - The enterprise architecture framework is well defined; using approved standard and/or customized versions of the templates. Processes are documented across the organization. Performance metrics are being tracked and monitored in relationship to other general practices and process areas.
4. **Managed Program** - At this point performance metrics are collected, analyzed and acted upon. The metrics are used to predict performance and provide better understanding of the processes and capabilities.

5. **Continuously Improving Vital Program** - The processes are mature; targets have been set for effectiveness and efficiency based on business and technical goals. There are ongoing refinements and improvements based on the understanding of the impact changes have to these processes.

When used in conjunction with NASCIO's Enterprise Architecture Development Tool-Kit, organizations can use the results from this maturity model to create a roadmap to further maturity. NASCIO recommends that organizations strive for greater maturity in their programs based on benefits of more mature programs mentioned in the previous section. A thorough evaluation using this model will help organizations remain focused in their enterprise architecture efforts and avoid common pitfalls which lead to stalled progress. ("NASCIO enterprise architecture maturity model: Version 1.3," 2003)

EAAF

The U.S. Office of Management and Budget (OMB) developed the Enterprise Architecture Assessment Framework (EAAF) to assess how well enterprise architecture programs provide support to the rest of the organization. Designed specifically to assess the Federal Enterprise Architecture (FEA) prescribed for use by all U.S. federal government agencies, EAAF focuses on business outcomes rather than technical elements to determine the maturity of the program.

Evaluation of the enterprise architecture ranges on a scale from zero to five based on completion, use capability, and results. The completion section measures the degree to which the enterprise architecture is documented and conformed to FEA specifications. The use capability section measures how well the organization can manage the program to increase

awareness, inform decision makers, and create positive results. The results category measures the value the program provides to the organization in the form of improved alignment, cost savings, and portfolio value. The average score in each of these areas determines the overall maturity of the program. These results then go back to the organization as a benchmark of their progress to improve upon. (*Improving agency performance using information and information technology (enterprise architecture assessment framework v3.1)*, 2009; Schekkermann, 2008)

EAMMF

The U.S. Government Accountability Office (GAO) created the Enterprise Architecture Management Maturity Framework (EAMMF) to evaluate the maturity of enterprise architecture management practices. Organizations fit into one of five development stages based on the presence of 31 core elements derived from the FEA Practical Guide. For easier analysis, the core elements are broken down into the four attribute categories of (1) demonstration of commitment, (2) provision of capability to meet commitment, (3) demonstration of satisfaction of commitment, and (4) verification of satisfaction of commitment. Each stage of maturity has core elements associated with it and an organization earns standing at a given stage when it satisfies all of the elements for that stage as well as previous stages. The five stages of maturity are listed below.

1. Creating enterprise architecture awareness
2. Building the enterprise architecture management foundation
3. Developing enterprise architecture products
4. Completing enterprise architecture products
5. Leveraging the enterprise architecture to manage change

EAMMF recommends the application of the results of the maturity model in two ways. First, the results should benchmark progress toward organizational goals. Second, the results allow the development of improvement plans to address any adverse issues and continue progress toward a more mature enterprise architecture program. (*A framework for assessing and improving enterprise architecture management (version 1.1)*, 2003; Schekkermann, 2008)

Planning and Managing Enterprise Architecture

These advanced questions take a deeper look at how an organization wants to implement enterprise architecture. While the basic questions focused on exploring the properties of an organization as a whole, the advanced questions will explore an organization's plans and strategies for enterprise architecture. Unlike the basic questions, there are no official models or standards for determining the right enterprise architecture strategy for a specific organization. The most advanced aspects of an enterprise architecture program need careful analysis by both the IT and business staffs. Many paths lead to enterprise architecture success. In answering these questions, organizations try to identify potentially successful paths and select the fastest, most certain, and most effective path.

How Much of the Enterprise and How Deep?

One of the most critical areas to define in any project is the scope. Enterprise architecture is no different. When starting an enterprise architecture program, an organization needs to decide the boundaries of the program. Without a solid definition of the system's boundaries, needed functionality may not arise or resources may go to waste in unnecessary areas. Like many other facets of enterprise architecture, scope is not easily defined. To better illustrate what an enterprise architecture scope entails, Gartner and The Open Group have divided scope into four dimensions: enterprise scope, architecture domains, level of detail, and

time period. ("Introduction to the ADM," 2009; D. Weiss, 2006) These four dimensions cover the majority of enterprise architecture scope issues. In addition to the scope of the entire enterprise architecture effort, other smaller scopes may apply for each step of the architecture building process. ("Introduction to the ADM," 2009) To gain a better understanding each dimension, they are discussed below.

In order to define the scope of enterprise architecture, a team must define the enterprise and decide how much of it will be governed by the enterprise architecture. This dimension of the scope focuses on the people, processes, and systems affected by enterprise architecture. This decision usually rests with those at a high business unit level. Organizations must decide what parts of the organization will and will not fall under the enterprise architecture program. Gartner reports from 2006 suggest that enterprise architects should plan to include all parts of the enterprise, but with enterprises today, it is hard to tell where the enterprise stops and suppliers, distributors, and contractors begin. If it is not feasible to include the entire organization, then plans should be made for the adoption of the enterprise architecture by non-participating units. The reports also suggest that planning enterprise architecture at the highest levels of the organization is more likely to yield an architecture compatible with the entire organization. (P. Allega, 2006; D. Weiss, 2006) The TOGAF 9 architecture framework supports this view of enterprise scope. It recognizes that in many organizations federated architectures exist within a single meta-architecture which defines the interoperability requirements the federated architectures. ("Introduction to the ADM," 2009) This mixed approach allows the entire enterprise to be covered by enterprise architecture and individual business units to develop their own specialized architectures within the rules of the enterprise wide architecture.

The next step in defining the enterprise architecture scope, the selection of created architectures, allows teams to create specialized “blueprints” of certain aspects of the organization. The four major architectures or domains set forth in TOGAF 9 include business, information, application and technology. ("Introduction to the ADM," 2009) Gartner recommends utilizing business, information, technology and solution architectures. (D. Weiss, 2006) Though recommended, implementation of major architectures may not be possible or even necessary for some organizations. However, because of the risk and cost associated with integrating an architecture after the fact, organizations should work define all of the major architectures from the beginning or thoroughly understand the risks and rationale behind their exclusion. ("Introduction to the ADM," 2009)

Once selected, an organization needs to decide the level of detail at which the relevant architectures will be defined. While it may be possible to model and standardize the enterprise down to the minutest levels, it is not advisable to do so. The level of granularity for enterprise modeling will differ from one organization to another. The Open Group warns that the omission of a critical detail may make a system useless and the inclusion of unnecessary details may make the architecture cluttered and require too many resources. ("Introduction to the ADM," 2009)

Within the field of enterprise architecture modeling, there is no standard modeling language or convention. The lack of maturity in this field leaves many organizations developing their own modeling techniques or using immature ones. This often leads to poor modeling practices which can hinder the success of enterprise architecture. Gartner recommends that details should be defined at the highest levels first and lower levels of detail should be defined only when necessary. (D. Weiss, 2006) Additionally, The Open Group recommends that all major architectures should hold the same level of detail to achieve greater levels of interoperability across the architectures. ("Introduction to the ADM," 2009)

The final consideration in the definition of scope is the time horizon of the target architecture and transition architectures along the way. Many architecture frameworks focus around designing a desired future state of the organization. How far in the future this target state exists is known as the time horizon. Much like the level of detail scope, the time horizon could be defined infinitely far into the future, but doing so is not effective. If defined too soon, the architecture will not provide the vision and insight needed to be effective. However the accuracy, definition, and prediction of the target architecture must be completed with as little cost as possible. The further in the future the target architecture, the harder these requirements are to meet. Organizations should work to create a useful, accurately defined, and cost effective time horizon. The Open Group suggests that the definition of the transition architectures must take place in order to make a more feasible target architecture. Each of these transition architectures has its own scope in all of the aforementioned dimensions and represents a subset of the target architecture. The sum of the transition architectures is the target architecture. By using transition architectures, organizations can break up the development of enterprise architecture into more manageable chunks. ("Introduction to the ADM," 2009)

Implementation

Once an organization has defined its current and target architectures, they must put them into practice. However, these large-scale, high-level changes cannot happen overnight. Changing and aligning an enterprise is no small task, and an enterprise architecture program needs have a plan to put its work into practice. The process of moving from the current architecture to the target architecture is generally referred to as implementation, but is also known as migration or transition depending on the framework or methodology. While not

every enterprise architecture framework or methodology outlines a plan for implementation, the ones that do generally follow a similar pattern. This pattern is discussed below. (Amour, 2001; Migration planning," 2009; Opportunities & solutions," 2009)

Most implementation plans start with some sort of a gap analysis. A gap analysis compares an organization's current architecture with its target architecture and looks to identify any gaps between them. Along with identifying gaps, the analysis also looks for dependencies among gaps. These gaps represent the work that allows the architecture reach its target state. The result of the gap analysis is a detailed work order that will take the organization from their current architecture to their target architecture. (Amour, 2001; Opportunities & solutions," 2009)

After the gaps are defined, a plan for filling these gaps needs to be made. When planning the implementation, organizations need to consider the priority and manageability of the work. ("Migration planning," 2009) While doing the most essential and valuable work all at once, seems desirable, it may not be practical. Large projects are both difficult to manage and susceptible to a higher rate of failure, especially in newly formed enterprise architecture programs. The Open Group suggests breaking up the work into several transition architectures for implementation with the sum of these transitions being the target architecture. The smaller transition architectures are much easier to manage and thus more likely to be successful. ("Introduction to the ADM," 2009) In order to find success, organizations must balance priority and manageability when designing an implementation plan for enterprise architecture.

Since all of the implementation work cannot be done at once, there is a need for organizations to prioritize their work. In prioritizing their work, organizations should consider

the value of the work as well as its dependency on other work. The Open Group provides several tools for organizations to assess the potential value of implementation work in order to help enterprise architects identify high priority work. They also offer tools to model dependencies. ("Migration planning," 2009) With the value propositions and dependency restrictions in mind, organizations can then schedule the implementation into multiple transition states that will bring the organization to its target state. (Amour, 2001)

After the definition and schedule of the transition work, the rest of the process simply entails completing the work according to the strategy defined by the enterprise architecture team. To make sure the projects follow the architecture, many organizations use some form of implementation governance. A 2009 report from Forrester lists documentation reviews, dedicated review meetings, reviews as part of the development process, and project consulting as the most popular methods of implementation governance. (Hoppermann, 2008) These processes rely heavily on deliverables from the enterprise architecture team to gauge compliance. Implementation governance almost always utilizes the enterprise architecture team and may include members of the IT staff or business stakeholders. A 2008 Gartner article recommends the governance process be defined by the enterprise architecture team and executed by the IT staff to avoid stretching the team too thin. (Burton, 2009b) The presence of an effective governance program ensures that work done by the enterprise architecture team translates into positive organizational change. ("Architecture governance," 2006)

Comparison of Popular Enterprise Architecture Frameworks

References to several popular enterprise architecture frameworks have arisen throughout this thesis. Each framework approaches the challenges of the modern organization

differently. To understand the usage of these frameworks, one must understand the frameworks themselves. Because all of the frameworks strive to complete a common goal, it would be most useful to see the differences in how they achieve those goals. A multitude of work exists that examines and compares enterprise architecture frameworks. While an exhaustive analysis is beyond the scope of this thesis, this section will focus summarizing these analyses into a brief description of each framework, an analysis of their strengths and weaknesses, and a comparison of the frameworks to each other. This section will also take a chronological approach to highlight the evolution of enterprise architecture over time. This analysis will set the stage for our primary goal of examining how enterprise architecture frameworks are used in organizations today.

Evaluation Technique

Below are the points upon which the enterprise architecture frameworks will be evaluated.

Taxonomy/Framework/Methodology

The first examination point is the operation of the framework. Earlier, the differences between frameworks, taxonomies, and methodologies were discussed. These differences will be revisited in regards to each examined framework. The structure of a framework indicates the approach it takes to solving the organization's challenges and dictates how it can be used most effectively. Frameworks with similar organizational structures may share common use patterns.

Views and Models

Stakeholders use views and models to observe the architectural information. Views and models show the enterprise architecture's structure and allow stakeholders to have windows

into and pictures of the organization for planning for future changes. They are the primary way stakeholders learn about and interact with the enterprise architecture, which makes them a valuable asset. As discussed earlier, no standard for modeling enterprise architecture exists. In a similar fashion to a framework's structure, its views and models are a sign of how it is intended to be used and reflect certain assumptions and conceptualizations. Because of differences in organizational structure and culture, certain views and modeling techniques may be a better fit for an organization than others. This section will examine how frameworks present their information to their stakeholders.

Process/Application/Architecture Development

The next point to be examined is the development processes and methodologies prescribed by the examined enterprise architecture frameworks. Many, but not all, frameworks include some methodology for developing processes, applications, or architectures. These methodologies are designed to utilize all of the tools that the framework offers. This section focuses on whether or not a methodology is included, how it works, and the intended product of the methodology.

Zachman

Developed in 1987 by John Zachman, the Zachman framework was the first enterprise architecture framework. Zachman, working for IBM, imagined a framework that accounted for multiple stakeholders and differing viewpoints for each. At the intersection of each stakeholder and viewpoint, the framework describes what documentation should exist to provide the specified information. (Zachman, 1987) While the Zachman framework does not provide any sort of development model or guidance on how to use the information gathered, it is still useful in many applications. John Zachman himself noted that his framework could be used in any

environment, not just enterprise architecture, to better organize information resources among stakeholders. (Sessions, 2009) Because the Zachman framework is so generalized, it can be used in many situations and combined with other enterprise architecture tools such as TOGAF's architecture development model (ADM). ("ADM and the Zachman framework," 2006)

The Zachman framework, while technically a framework, might better be describes as a taxonomy. In particular, the Zachman model provides direction on what information should be directed to whom and for what purpose. However, this is the extent of its function. The framework gives little advice on how to gather this information or how to use it. This allows the framework to be applied in many different environments, but it also fails to provide direction to the organization, which is why some experts refer to the Zachman framework as a taxonomy rather than a framework. As discussed earlier, a taxonomy is a system used to classify objects. ("Taxonomy," 2010) In the case of the Zachman framework, the framework classifies the various enterprise architecture documentation objects into their respective stakeholder roles.

The most important element of the Zachman framework is the matrix. Along one axis of the grid are the stakeholder roles. In a similar metaphor to the one used earlier in this paper, Zachman described the roles of enterprise architecture to be analogous to the roles in the architecture and construction of a building. (Zachman, 1987) These roles stress the differences in informational needs of each stakeholder. Each role may have the same questions about the project; each requires a different granularity, technical detail, and format than the others. The Zachman grid separates the stakeholders into 6 groups and defines their basic role in an organization.

The other axis is divided into the information types. They were initially defined as the 6 interrogatives; who, what, when, where, why, and how. They can also be called, people, data, time, network, motivation and function descriptions. Each of these information types corresponds to an element of the system that needs to be understood. The categories serve to distinguish between types of information as well as call attention to their necessity. The Zachman framework calls for all 36 squares to be populated with data pertaining to the system being supported. The presence of data in all the squares ensures that each stakeholder will have the necessary and appropriate information to make decisions regarding the system.

(Zachman, 1987)

Unlike most of the other enterprise architecture frameworks used today, the Zachman framework does not utilize any sort of architecture or documentation methodology. Organizations that utilize the Zachman framework will need to decide how they will develop and use the information that they create. Despite the lack of a development methodology, the Zachman framework is still a very effective tool for managing information about the organization. (Sessions, 2009; Zachman, 1987)

TOGAF

The Open Group Architecture Framework (TOGAF) began as the Technical Architecture Framework for Information Management (TAFIM). TAFIM was initially designed by the U.S. federal government, but was eventually abandoned and its rights were transferred to The Open Group. Using TAFIM as a foundation, The Open Group began transforming it into TOGAF, and in 2001, TOGAF 7 was published. Since then, TOGAF has undergone several revisions and iterations bringing it to version 9 in 2009. A 2008 survey showed that TOGAF had passed Zachman as the most used enterprise architecture framework in the world. (Obitz, 2009) TOGAF

divides the architecture into business, application, information, and technical architectures. Each of these addresses a different aspect of the organization and provides a unique viewpoint to each stakeholder group. ("Introduction," 2009; Josey, 2009; Sessions, 2009)

Despite calling itself a framework, TOGAF may better be described as a methodology or process. Best known for its Architecture Development Method (ADM), TOGAF provides a step by step description for creating an enterprise architecture for an organization. The ADM is a multi-phase iterative process whose product is an enterprise architecture tailored to a specific organization. This recipe for an architecture would be better described as a methodology because of its set of procedures rather than a passive support framework. This is not to say that TOGAF completely lacks framework elements. TOGAF includes many views, models and other common framework elements for stakeholders to consult. However, the majority of the work and emphasis of TOGAF are related to the ADM which falls into the methodology category more so than the framework category. ("Introduction," 2009; Josey, 2009; Sessions, 2009)

TOGAF addresses most of its models and viewpoints through its Architecture Content Framework (ACF). Similar to the Zachman framework, the ACF provides an organizational structure to support enterprise architecture information. In version 9, TOGAF also includes a metamodel that helps organize and relate informational at the organization-wide level. TOGAF breaks information into three basic types: deliverables, artifacts and building blocks. Deliverables are typically the output of a project. They are defined at the beginning of a project and are approved or signed-off on once completed. Artifacts, more granular pieces of information, often take the form of diagrams, catalogs, models, or matrices. Finally, building blocks represent pieces of capability. Architecture building blocks can be combined to create solution building blocks. These building blocks are representations of actionable content which

can be combined and reused to meet specific organizational needs. ("Introduction to the architecture content framework," 2009)

As mentioned before, the ADM is the process by which an architecture is developed in TOGAF. The ADM is an iterative process that begins with high-level principles and refines them down to a low-level architecture. The process begins with by collecting requirements and gaining acceptance from the key stakeholders. Then, the current and target architectures are developed. Once these architectures are defined, the gaps between them are analyzed. Using the gap analysis, a list of work to fill the gap is created. This list is then reviewed and the projects are prioritized and selected for implementation. Once selected, they are supervised through to their completion. The process begins all over again to update the current state of the architecture and define a new target architecture. During this process, all four of the architectures are designed and put into use, and information is created to populate the ACF. By providing a detailed process for putting the architecture into practice, TOGAF has shown itself to be a strong choice for organizations that want to put enterprise architecture into action. Roger Sessions does note, however, that the ADM is the blueprint for an architecture, but not necessarily a good or useful one. Using the ADM without the proper care and intentions will develop an architecture that is ill-equipped to meet an organization's needs. ("Introduction to the ADM," 2009; Josey, 2009; Sessions, 2009)

FEA(F)

The Federal Enterprise Architecture (FEA), formerly known as the Federal Enterprise Architecture Framework (FEAF), is a framework developed by the U.S. Office of Management and Budget (OMB) for use among federal agencies and departments to maintain compliance with the Clinger-Cohen Act of 1996. ("Circular no. A-130," 2000; Sessions, 2009) FEA uses a

segment and service model to organize its organizational functions. All segments and services are defined at the enterprise level so the entire government may reuse them. Segments are granular pieces of functionality that function at the agency level. They are categorized as either core mission area for agency specific functions or business service for basic functionality that all agencies use. Enterprise services function at the enterprise level and service all agencies. FEA provides a methodology for developing segments as well as a reference models for classifying them and managing documentation. ("Circular no. A-130," 2000; Federal Architecture Working Group, 2001; Sessions, 2009)

FEA can best be described as both a framework and a methodology. The reference models function as a support structure to better organize information. Their concept is similar to that of the Zachman framework, but implemented differently across the five models. FEA also provides a development methodology as well. The methodology focuses on defining and developing individual segments one at a time until the architecture reaches completion. FEA is one of the most complete frameworks in terms of covering the framework-methodology continuum. ("Circular no. A-130," 2000; Federal Architecture Working Group, 2001; Sessions, 2009)

FEA uses five reference models to communicate the architecture to stakeholders. These models enable government agencies to better communicate due to the common language. Each model has its own focus and they are listed below.

- Business Reference Model – Provides a business-centric view of the segments and services. Allows business users to understand relationship between segments.

- Components Reference Model – Provides a description of how IT components support business functionality. Focused toward IT users for analyzing alignment.
- Technical Reference Model – Provides definitions of technologies and standards available for use. IT-centric view of the technical resources available.
- Data Reference Model – Provides a means for describing types of data. Promotes a common language and understanding for information architects.
- Performance Reference Model – Provides a means for deriving value from the architecture. Useful for empirically determining the quality, usefulness, or value of the architecture segments or the architecture as a whole.

These five models provide information to stakeholders from business and technical areas as well as those in between. In addition, FEA provides a model for determining the value and effectiveness of the enterprise architecture. Like any other investment, enterprise architecture needs to be able to prove its value, and this model makes it much easier to do so. FEA also includes an assessment framework by which the agencies are graded on how well developed and mature their architectures are. (*FEA consolidated reference model document version 2.3*, 2007; Federal Architecture Working Group, 2001; Sessions, 2009)

The FEA Process is the process by which segments are developed. It is a step by step methodology, and differs from TOGAF's ADM as it focuses on individual segments rather than the entire enterprise all at once. The process begins by defining the scope of a segment and identifying its relationship to the agency's mission. The target architecture is then defined. Once funding and buy-in are achieved, the target architecture is broken down into projects and a management plan is created. This process is repeated for each segment in the agency until

the enterprise architecture reaches completion. (*FEA consolidated reference model document version 2.3*, 2007; Federal Architecture Working Group, 2001; Sessions, 2009)

DoDAF

The Department of Defense Architecture Framework (DoDAF) is an enterprise architecture framework developed by the U.S. Department of Defense (DoD). It is similar to FEA in that it fulfills the requirements for enterprise architecture laid out in the Clinger-Cohen Act. DoDAF has undergone several revisions since its inception in August 2003. In May 2009, the DoDAF Working Group released DoDAF Version 2.0. The framework is prescribed for use in all DoD departments and agencies. DoDAF focuses primarily on increasing the availability and usability of enterprise architecture information. The revision to version 2.0 shifts emphasis on architecture development from a “product-centric process” to a “data-centric process” in order to increase the effectiveness of information presented to decision makers. (*DoDAF version 2.0*, 2009)

DoDAF is relatively accurate in its description of itself as a framework. Its primary purpose is to organize information so that it can be easily retrieved by those making decisions. It is similar to the Zachman framework in that it organizes enterprise architecture information by information type and stakeholder role. However, by describing how to gather said information and put it to use, DoDAF goes a few steps further than Zachman and becomes a more complete framework. This framework provides common language and models that can be understood throughout the DoD. Enterprise architecture information is divided into seven viewpoints. Each viewpoint is then broken down into models, each with their own purpose and use scenario. In addition to the prescribed models, DoDAF also allows for the creation of “Fit-for-Purpose Views”. These are models created to fill an information need that is not otherwise

filled by an existing model. When developing the architecture, architects have the option to create “Fit-for-Purpose Views” and omit standard models that they believe will not be used. This flexibility helps make sure that DoDAF can meet the needs of its stakeholders while avoiding the overhead and non-compliance that useless elements bring. (*DoDAF version 2.0*, 2009)

As mentioned earlier, DoDAF divides its architectural information into seven viewpoints. Each viewpoint serves a particular purpose. The viewpoints and their purposes are listed below as described in the DoDAF version 2.0 specifications.

- All Viewpoint – Describes the overarching aspects of architecture context that relate to all viewpoints.
- Capability Viewpoint - Articulates the capability requirements, the delivery timing, and the deployed capability.
- Data and Information Viewpoint - Articulates the data relationships and alignment structures in the architecture content for the capability and operational requirements, system engineering processes, and systems and services.
- Operational Viewpoint - Includes the operational scenarios, activities, and requirements that support capabilities.
- Project Viewpoint - Describes the relationships between operational and capability requirements and the various projects being implemented. The Project Viewpoint also details dependencies among capability and operational requirements, system engineering processes, systems design, and services design within the Defense Acquisition System process.

- Services Viewpoint - Is the design for solutions articulating the Performers, Activities, Services, and their Exchanges, providing for or supporting operational and capability functions.
- Standards Viewpoint - Articulates the applicable operational, business, technical, and industry policies, standards, guidance, constraints, and forecasts that apply to capability and operational requirements, system engineering processes, and systems and services.
- Systems Viewpoint - For Legacy support, is the design for solutions articulating the systems, their composition, interconnectivity, and context providing for or supporting operational and capability functions.

These viewpoints cover aspects of the architecture from solutions architecture to legacy systems and include an overarching view to provide context. With the inclusion of “Fit-for-Purpose Views” DoDAF provides a comprehensive view of a department or agency’s architecture. (*DoDAF version 2.0, 2009*)

While DoDAF offers an architecture development process, it is not required that this process be used. What is important is that whatever development method used must comply with the documentation requirements of DoDAF. To better enable this use scenario, DoDAF includes a section with suggestions on how to incorporate the needs of DoDAF into almost any development methodology. This is useful for many DoD organizations due to their heavy use of contracted work. The outside firm can use whatever development method they like as long as they generate the data required by DoDAF. This has proven to be very beneficial for the DoD in enabling information sharing across agencies. (*DoDAF version 2.0, 2009*)

Gartner

The Gartner Enterprise Architecture Process (GEAP) and Gartner Enterprise Architecture Framework (GEAF) are an enterprise architecture methodology and framework created by the research and consulting firm Gartner. Gartner was a leader in executive-level IT consulting when it began developing its own approach to enterprise architecture in 1996. They continued to develop their approach and framework independently, until 2005 when they acquired the META Group. After the acquisition, Gartner merged their approach with that of the META Group to create the approach they use today. For the ease of discussion the GEAP and GEAF will be referred to collectively as the Gartner approach. (Bittler, 2005; G. A. James, Handler, R. A., Lapkin, A., Gall, N., 2005; Sessions, 2009)

The Gartner approach is similar to TOGAF and FEA in that it contains discreet architecture development and framework elements. Thus, it fits the definition for both a framework and methodology. However, the emphasis of the Gartner approach is on the GEAP. The GEAP would best be described as a methodology or more specifically, a practice. (Sessions, 2009) It is a process for developing an architecture, but it lacks the formalized processes of TOGAF and FEA. Instead it relies on the expertise of the consultant or business leader to develop the majority of the architecture. A general outline of the process is provided, and the organization is free to use whatever methods it sees fit to complete the process. The GEAP is similar to a methodology, but the lack of a step by step process or recipe for an architecture makes it incomplete. The incomplete and open nature of the GEAP have led to it being labeled as a practice rather than a methodology. (Bittler, 2005; G. A. James, Handler, R. A., Lapkin, A., Gall, N., 2005; Sessions, 2009)

Success in the GEAP is based on business outcomes rather than the filling of a matrix or the completion of certain steps. This holistic approach tries to avoid the pitfall of creating ineffective architectures when following a rigid methodology. The GEAP focuses on where the business is going and how it is going to get there. (Sessions, 2009) The process generally begins with getting the organization to discuss and agree upon its vision for the future. Incorporated in the vision statement are the business strategy and the environment in which the organization operates. These discussions are then used to formulate the future state architecture. Once the future state has been determined, the GEAP works to define requirements, principles, and models that represent the future state architecture. The organization must then document their current state and decide how it wants to bridge this gap using the requirements, principles, and models it created. This process is iterative and must be managed in order for the enterprise architecture effort to be effective. Upon each iteration, the initial vision should be examined to see if it is still accurate. It is through this process, that the GEAP is able to turn organizational vision into effective organizational change. (Bittler, 2005; G. A. James, Handler, R. A., Lapkin, A., Gall, N., 2005; Sessions, 2009)

The GEAF acts as a framework to organize and present enterprise architecture documentation for the organization. While Gartner notes that a framework is helpful in any enterprise architecture effort, it recognizes that any vendor neutral framework should be able to complement the GEAP. The GEAF divides the enterprise architecture into technology, business, and information architectures with a solutions architecture at their intersection. Each of the three main architectures serves as a contextual viewpoint for the organization. The solutions architecture serves to unify all three of the viewpoints into specific system implementations as solutions to organizational problems. Within each architecture are layers of

abstraction which cater to the different stakeholder groups. These layers are similar to the roles within the Zachman framework. The GEAF then uses several models in order to communicate the architectures to the stakeholders. Information from the framework is used by stakeholders to make decisions on future architecture developments or business initiatives. (Bittler, 2005; G. A. James, Handler, R. A., Lapkin, A., Gall, N., 2005; Sessions, 2009)

Emergence of Hybrid Approaches

The analysis of the enterprise architecture frameworks shows that each framework has its own way of solving the problems of the modern organization. Organizations looking to start an enterprise architecture effort may be asking, “Which framework is the best?” A better and more appropriate question would be, “Which framework is best *for us?*” To answer these questions, an organization would have to examine several potential frameworks, similar to what was done earlier, to find the one that best meets their needs. Organizations have taken these steps as evidenced by the 74% of organizations that use enterprise architecture frameworks. (Obitz, 2009; Peyret, 2006)

A unique question arises when no framework adequately meets all of an organization’s needs. A 2006 study investigated CIOs’ top concerns and whether or not enterprise architecture addresses them. The study concluded that the Zachman and DoDAF frameworks show room for improvement with respect to alignment with executive concerns. (Lindstrom, 2006) The next question to ask is, “What do organizations do about this?” Do organizations make due with this lack of coverage or do they adjust their frameworks somehow? Research by Infosys indicates that organizations are tweaking their enterprise architecture frameworks in order to meet their needs. The study states that 71% of organizations modified their framework in one way or

another. (Obitz, 2009; Peyret, 2006) Another study by Forrester puts this percentage at 90%. (G. Leganza, Smilie, K., Cullen A., Czarnecki, M., 2009) Whether it is to address unmet needs, remove unnecessary processes, or replace prescribed processes with ones currently in use, organizations are making changes to their frameworks. Despite the prevalence of these customized enterprise architecture frameworks, there has been little research on the topic.

Justification for Research

If organizations are modifying their enterprise architecture approaches, how are they doing it? Research indicates two trends. The first trend is the incorporation of current practices. The Infosys survey stated that approximately 47% of organizations responded that they incorporated their current processes in their enterprise architecture framework. (Obitz, 2009) The other trend is to incorporate elements of other enterprise architecture frameworks. (Peyret, 2006) By combining elements of different frameworks organizations can compensate for one framework's shortcomings with another's strengths. For example, the Zachman framework is often incorporated into enterprise architecture efforts because of its simplicity and ignorance to practices and strategy. In the TOGAF 8.1.1 manual, The Open Group describes how the outputs of the ADM map to the Zachman matrix. ("ADM and the Zachman framework," 2006) By combining frameworks, organizations are creating a framework of frameworks or a hybrid architecture.

While combinations of frameworks exist in theory, little work has been done to illuminate how organizations combine elements of the popular enterprise architecture frameworks to meet their organizational needs. (Zarvic, 2006) A recent Gartner survey revealed that 55% of organizations use a blended approach to practicing enterprise architecture and 69%

plan to do so in the future. (Burton, 2010) Research from Forrester and Gartner indicates that organizations themselves do not have a complete grasp on how to effectively select an enterprise architecture framework. (Burton, 2010; Peyret, 2006) Continued research in this area would provide insight into how organizations are actually using enterprise architecture. In order for the study of enterprise architecture to advance, there needs to be accurate information on the usage patterns of organizations. A better understanding of usage patterns would aid in the development of best practices and enable the evolution of the enterprise architecture field.

The goal of this research is to identify current enterprise architecture framework usage patterns in order to better understand the current state of the art and predict or suggest changes to make enterprise architecture programs more effective.

Overview of Study and Methodology

For our collection instrument, we chose a survey instrument. It was chosen for several reasons with the primary ones being the exploratory nature of the research and the number of participants targeted. The survey targeted approximately 4,000 enterprise architecture leaders worldwide. For our research budget, it was cost prohibitive to use a more in depth or individualized method. Since this was an initial study, the goal was to discover as many trends for future research as possible. A great deal of depth was not needed for this for this first round of research, so an instrument that could reach most participants per dollar of research funding was chosen. The survey was distributed online using SurveyMonkey.com. In order to save resources, items relating to another enterprise architecture study were included in the survey, but will not be discussed.

The survey consisted primarily of multiple-choice items complimented by short open-ended items to explain those choices or specify a response of “other”. Depending on the responses of the participant, the survey was modified to avoid asking unnecessary questions and ask more relevant ones. This allowed the survey to ask more specific questions to the appropriate groups and help eliminate responses from participants who should not be responding to those items. In total there were 36 items on the survey relating to this study, but individual participants may have responded to only a subset depending on their responses.

The entire survey instrument can be found in the Appendix. Only the sections relating to this study, sections 1, 3, and 4, are included. A short summary of each survey section follows.

The purpose of the first section of the survey was to collect information on enterprise architecture usage patterns. The intent of the study is to identify trends worldwide, within a subset of organizations as categorized by the third and fourth sections of the survey, or by other types of enterprise architecture use. This section asked questions based on the subject matter of this paper. It consisted of multiple-choice items complimented by open-ended items. This section also contained some open-ended responses intended to collect information about the intentions and rationale of enterprise architecture use by organizations. These items were the primary focus of the analysis for trends when categorized by various other survey items.

The purpose of the third section of the survey was to collect information about the individuals leading enterprise architecture efforts around the world. The information will help create a profile of enterprise architecture leaders and identify trends in usage patterns. This section utilized only multiple-choice items. The information collected included age, gender and educational background of the respondents.

The purpose of the fourth section was to gather information about the organizations in which the participants work. The items in this section consisted of multiple-choice items with an open-ended response to specify an answer of “other”. In addition to creating a profile of organizations that do and do not use enterprise architecture, this section was intended to help identify trends within certain groups. Research in other business topics has shown trends in organizations based on industry, organizational size, IT staff size as well as other characteristics. (P. Allegra, 2006; Babu K, 2008; Hoppermann, 2008; Obitz, 2009; Weill, 2007) The survey also focused on some enterprise architecture specific items that have been included in previous surveys. (Burton, 2010; Obitz, 2009; Weill, 2007)

Details on the statistical analysis methods will be discussed in the following section.

Presentation of Findings and Analysis

As of the writing of this report, we have collected 21 valid responses. A valid response is defined as any response from a targeted participant that completed at least 50% of the survey items. While it is not possible to draw decisive conclusions from this preliminary data, we may be able to identify some trends in response. Due to the low number of responses, we do not feel the organizational demographics are representative of the targeted population. The majority of the demographic categories are empty or have only one response. However, we do believe data about enterprise architecture framework use does represent the targeted population. Much of the data collected indicates at least one clear pattern of use. For these reasons, demographic data is omitted from this report, and the report will focus on presenting framework usage data.

For quantitative data, the responses will be presented in graph form with the absolute values listed. Placing the data in charts allows quick identification of popular practices as well as their relative popularity compared to alternative practices. For qualitative data, the results will be analyzed for any similarities between responses. Patterns of response in the data may indicate a significant trend to watch for in the full data set. For both types of data, a brief analysis will be conducted. Any high-level trends or themes will be discussed in the conclusions section.

Section 1 – Enterprise Architecture Usage

The first item on the survey asked participants if their organization uses or plans to use an enterprise architecture program. Because this study targets leaders of enterprise architecture programs, participants who responded “No” or “Don’t know” were excluded from the study. Participants cannot lead nonexistent or unknown programs.

The second item on the survey asked participants whose organization does not utilize enterprise architecture why it is not used. Of the open-ended responses collected, the most popular response was that they were not able to justify its use. We are unable to tell if this decision reflects a failed effort or no effort at all. However, the data indicates that enterprise architecture may not be appropriate in all organizations.

1.1 EA Program

The third survey item asked participants how long their organization has had a formal enterprise architecture program. The results are listed in Figure 1.

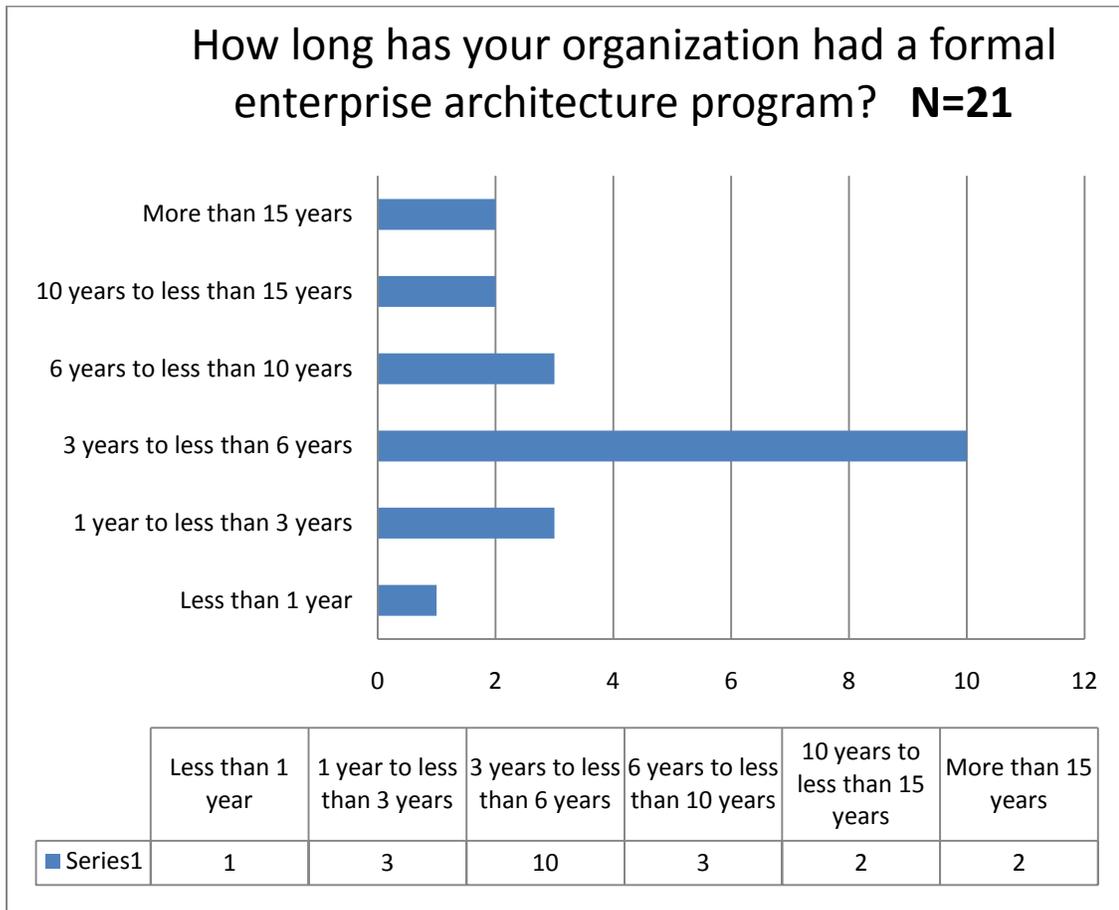


Figure 1 Graph presenting the age of enterprise architecture programs.

Figure 1 shows almost half of all responding enterprise architecture programs have been developed in the last three to six years. Only four responding programs have been in existence less than three years. This information reveals a spike in the adoption of enterprise architecture between three and five years ago. Further analysis will be needed to understand the cause of this spike, but it should be noted that TOGAF, the most popular framework, had versions 8.1 and 8.1.1 released during this period. (Sessions, 2009)

1.2 EA Organization Structure

The fourth survey item asked participants who the enterprise architecture program reports to directly. The results are presented in Figure 2.

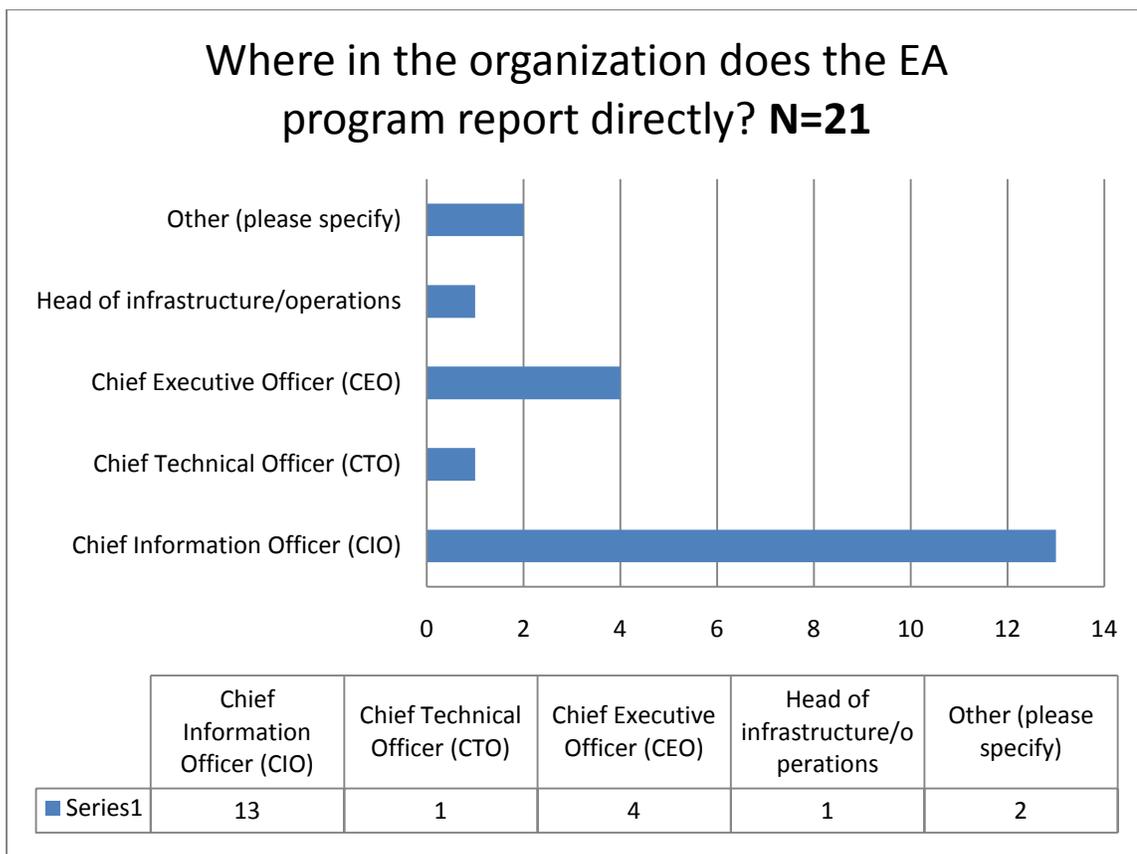


Figure 2 Graph presenting the direct reports of enterprise architecture programs.

Figure 2 shows that the majority of programs report to a top executive. More specifically, programs are reporting to the Chief Information Officer (CIO). This research indicates that top executives are interested in enterprise architecture programs. It also indicates that programs are considered to be an IT issue rather than an organization-wide issue. Research presented earlier in this report indicates this may not be a beneficial practice. Participants responding with “other” specified non-executive management as a direct report.

1.3 EA Program Budget

The fifth survey item inquired about the budget of the participant's enterprise architecture program. Only 12 of the 21 participants responded to this open-ended item. Responses ranged from \$10,000 USD to \$10,000,000 USD with one organization not individually tracking enterprise architecture spending. This data is likely linked to organization size. Since we do not have usable demographic data at this time, analysis of this data must be postponed until more complete data has been collected.

1.4 Size of EA Program

The sixth item on the survey asked participants about the number of people employed by the enterprise architecture program. The results are presented in Figure 3

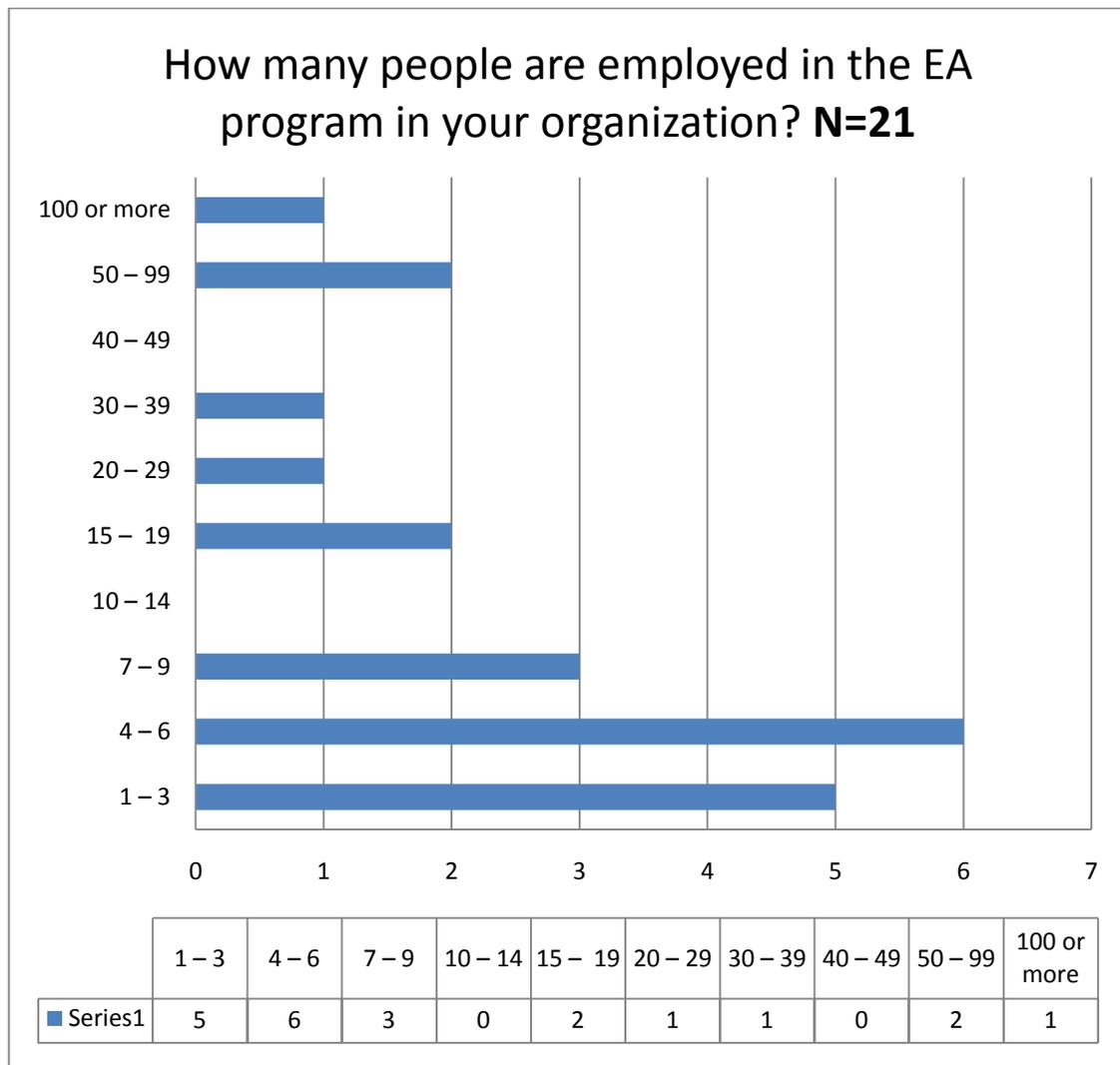


Figure 3 Graph presenting the sizes of enterprise architecture teams.

Figure 3 indicates that the average enterprise architecture team is relatively small with 66% of teams consisting of nine or less members. However, there are also three teams consisting of 50 or more members. This data is likely tied to organizational size as more architects are needed to support larger organizations. It may also be reflective of how governance is handled. If solutions architects are used, there will need to be enough of them to support all of the organization's projects and the team will be larger. If IT project teams are

responsible for reporting to architects, the teams will remain small. If these assumptions are true, the data would indicate that most enterprise architecture teams rely on IT to report to the enterprise architecture team.

1.5 Organizational Goals for EA

The seventh item on the survey asked participants what the top three organizational goals for their enterprise architecture programs were. The results are shown in Figure 4.

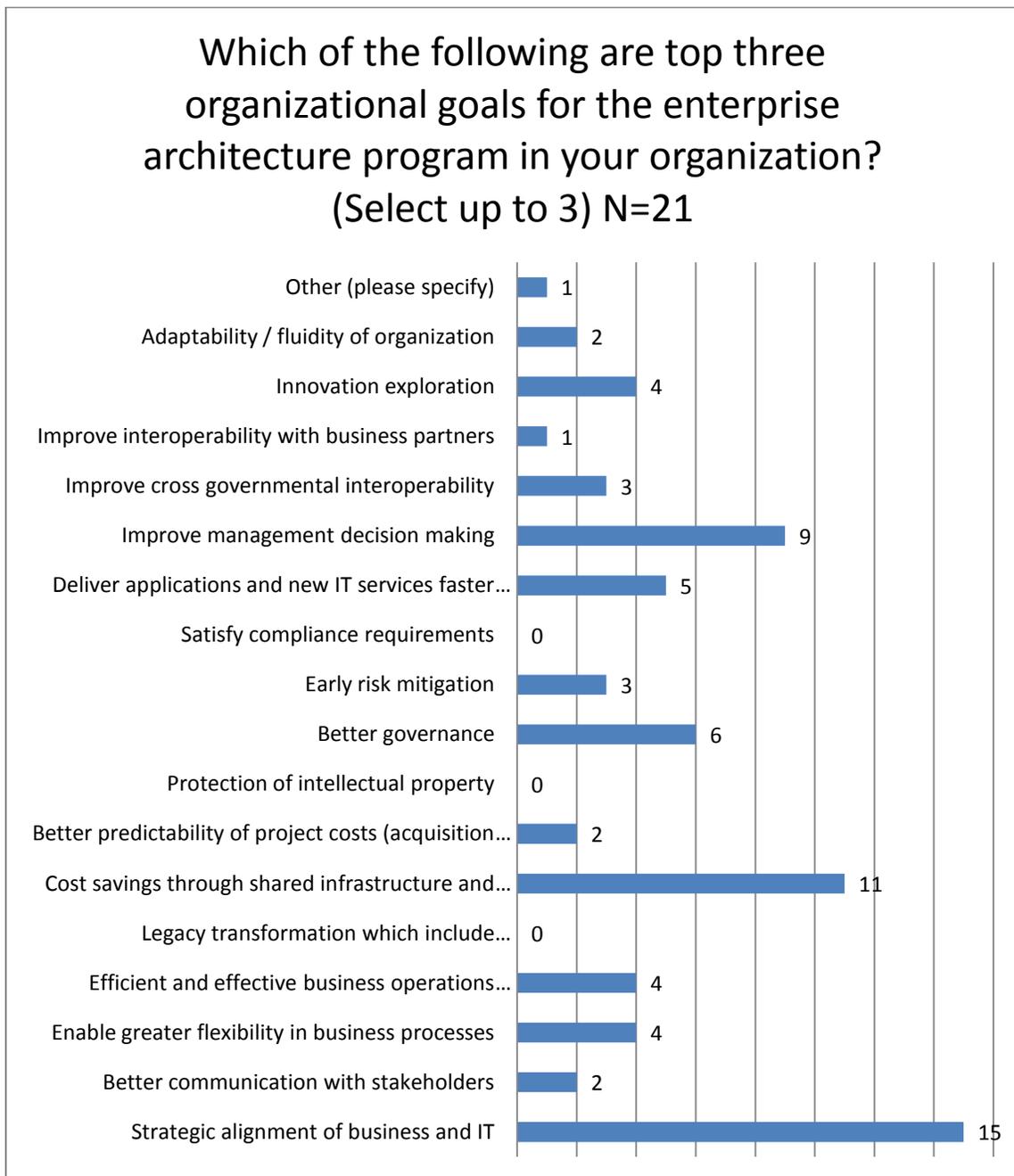


Figure 4 Graph presenting data on enterprise architecture program goals.

Figure 4 presents the organizational goals set for enterprise architecture programs. These goals reflect benefits organizations wish to realize through their programs. The top responses of strategic alignment, cost savings through standardization, and improved decision

support are similar to the results of a 2008 study done by Infosys. (Obitz, 2009) This would indicate that the motivations behind enterprise architecture have remained nearly constant over the last two years. Whether or not this is beneficial or not will require more data and further analysis.

1.6 EA Framework

The eighth item on the survey asked participants about the criteria they used for choosing their enterprise architecture framework. The results are presented in Figure 5.

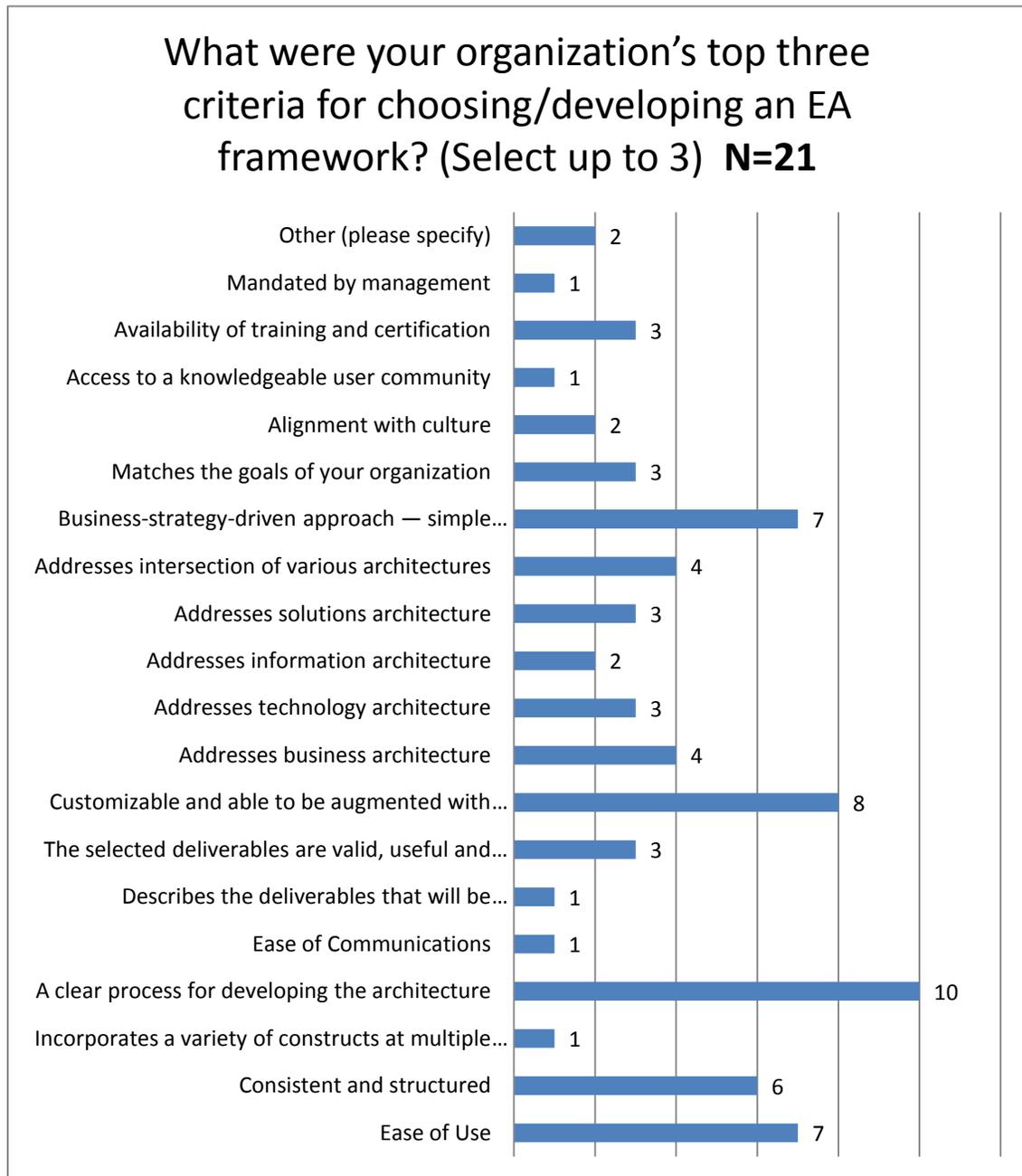


Figure 5 Graph presenting data on framework selection criteria.

Figure 5 presents the top criteria considered by participating organizations when selecting or developing an enterprise architecture framework. The top responses citing a defined development process, consistent and structured approach, and ease of use indicate a desire of organizations to have an architecture framework that can be put into action early, easily, and often. The popularity of customization as a criterion supports recent research indicating a high rate of framework customization. (G. Leganza, Smilie, K., Cullen A., Czarnecki, M., 2009; Obitz, 2009)

The ninth item on the survey asked participants about their approach to selecting or developing an enterprise architecture framework. The results are shown in Figure 6.

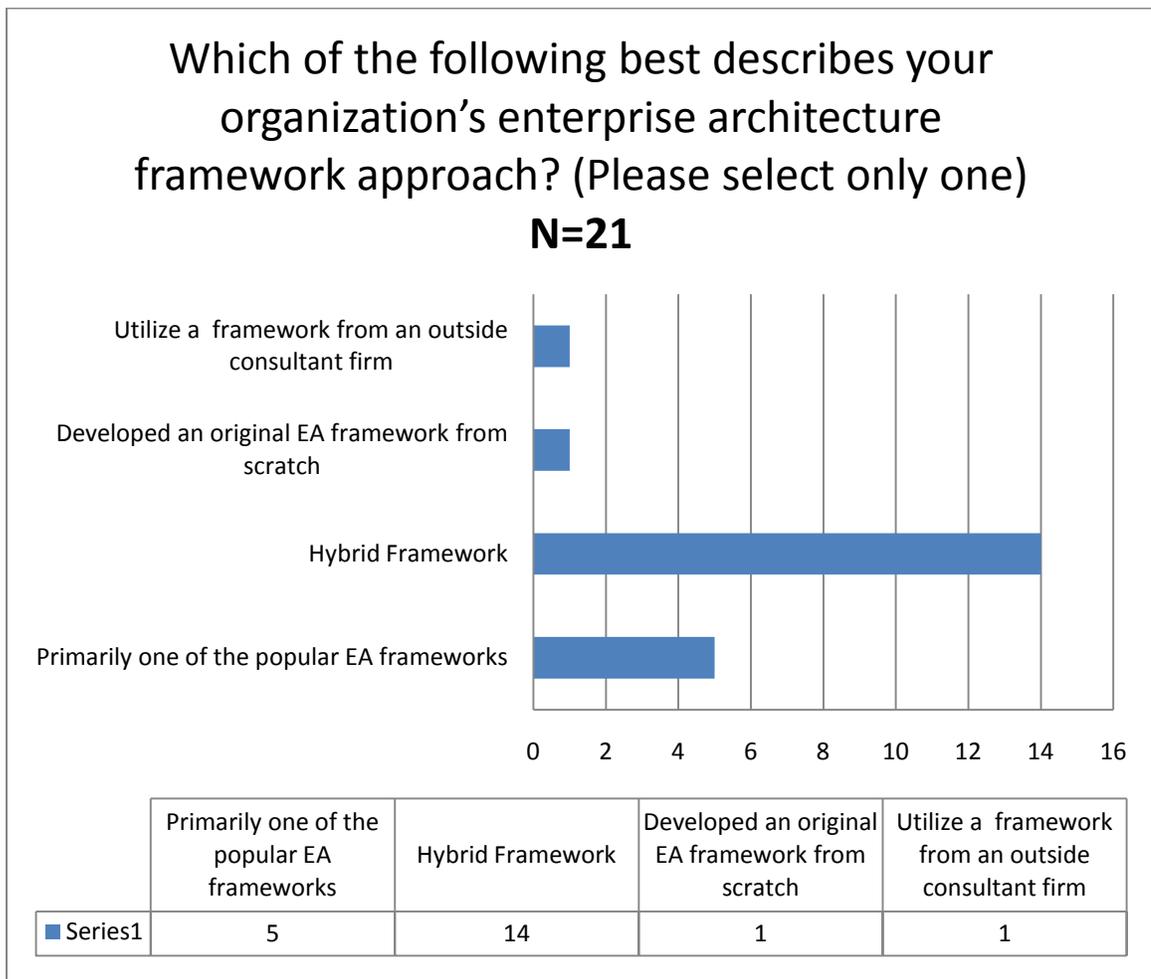


Figure 6 Graph presenting data about enterprise architecture framework selection and development approaches.

Figure 6 shows a strong trend favoring the use of hybrid frameworks. The 66% of organizations using hybrid frameworks further supports earlier research on the prevalence of hybrid frameworks. The data also indicates that almost all organizations use elements of existing frameworks, with only a single organization developing their own framework.

The tenth and eleventh items on the survey asked participants about the frameworks they utilize in their organization. For the organizations using a single approach, four

organizations use TOGAF, and a single organization uses an enterprise architecture center of excellence. For organizations using a hybrid approach or developing their own framework, the results are shown in Figure 7.

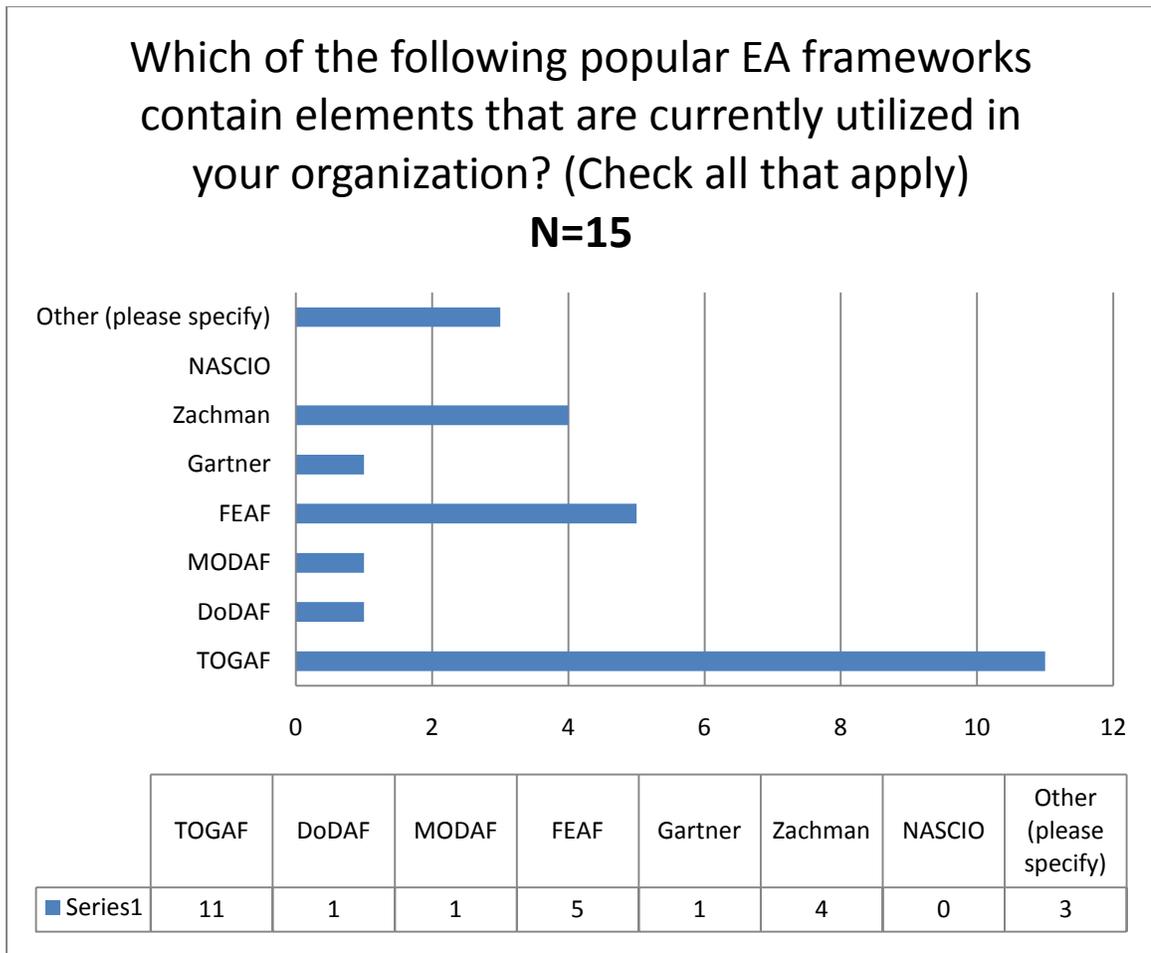


Figure 7 Graph presenting data about the composition of hybrid frameworks.

Figure 7 shows that TOGAF remains the most popular framework with the Zachman and FEAF frameworks also showing higher than average usage. Other than these three frameworks, no other framework had more than one organization using it. This data indicates that TOGAF met the criteria selected by organizations better than the other frameworks as evidenced by its

higher than average adoption rate. This suggests that TOGAF is the framework best suited for use in a hybrid environment.

The twelfth item on the survey asked participants whose organization utilizes a hybrid approach to identify the elements included in their hybrid approach. The open-ended response data indicates several varied approaches. One trend in response is to select the top framework element for each area regardless of which framework it is from originally. Another trend is to use one framework primarily and add functionality through the use of elements from other frameworks. More data needs collected and analyzed before either of these use trends can be identified decisively.

The thirteenth item on the survey asked participants with hybrid approaches what self-designed elements were utilized in their hybrid approaches. In the open-ended responses, two organizations identified portfolio management as a custom designed element. Another two organizations mentioned customizing FEAF to better support their core mission areas. The responses to this item are too varied to draw any meaningful conclusions at this time.

The fourteenth item on the survey asked participants what their motivations were in selecting their approach. Once again, the open-ended responses were varied. Six organizations that utilize elements of TOGAF cited its wide adoption as one of their motivations for using the framework. Additional data is needed before other trends can be identified.

The fifteenth item on the survey asked participants with which three aspects of their approach they are most pleased. Of the open-ended responses, the following aspects were mentioned at least twice: standardization, development methodology, governance, metric collection, availability of training, flexibility of framework, and focus on business strategy. These

results are reflective of the enterprise architecture goals found in Figures 4 and 5, and confirm the internal validity of the data. Further analysis is needed to confirm and identify any additional trends in response.

The sixteenth item on the survey asked participants with which three aspects of their approach they are least pleased. The most popular open-ended response was a lack of understanding, awareness, or acceptance from the rest of the organization. This has been reported as a common problem for enterprise architecture programs in previous research as well. (Burton, 2009b; Hoppermann, 2008; G. A. James, Burke, B., 2005; G. Leganza, Cullen A., Smilie K., 2007; G. Leganza, Smilie, K., Cullen A., Czarnecki, M., 2009; Obitz, 2009) While enterprise architecture has made some progress in recent years, the data indicates that some organizations are still having trouble with one of enterprise architecture's most basic problems.

The seventeenth item on the survey asked participants what their top three priorities were for improving their enterprise architecture program over the next year. Improvements in the areas of metrics, involvement with the rest of the organization, information exchange, modeling, and strategic alignment were the most popular among the open-ended responses. These areas are all related to engaging business stakeholders and justifying the use of enterprise architecture in the organization. The data indicates that teams are looking to improve in the areas interfacing with business stakeholders. This is likely related to the team's dissatisfaction with the lack of understanding, awareness, and acceptance by the rest of the organization. The data confirms the continued presence of the IT-business divide, but also shows that organizations are aware of it and looking to remedy it.

1.7 Metrics Used to Construct the EA Business Case

The eighteenth item on the survey asked participants if any value metrics were included in the business case for enterprise architecture. The results are shown in Figure 8.

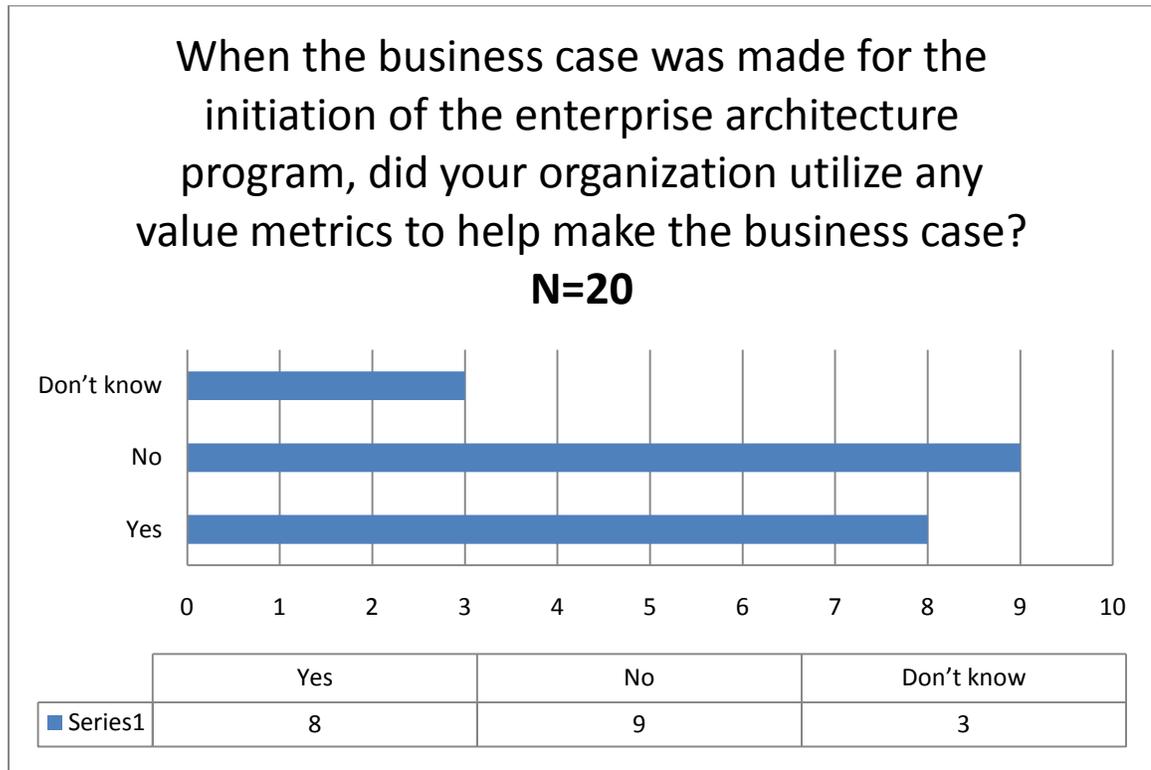


Figure 8 Graph presenting data on the presence of value metrics in enterprise architecture business cases.

Figure 8 shows the number of organizations that did and did not include value metrics in their enterprise architecture business case. The data shows that only half of organizations utilized value metrics and indicates that metrics are not necessary in expressing value at the business case stage. Additional analysis will need to be done to understand if the presence of metrics in the business case has an effect on program effectiveness. It will be interesting to see if the necessity of metrics changes throughout the life of the enterprise architecture program.

The nineteenth item on the survey asked participants whose organizations used value metrics in their business cases to identify the types of metrics used. One participant did not provide any response to this item, so only the remaining seven were analyzed. The results are shown in Figure 9.

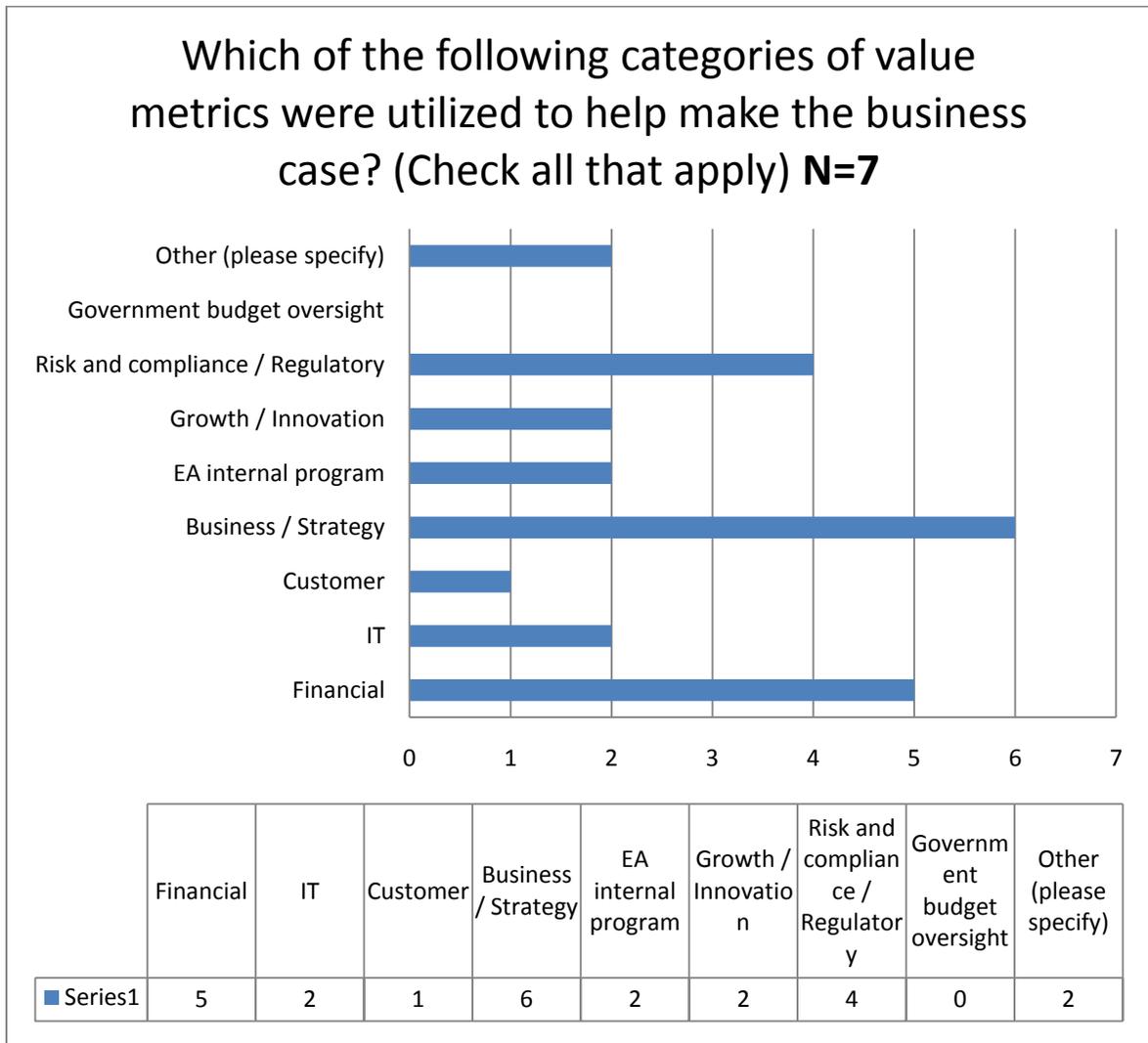


Figure 9 Graph presenting data about enterprise architecture business case metrics.

Figure 9 shows that organizations favor certain types of metrics over others. The data indicates that business strategy, finance, and compliance metrics are the most popular types of

metrics. These metrics support the top goals of improved alignment, cost justification, and standardization mentioned earlier in the report, and these similarities give internal validity to the results. It is encouraging to see the prevalence of business strategy and financial metrics used in the majority of organizations. This practice ensures that the program is focused on business outcomes and helps teams justify the program from the beginning, potentially avoiding the IT-business divide. (P. Allega, 2006; Newman, 2007; Pereira, 2005; D. Weiss, Rosser, B., 2008)

The twentieth item on the survey asked participants whose organizations did not use metrics in their business case to describe how they constructed their business case. The open-ended responses revealed two trends. The first trend was that there was no formal business case at all. The enterprise architecture programs were developed without having to make a formal case. Additional responses will need to be collected to confirm this trend. Future research will need to be done to determine the effect the presence of a formal business case has on the success of an enterprise architecture program. The other trend is that business cases were based upon enterprise architecture's ability to solve specific organizational problems. The problems to be addressed varied, so further data collection is needed before any patterns can be identified.

The twenty-first item on the survey asked participants about the most senior organization member to approve the enterprise architecture business case. Only seven open-ended responses were collected. Six of these responses named a top executive with three naming the CIO. Two of the responses named the CEO and one named the COO. The only other response named the President and Board of Governors. It is difficult to draw any conclusions from this data, but it does confirm the earlier data suggesting that enterprise architecture is

viewed as an IT issue handled by the CIO. More data will need to be collected before definitive conclusions can be drawn.

The twenty-second item on the survey asked participants to provide any additional information about the construction of the enterprise architecture business case. Only three valid responses were collected. These responses listed benefits of enterprise architecture that were included in the business case. Due to the low volume of responses, it is difficult to draw any meaningful conclusions from the data.

The twenty-third item on the survey asked participants if they use or plan to use an enterprise architecture value measurement program. The results are shown in Figure 10.

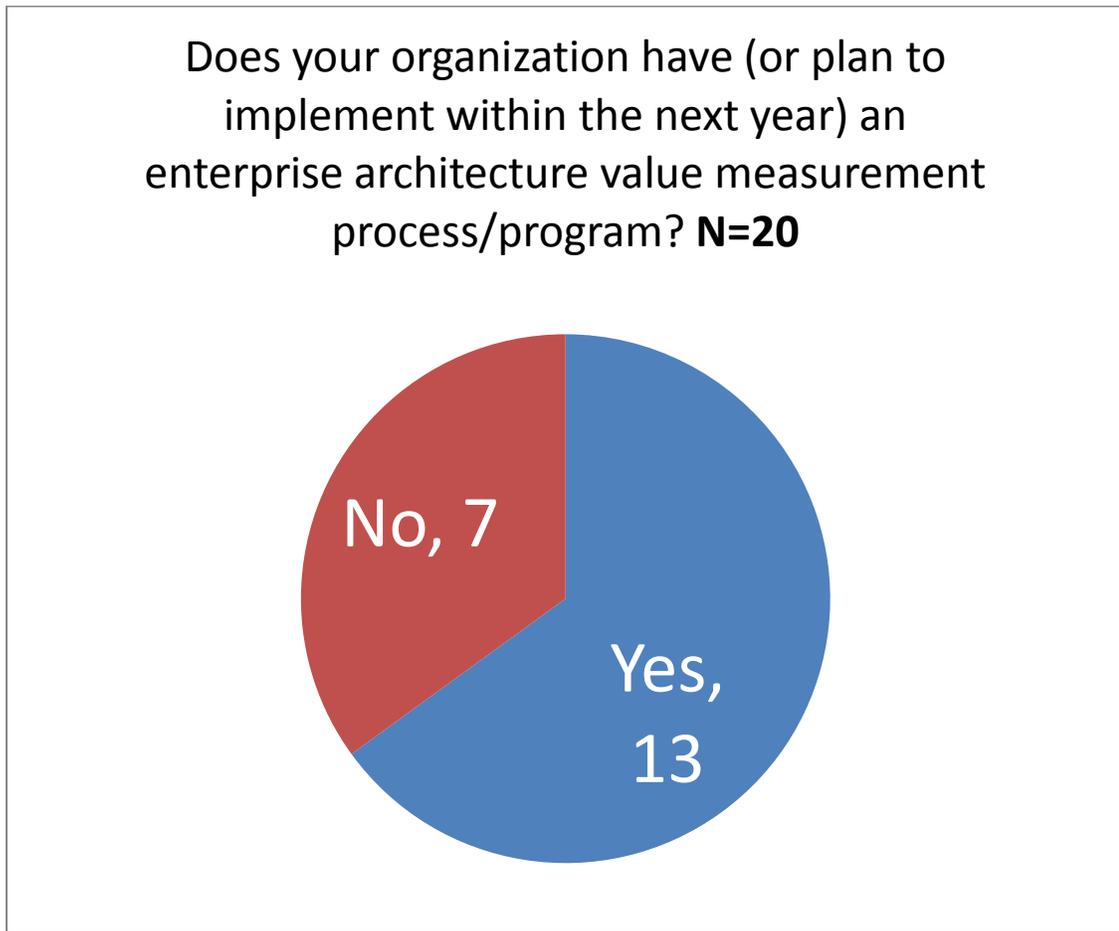


Figure 10 Graph presenting data about how many organizations do and do not utilize an enterprise architecture value measurement program.

Figure 10 shows that a majority of the responding organizations use some type of enterprise architecture value measurement program. Further results are needed before we can conclude if this is a significant increase over the number organizations using metrics in their business case. If there is indeed an increase, it may indicate that metrics become more important as the program matures. Only one organization that used metrics in the business case does not have a value measurement program. Two organizations that did not use metrics in the business case currently utilize a value measurement program. More data will need to be

collected to confirm if either of these patterns are large scale or not. A trend of increasing value measurement adoption would support a correlation between the necessity of metrics and the maturity of an organization or its enterprise architecture program.

The twenty-fourth and final item on the survey pertaining to enterprise architecture usage asked participants whose organizations do not measure enterprise architecture value to explain why they choose not to do so and if they have plans for value measurement in the future. Five open-ended responses were collected. The only similarity in response indicated that a lack of organizational size and maturity made the formal collection of metrics not worthwhile or justifiable. More data will need to be collected before this trend can be shown to be significant.

If participants indicated that their organization used a value measurement program, they were directed to complete the value measurement section of the survey. As that section is outside the scope of this study, this concludes the presentation and analysis of the results.

Conclusions

Despite the preliminary nature of the data and low volume of responses, two patterns have emerged. Once more data has been collected, further analysis will need to be done to confirm the existence of these patterns, but they are worth mentioning so they can be tested during future analysis.

The first noticeable trend is the prevalence of hybrid frameworks. Organizations are combining elements of popular frameworks with their own practices to create a more complete and useful enterprise architecture framework. The addition of external elements may indicate

that organizations feel that the popular frameworks are incomplete by themselves. Hybrid frameworks addressing this issue are designed in two ways. One approach is to combine best-of-breed elements regardless of their original framework to create a single hybrid framework. The other approach uses one framework as a foundation and adds any elements the organization feels are needed from other frameworks. The criteria for making these changes vary among organizations. No framework will ever be able to meet every organization's needs, but the data from this study can be used by the framework organizations to improve their frameworks. They can identify areas that their users feel the frameworks do not cover adequately and develop support for those areas. Combined with data on enterprise architecture success, data from this study can be used to develop best practices for hybrid framework development and serve as a strong foundation for future hybrid framework research.

The other noticeable trend is related to one of enterprise architecture's most common problems. Because enterprise architecture began as a way to manage IT systems, it is often categorized as an IT issue. However, enterprise architecture, as the name suggests, encompasses the entire enterprise or organization. By limiting enterprise architecture to only technological domains, the organization is hindering the effectiveness of the program. (P. Allega, 2006; D. Weiss, 2006) Enterprise architecture programs are attempting to become a greater part of the organization as evidenced by the program goals, most and least satisfied aspects, and improvement priorities. These results also show that teams are disappointed by their current relationships with and positions within the rest of the organization. If enterprise architecture is to evolve as a practice, teams will need tools and techniques to better integrate themselves with the business. Hopefully, the full results of this study will identify successful use patterns

that can be used to develop best practices for teams struggling to become accepted by the rest of the organization.

The analysis of the full survey results is likely to identify many more trends and patterns. The findings may raise more questions than they answer, but on the topic of hybrid frameworks, questions are better than ignorance. Hybrid approaches have become more popular than traditional approaches and there is a need for information to support this emerging trend. While this study may not provide all of the needed information, it is the first step in truly understanding how enterprise architecture teams can use hybrid frameworks to provide value to the entire organization.

Possible Future Research Areas

Once the full results of this survey are available, there are several interesting directions in which further research can proceed. One of these possibilities is the creation of a meta-framework or hybrid framework development methodology. Current research and best practices for selecting an enterprise architecture framework focus on selecting one framework over the others. If our results confirm the increased prevalence of hybrid frameworks, current best practices for framework selection would be rendered insufficient for modern organizations. Utilizing the results of this study along with the results of the enterprise architecture value assessment, future research could attempt to develop best practices for building a hybrid framework. The research could leverage popular usage patterns and cross-reference them against how well the programs using them can provide value to the organization. Using these two data sets, a link between usage patterns and program success can be drawn. The conclusions could then be a foundation for developing a list of best practices for the creation of

a hybrid enterprise architecture framework and eventually be refined into a repeatable methodology or process. In my opinion, a hybrid framework development methodology would be the most valuable derivation of this work.

To support the development of a hybrid framework development methodology, further research needs to be done to better understand the rationale of framework choices and how these choices affect program and organizational success. Our study looks into these issues, but a more rigorous study is needed for the development an effective methodology. A study addressing this need could focus on a subset of the respondents from our study and use interviews and interrogatories to collect data. Participants could be selected based on the success of their programs as indicated in this study. The enhanced quality of this data would be invaluable in understanding how hybrid frameworks are built.

Several articles comparing enterprise architecture frameworks describe some of the frameworks as complete or incomplete. (Lindstrom, 2006; Sessions, 2009) Research defining the characteristics of a complete enterprise architecture framework would be useful in the creation of a hybrid development methodology. By defining what aspects an enterprise architecture framework needs to address, the research would help organizations understand what must be included when building a hybrid framework. Further research into which frameworks address these issues best would provide useful insight for the creation of a development methodology.

There are many other possibilities for the future of hybrid enterprise architecture framework research. These suggestions are but a small piece of the puzzle but represent a viable way to implement the knowledge gained through research in tomorrow's organizations.

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Appendix - Research Questions

Section 1 – Enterprise Architecture Usage

This section captures information regarding EA program, EA framework and its usage in your organization. Please answer in terms of the organization where you have primary EA responsibility.

- 1) Does your organization utilize (or plan to utilize within the next year) an enterprise architecture (EA) program?
 - a) Yes
 - b) No
 - c) Don't know

- 2) If you answered 'No' to Question 2, please explain why an EA program is not employed in your organization and the future plans (if any) for enterprise architecture in your organization.

----- End Survey -----

If answered 'Don't know', end survey; If answered 'Yes' to Question 2, continue survey.

1.1 EA Program

- 3) How long has your organization had a formal Enterprise Architecture program?
(Please select only one)

- a) Less than 1 year
- b) 1 year to less than 3 years
- c) 3 years to less than 6 years
- d) 6 years to less than 10 years
- e) 10 years to less than 15 years
- f) More than 15 years
- g) Don't know

1.2 EA Organization Structure

- 4) Where in the organization does the EA program report directly? **(Please select only one)**
- a) Chief Information Officer (CIO)
 - b) Chief Technical Officer (CTO)
 - c) Chief Executive Officer (CEO)
 - d) Chief Operating Officer (COO)
 - e) Chief Financial Officer (CFO)
 - f) Head of IT planning
 - g) Head of application development
 - h) Head of infrastructure/operations

- i) Head of corporate strategy/planning
- j) Other (please specify)

1.3 EA Program Budget

- 5) Please indicate the overall budget for enterprise architecture in your organization?
(in US dollars)

1.4 Size of EA Program

- 6) How many people are employed in the EA program in your organization? **(Please select only one)**
- a) 1 – 3
 - b) 4 – 6
 - c) 7 – 9
 - d) 10 – 14
 - e) 15 – 19
 - f) 20 – 29
 - g) 30 – 39
 - h) 40 – 49

- i) 50 – 99
- j) 100 or more
- k) Don't know

1.5 Organizational Goals for EA

- 7) Which of the following are **top three** organizational goals for the Enterprise Architecture program in your organization? **(Please select only three goals from the following)**
- a) Strategic alignment of business and IT
 - b) Better communication with stakeholders
 - c) Enable greater flexibility in business processes
 - d) Efficient and effective business operations (improved ability to seize new business opportunities, flexible outsourcing capabilities)
 - e) Legacy transformation which include technology convergence
 - f) Cost savings through shared infrastructure and services from standardization, consolidation of application and component reusability
 - g) Better predictability of project costs (acquisition cost, operation and maintenance costs)
 - h) Protection of intellectual property
 - i) Better governance

- j) Early risk mitigation
 - k) Satisfy compliance requirements
 - l) Deliver applications and new IT services faster (enhanced service delivery) to facilitate technology leadership
 - m) Improve management decision making
 - n) Improve cross governmental interoperability
 - o) Improve interoperability with business partners
 - p) Innovation exploration
 - q) Adaptability / fluidity of organization
 - r) Other (please specify)
-

1.6 EA Framework

- 8) What were your organization's **top three** criteria for choosing/developing an EA framework? **(Please select only three criteria from the following)**
- a) Ease of Use
 - b) Consistent and structured
 - c) Incorporates a variety of constructs at multiple levels of abstraction.
 - d) A clear process for developing the architecture

- e) Ease of Communications
- f) Describe the deliverables that will be produced and their relationship to each other
- g) The selected deliverables are valid, useful and support governance mechanisms
- h) Customizable and able to be augmented with elements from other frameworks or methods
- i) Addresses business architecture
- j) Addresses technology architecture
- k) Addresses information architecture
- l) Addresses solutions architecture
- m) Addresses intersection of various architectures
- n) Business-strategy-driven approach — simple and natural
- o) Matches the goals of your organization
- p) Alignment with culture
- q) Access to a knowledgeable user community
- r) Mandated by management
- s) Availability of training and certification
- t) Other (please specify)

9) Which of the following best describes your organization's enterprise architecture framework approach? **(Please select only one)**

- a) Primarily one of the popular EA frameworks
- b) Hybrid framework (framework consisting of elements of different popular EA frameworks and perhaps custom elements developed by your organization)
- c) Developed an original EA framework from scratch
- d) Utilize a framework from an outside consultant firm

10) If you answered 'a' to Question 10, please answer the following question and then proceed to Question 15:

Which popular EA framework do you primarily utilize? **(Please select only one)**

- a) TOGAF
- b) DoDAF
- c) MODAF
- d) FEAF
- e) Gartner
- f) Zachman
- g) NASCIO

h) Other (please specify)

If you answered 'b' to Question 10, please complete questions 12 - 15 and then proceed.

If you answered 'c' or 'd' to Question 10, please proceed to question 15.

11) Which of the following popular EA frameworks contain elements that are currently utilized in your organization? **(Check all that apply)**

a) TOGAF

b) DoDAF

c) MODAF

d) FEAF

e) Gartner

f) Zachman

g) NASCIO

h) Other (please specify)

12) From the frameworks selected in Question 12, please describe the elements utilized from each framework and how these elements are used.

13) What custom elements, not adapted from the frameworks selected in Question 12, were developed? Please describe how these custom elements are used.

14) What was the motivation for selecting this EA approach in your organization?

15) What are the three aspects of your EA approach that you are **most** satisfied with?

16) What are the three aspects of your EA approach that you are **least** satisfied with?

17) What are the top three priorities in your organization for improving the effectiveness of your EA program over the next year?

1.7 Metrics Used to Construct the EA Business Case

18) When the business case was made for the initiation of the enterprise architecture program, did your organization utilize any value metrics to help make the business case?

- a) Yes
- b) No
- c) Don't know

If answered 'Yes' to Question #19, answer question #20 and move on to Question #22. If answered 'Don't know' move on to question #24

19) Which of the following categories of value metrics were utilized to help make the business case? (Check all that apply)

- a) Financial
- b) IT
- c) Customer
- d) Business / Strategy
- e) EA internal program
- f) Growth / Innovation
- g) Risk and compliance / Regulatory
- h) Government budget oversight

i) Other (Please specify)

20) If you answered 'No' to question #19, please tell us how the business case was constructed and then move on to question #24

21) Please indicate the most senior person in your organization who approved the business case for the EA program.

22) Please provide any additional information on the construction of the EA business case.

23) Does your organization have (or plan to implement within the next year) an enterprise architecture value measurement process/program?

a) Yes

b) No

c) Don't know

If you answered 'Yes' to Question 24 please proceed to Section 2.

24) If you answered 'No' to question 24 please explain why an EA value measurement program is not utilized in your organization. Also discuss future plans (if any) for enterprise architecture value measurement in your organization.

----- Move on to question #71-----

If the answer to # 24 is 'don't know' ----- Move on to question #71-----

Section 3 – Individual demographic information

3.1 Education

25) What is your highest level of formal education? **(Please select only one)**

- a) Associates degree
- b) Bachelors degree
- c) Masters degree
- d) Doctorate
- e) Other (Please specify)

26) In what field is this degree? **(Please select only one)**

- a) Business
- b) Computer Science
- c) Engineering
- d) Information Technology

- e) Public administration / Public policy
- f) Other (please specify)

27) Do you hold degrees in other fields?

- a) Yes
- b) No

If yes, check all that apply:

- a) Business
- b) Computer Science
- c) Engineering
- d) Information Technology
- e) Public administration / Public policy
- f) Other (please specify)

28) Please indicate any professional certifications that you hold

3.2 Gender

29) Please specify your gender. **(Please select only one)**

- a) Male

- b) Female
- c) Decline to answer

3.3 Age

30) What is your age group? **(Please select only one)**

- a) 18 – 20 years
- b) 21 – 25 years
- c) 26 – 30 years
- d) 31 – 35 years
- e) 36 – 40 years
- f) 41 – 45 years
- g) 46 – 50 years
- h) 51 – 55 years
- i) 56 – 60 years
- j) > 60 years
- k) Decline to answer

3.4 EA Experience

31) Please indicate your total years of experience in enterprise architecture related roles

(Please select only one)

- a) Less than 3 years
- b) 3 years to less than 6 years
- c) 6 years to less than 10 years
- d) 10 years to less than 15 years
- e) 15 years to less than 20 years
- f) 20 years to less than 30 years
- g) 30 years or more

Section 4 – Questions about your Organization

Please answer in terms of the organization where you have primary EA responsibility

4.1 Industry

32) Which of the following is your primary industry of operation? **(Please select only one)**

- a) Automotive
- b) Banking & Financial services
- c) Biotechnology & Pharmaceuticals
- d) Chemicals
- e) Construction & Engineering
- f) Consulting & Business Services

- g) Consumer Goods
- h) Distribution
- i) Education
- j) Electronics
- k) Energy & Utilities
- l) Food & Beverage Processing
- m) Government – State and Local
- n) Government – Federal defense and intelligence agencies
- o) Government – Federal civilian agencies
- p) Health Care & Medical
- q) Hospitality & Travel
- r) Information Technology
- s) Insurance
- t) Logistics & Transportation
- u) Manufacturing
- v) Media & Entertainment
- w) Metals & Natural Resources

- x) Non-Profit (Non-Government)
- y) Professional services
- z) Retail
- aa) Telecommunications
- bb) Other (please specify)

4.2 Size

33) For the organization being described, please indicate the number of employees

(Please select only one)

- a) Less than 100
- b) 100 - 249
- c) 250 - 499
- d) 500 – 999
- e) 1000 - 2499
- f) 2500 – 4999
- g) 5000 – 9999
- h) More than 10000
- i) Don't know

34) For the organization being described, please indicate the number of IT employees

(Please select only one)

- a) Less than 25
- b) 26 - 50
- c) 51 - 75
- d) 76 - 100
- e) 101 - 200
- f) 201 – 500
- g) 501 – 1000
- h) More than 1000
- i) Don't know

4.3 Geographic Distribution

35) In which part of the world is your organization headquartered? **(Please select only one)**

- a) North America
- b) Central America
- c) South America
- d) Europe

- e) Middle East
- f) Africa
- g) Asia Pacific
- h) Other (please specify)

4.4 Annual Revenue/Sales/Operating Budget in US Dollars

36) What is your organization's Annual Revenue (if a company) or Operating Budget (if Government or Non-Profit Organization)? **(Please select only one)**

- a) Less than \$1 million
- b) \$1 million to less than \$5 million
- c) \$5 million to less than \$10 million
- d) \$10 million to less than \$25 million
- e) \$25 million to less than \$50 million
- f) \$50 million to less than \$100 million
- g) \$100 million to less than \$250 million
- h) \$250 million to less than \$500 million
- i) \$500 million to less than \$1 billion
- j) \$1 billion to less than \$10 billion
- k) \$10 billion to less than \$100 billion

l) More than \$100 billion

m) Don't know

Thank you for completing this survey. Your input will help us provide a needed assessment of the current state of EA framework usage and value management.

You will be emailed a summary of the survey results as a thank you once they are available.

If needed, may we contact you at your email address for more information concerning your answers to this survey? (Yes/No)

May we include you in future studies related to the enterprise architecture profession?

(Yes/No)

Again, thank you for your time and contribution to the EA profession!

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