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Strategies to Improve Adoption of the Federal Enterprise Architecture Framework

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Walden University

College of Management and Technology

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Michael Caruso

has been found to be complete and satisfactory in all respects,
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the review committee have been made.

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2019

Abstract

Strategies to Improve Adoption of the Federal Enterprise Architecture Framework

by

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MS, Walden University, 2017

MS, Pace University, 2002

BS, Towson University, 1996

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Information Technology

Walden University

October 2019

Abstract

The U.S. federal government spends millions of taxpayer dollars to implement the federal enterprise architecture framework (FEAF). This qualitative multiple case study extracted successful FEAF implementation strategies used by agencies in the Washington, DC, metropolitan area. The population for this study included 10 information technology (IT) planners in 3 federal agencies. Data were collected from semistructured interviews and triangulated in comparison to 33 public documents. General system theory was used as a conceptual framework for the study, and data analysis included reviews of the academic literature, thematic analysis, and member checking to identify themes and codes related to successful aspects of the strategies collected. Key themes emerging from data analysis included critical leadership support for implementation, organizational culture, practices for maintaining an accurate organizational history, and means to maintain this knowledge. Based on the findings, the implications of this study for positive social change include efficient, effective, and reliable government services for U.S. citizens and a significant reduction in IT spending in federal agencies. In turn, the results may result in effective federal services and effective use of taxpayer money.

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Dedication

I dedicate this work to my mother, father, grandparents, and my daughter, Libby, for their constant support and for tolerating me while I was going through this process. It was a very long journey with many dark times, but with their help, I was able to achieve this dream. I would also like to thank Dr. Anna Gilleece, Dr. Hunsicker, and Dr. Robert Hammell, without whom, none of this would have been possible.

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Table of Contents

List of Tables	iv
List of Figures	v
Section 1: Foundation of the Study	1
Background of the Problem	1
Problem Statement	2
Purpose Statement.....	2
Nature of the Study	3
Research Question	5
Interview Questions	5
Conceptual Framework.....	6
Definition of Terms.....	9
Assumptions, Limitations, and Delimitations.....	10
Significance of the Study	12
Value to IT Organizations.....	12
Contribution to Information Technology Practice.....	14
Implications for Social Change.....	14
A Review of the Professional and Academic Literature.....	15
Theme 1: A Review of General System Theory.....	17
Theme 2: Enterprise Architecture and General System Theory	21
Theme 3: Implementation Strategies	31
Theme 4: Barriers to Change	40

Theme 5: Sample Applications of the Case Study Methodology	46
Transition and Summary	48
Section 2: The Project	51
Purpose Statement	51
Role of the Researcher	51
Participants	53
Research Method and Design	55
Population and Sampling	60
Ethical Research	65
Data Collection	68
Data Organization	73
Data Analysis	74
Reliability and Validity	76
Dependability	77
Credibility	78
Transferability	78
Confirmability	79
Data Saturation	80
Transition and Summary	81
Section 3: Application to Professional Practice and Implication for Social Change	82
Overview of Study	82
Presentation of the Findings	82

Theme 1: Leadership Support.....	83
Theme 2: Cultural Integration.....	90
Theme 3: Understanding the Framework	94
Theme 4: Political Override of Key Initiatives.....	99
Theme 5: Organizational Knowledge Retention.....	103
Applications to Professional Practice	108
Leadership Training and Buy-In.....	108
Governance	109
Integrate FEAF Training.....	111
Key Initiatives.....	111
Institutional Knowledge Retention via Mentorship and Documentation	112
Implications for Social Change.....	116
Recommendation for Action.....	118
Recommendations for Further Study	119
Reflections	121
Summary and Study Conclusions	122
References.....	123
Appendix A: Phone/Skype Interview Protocol.....	160
Appendix B: Interview Questions.....	164

List of Tables

Table 1 Minor and Major Themes of Leadership Issues 83

Table 2 Minor and Major Themes of Cultural Integration With Supporting Metrics 91

Table 3 Minor and Major Themes of FEAF Understanding With Supporting Metrics... 95

Table 4 Minor and Major Themes of Political Influence With Supporting Metrics 99

Table 5 Minor and Major Themes of Organizational Knowledge With Supporting
Metrics 104

List of Figures

Figure 1. FEAF component layers	8
Figure 2. Federal system and agency relationships	9

Section 1: Foundation of the Study

Enterprise architectures (EAs) provide holistic descriptions of organizations, their objectives, processes, and the technology used to achieve those objectives. An EA framework defines how to create and implement an EA. One example is the federal enterprise architecture framework (FEAF) recommended for use by U.S. government agencies. Implementation of an EA represents a significant challenge and change for any large organization such as a U.S. government agency. Organizations face many technical, cultural, and organizational structure challenges. The purpose of this study was to identify the strategies employed by a sample of U.S. government organizations to overcome those challenges in their efforts to expedite the adoption of FEAF. For this study, I first present the context for the benefits of adopting EA as prescribed in the literature. This initial exploration allows me to delineate and then explore to some depth the specific strategies identified by government information technology (IT) planners successfully used to expedite the adoption of FEAF.

Background of the Problem

FEAF can be leveraged by a government agency for strategic planning, to adapt to changing organizational requirements, and to provide stability and consistency to the services it offers. Furthermore, the U.S. government has identified FEAF as a key tool for agencies to use in reducing waste of taxpayer funds associated with overlapping services and systems (Government Accountability Office [GAO], 2014).

As required by the Clinger-Cohen Act, federal organizations are required to define their EA using FEAF (Clinger-Cohen Act of 1996, 1999). The Act was passed to

help eliminate waste and improve operating efficiency and IT spending in government organizations. However, some federal agencies still struggle to fully implement such architectures (Office of the Inspector General [OIG], 2015, 2017). As a result, audit reports indicate that a significant amount of financial waste remains associated with duplicative systems and services among government agencies (GAO, 2014). In this study, I explored strategies used by those federal organizations that have expedited adoption of the FEAF.

Problem Statement

The 1996 Clinger-Cohen Act (1999) directs federal agencies to adopt formalized EAs to guide all IT systems development. However, key agencies such as the Department of Energy and the Federal Trade Commission have yet to holistically implement such architectures (OIG, 2015, 2017). A GAO report indicates that the U.S. government will spend \$51 billion on civilian IT projects in 2017, with 71% of this budget spent on systems that are not aligned with an EA (Office of Management and Budget [OMB], 2016). A 2006 GAO report indicated that despite the Clinger-Cohen Act being in place for 10 years, more than 50% of 27 key federal agencies had not fully implemented FEAF (GAO, 2006). The general IT problem is that key federal IT organizations continue to lag in following the government's directive of adopting the FEAF. The specific IT problem is that some federal IT planners lack strategies to expedite the implementation of FEAF.

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies used by federal IT planners to expedite the implementation of FEAF. The snowball

sample for this study was collected from referrals among participants. Those participants were IT planners involved with developing strategies for implementing and adhering to FEAF in three government agencies that have successfully implemented FEAF and are located in the Washington, DC, area of the United States. Federal organizations provide services to all United States citizens, and employment, health insurance, and economic support to the communities of those employees. When such organizations cannot meet their goals, they fail to support the citizens who rely on those services and thus negatively impact the economies of those communities. The findings from this study may contribute to positive social change by identifying strategies to expedite the application of architectures. Such strategies will eliminate waste and redundancies and contribute to a more effective and stable operating environment while consistently and reliably providing critical services to citizens and local communities.

Nature of the Study

A qualitative multiple case study methodology was used for this study. Qualitative research allows researchers to develop an understanding of a problem by analyzing the experiences and perceptions of individuals (Barnham, 2015). The selection of a qualitative method was appropriate for this study because the primary goal was to explore the strategies used by federal IT planners in their efforts to expedite the adoption of FEAF in three federal organizations that have begun adoption of the framework. Hope and Dewar (2015) stated that quantitative methods are appropriate when analyzing numerical data. As a result, quantitative methods were deemed inappropriate for this study because the research was aimed at identifying the strategies used rather than

analyzing numerical data or testing a hypothesis. Furthermore, Everett, Neu, Rahaman, and Maharaj (2015) stated that quantitative methods are used by researchers in the development and testing of hypotheses. However, in this study, there is no hypothesis and are no quantitative measures derived or collected; as such, quantitative methods were also deemed as not applicable. As the research question is exploratory and this study does not seek to test a hypothesis, a qualitative method was deemed the most appropriate for this study. O'Halloran, Tan, Pham, Bateman, and More (2018) stated that mixed-method research includes both qualitative and quantitative methodologies. Because quantitative methods were not appropriate, neither was a mixed-methods approach.

I determined that a parallel multiple case study methodology was best suited for this study as the goal was to extract strategies from described experiences of the participants. Case studies allow a researcher to examine complex phenomena in context (Gunasekaran, Yusuf, Adeleye, & Papadopoulos, 2018). EAs and their implementation strategies represent complex phenomena because there are multiple requirements and drivers behind such implementations. As a result, a case study methodology was deemed appropriate for this study. Specifically, I selected a parallel multiple case study design for this research. The parallel design allows a researcher to collect data for each case independently and in parallel. With a parallel multiple case study design, the study made use of interviews and a descriptive approach to surface the key strategies that enable federal organizations to expedite the adoption of FEAF. Other qualitative approaches, such as phenomenology and ethnography, were considered but deemed inappropriate. For example, Van Manen (2017) stated that the aim of phenomenology is to capture the

experience of a moment. However, in this study, the intention was not to capture the participants' experiences of an event or single moment. As such, phenomenology was not appropriate for this study. Ethnography was also a consideration. However, Trnka (2017) stated that ethnography involves the immersion of a researcher into the community being studied. Furthermore, Cardoso, Gontijo, Ono (2017) stated that ethnographies study a microculture within society. As there is no single community or cultural component to the study and I would not be working among the participants in the study, ethnography was not suitable as a research methodology for this study.

Research Question

I sought to answer the following research question in this study: What are the strategies used by federal IT planners that expedite the adoption of FEAF?

Interview Questions

I used the following interview questions to obtain data to address the research question:

1. What strategies have you used to ensure your understanding of FEAF in order to support adoption?
2. What strategies have you used to measure progress and define the completion of FEAF adoption?
3. What methods did you use to identify, define, and document critical services to transition them over FEAF architecture?
4. What strategies did you use to define and standardize systems and processes to establish functional integration as defined in FEAF?

5. What strategies have you used to evaluate and manage staff and technology resources to adhere to FEAF?
6. What strategies did you use to define and implement governance to manage the architecture to support FEAF?
7. What strategies did you implement to ensure that the governance process of FEAF and its authority were presented to the organization?
8. What strategies did you use to establish and manage system development and technical standards for implementing FEAF?
9. What strategies did you use to manage system and resource utilization in the organization when implementing FEAF?
10. What strategies did you use to implement audit and reporting services to support FEAF?
11. What strategies did you use to overcome cultural roadblocks to the adoption of FEAF?
12. What strategies did you find successful in establishing full leadership and organizational support for FEAF adoption?

Conceptual Framework

General system theory (GST), developed by von Bertalanffy (1950) provided the conceptual framework for this doctoral study. GST brings together concepts that had long been in existence, proposed by such philosophers such as Cusanus, Kant, and Spengler (Drack & Pouvreau, 2015). GST builds on perspectivism, where objects are defined not by their content but by their observed function (Drack & Pouvreau, 2015). GST as a

conceptual theory allows researchers to analyze systems and to formulate principals based on those observations. The principals can be used to explain the interactions of systems as well as their components and to establish means to control those interactions (Sayin, 2016). GST can be used to describe the synergistic effect of linked systems described by EAs. Federal IT architects use the concepts of GST in the design of sustainable, efficient, and effective architectures to ensure that IT systems support organizational goals and provide consistent services to citizens (Budiardjo, Firmansyah, & Hasibuan, 2017). Basic fundamental constructs or concepts of GST are (a) the whole of a system is greater than the sum of its parts, (b) the whole of the system will define the nature of its components, and (c) theories and behaviors that describe one system can also be applied to other systems (von Bertalanffy, 1950). As it applies to this study, GST is used as a framework to understand the strategies participants used in their efforts to adopt FEAF in their organizations. GST will be used as a lens to analyze and relate how various strategies can work together as a system to synergistically achieve the goals of expediting implementation of FEAF.

Using GST, IT planners can apply FEAF to all federal agencies, viewing each as an individual system. EAs, and specifically FEAF, define the nature of government agencies, what they do, and how each of their internal components will interact to support the system as a whole. Figure 1 illustrates that FEAF is a system with significant interaction and dependency between components. The systems application segment depends on the technology segment, as applications run on hardware such as servers and workstations. Thus how architects implement such components and the efficacy of those

components directly affect adjacent components. Similarly, the application architecture supports the data architecture as applications are used to organize and make the data available to the user. Subsequently, all the components come together to support the overall business architecture of the agency.

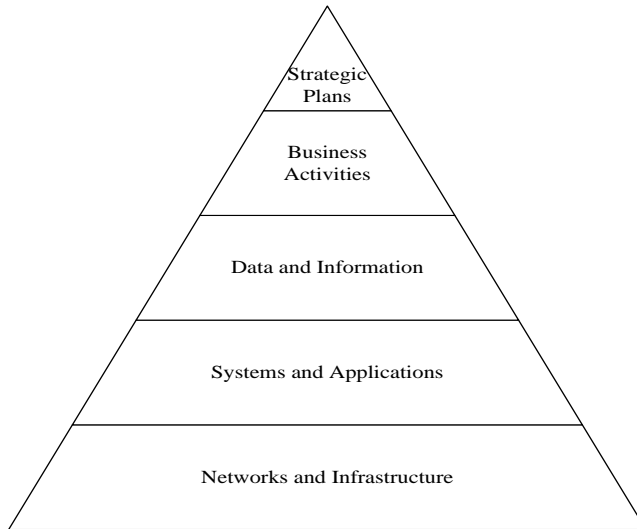


Figure 1. Federal enterprise architecture framework component layers. Adapted from “The Common Approach to Federal Enterprise Architecture,” by OMB, 2012, public domain.

Figure 2 illustrates that government agencies and FEAF for that agency must function within a larger system, specifically that of the federal government and its regulatory and management agencies. As a result, implementations of FEAF are further complicated as there are additional rules and regulations that guide the interaction of components and, ultimately, its implementation. Thus, GST offers a critical framework to aid in discovering the most effective practices used by successful implementations. Those, in turn, can be applied to other agencies that have yet to achieve holistic

implementation of FEAF, thus improving the overall function of a system by improving the interaction of its components.

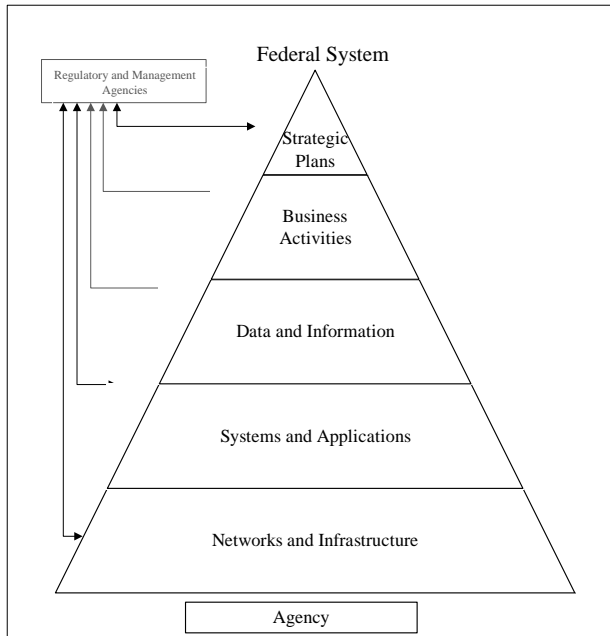


Figure 2. Federal system and agency relationships. Adapted from “The Common Approach to Federal Enterprise Architecture,” by OMB, 2012a, public domain.

Definition of Terms

Enterprise architecture: A holistic description of an organization that defines the management hierarchy of a company, its processes, its goals as well as its physical infrastructure. It also illustrates the relationships between those components and can be used to ensure that all components are working together to achieve the goals of the organization (Bijata & Piotrkowski, 2014).

Enterprise architecture management maturity framework (EAMMF): The EA management maturity framework, is a strategy for evaluating the level of maturity of EA implementations, specifically FEAF, within government organizations (Government Accountability Office, 2010).

Federal enterprise architecture framework: A set of tools and practices that federal agencies use to define their EA, as mandated by the Clinger-Cohen Act of 1996 (1999).

Assumptions, Limitations, and Delimitations

An assumption is an idea that is accepted either without the ability to prove it or without supportive evidence (Roger, 2015). There are three assumptions that I made in this study. The first assumption was that the participants provided accurate responses to interview questions, also known as internal validity. Member checking can be an effective tool in ensuring the validity of participant responses (Birt, Scott, Cavers, Campbell, & Walter, 2016). As a part of this study, I employed a detailed member-check process in which participant responses were recorded, transcribed, reviewed, and approved by participants before the data were included in the study. The second assumption was that the number of participants would yield sufficiently representative results. As such, I continued to seek and interview participants while monitoring themes. Van Rijnsoever (2017) stated that such repetition in the data will represent data saturation. Thus, I made the determination as to thematic saturation once themes began to repeat and no new themes developed. The final assumption was that the responses gathered yielded strategies that can be effectively applied to other federal agencies.

Price and Murnan (2004) stated that a limitation of a study is the presence of a preconceived notion outside the control of the researcher that can affect the conclusions. When qualitative research design is used, potential participant or researcher bias can be introduced in the interpretation of responses (Gergen, 2015). Bias can be countered

through standardized questions for participants (Gergen, 2015). To that end, I implemented an interview protocol (Appendix A) for this study. I made use of member checking to ensure that the data I collected was verified to be accurate, thus addressing any bias that my interpretations may have introduced.

The second limitation present in this study was that the experiences of the individuals in the case study design could differ from one another. While I used a standard set of open-ended interview questions, participant experiences vary, and some did not have experience in certain areas and did not have responses for certain questions. Thus, the resulting data reflect those gaps, and themes were derived from the common data and themes that exist in their recounted experiences.

The third limitation of this study with regard to the results relates to the sampling used and how well it provided a representation of successful strategies. Given the need for specific levels of expertise, experience, and context, selecting random participants from the general population, or even from a population of individuals in the federal government, was not possible. I sought to explore how strategies benefit federal agencies in a specific context. Unlike quantitative research, the results of this study cannot be statistically analyzed to determine their external validity. Konradsen, Olson, and Kirkevold (2013) recognized such challenges and suggested that a modified version of member checking could be used to achieve validity. Some researchers have suggested that transferability is an effective way to provide internal validity for qualitative studies (Burchett, Mayhew, Lavis, & Dobrow, 2013). The practice leaves the interpretation of applicability to the user. Given the specific nature of this study and its specific

application, I decided that member checking was the most effective way to mitigate the limitation. To that end, I ensured that the context of both the participant interviews and the results were geared toward the application of effective strategies to organizations that have yet to achieve successful implementation of FEAF. Supported by participant reviews and member checking, the strategy ensured that the information gathered was generalizable to appropriate organizations that fall into those specific categories.

Delimitations of a study are those factors that can define the scope and breadth of the research (Price & Murnan, 2004). The first delimitation is that the study focused on the strategies used by IT planners toward FEAF adoption and not on other IT processes or strategies in the studied organizations. Other strategies will support concepts and missions specific to the organization separate from FEAF and this study. The second delimitation is that participants did not include contract employees or outside consultants who work in those federal agencies.

Significance of the Study

Value to IT Organizations

Federal organizations must provide end users with a large number of reliable, consistent, and efficient services that run on architectures and systems that support the mission of the agency. FEAF is intended to provide a framework to that end (Bondar, Hsu, Pfouga, & Stjepandić, 2017). In order to apply that framework, there must be a consensus of understanding of implementation strategies among chief information officers (CIOs) and federal IT architects who will be responsible for the implementation of those architectures. Identifying common strategies in the successful adoption of FEAF

will help other organizations in their efforts to expedite the adoption of the framework. Adoption of FEAF will also help organizations implement more effective and efficient IT practices. This study is significant to planners of IT as it identifies successful strategies that have been used by federal CIOs and architects as best practices for federal organizations that have not yet implemented FEAF or that are struggling to complete their implementations.

Positive social change through improved delivery of services for citizens is one of the goals of this study. As federal organizations face greater scrutiny for security, efficiency, and reliability of their services, immediate actions must be taken to ensure that federal funding is not wasted on ineffective and inefficient systems (OIG, 2015). Such a method for identifying effective strategies for overcoming implementation challenges related to FEAF provides a means of implementing sustainable and efficient systems and services to taxpayers who rely on various government services. Thus, funding is not wasted on maintaining duplicative systems that put user information in peril and can also hinder or limit the services available to citizens who need them. For example, citizens affected by Hurricane Katrina in 2005 reported extreme difficulties in getting federal assistance in the wake of the disaster; those difficulties were attributed to vastly diverse, duplicative, and sometimes absent technology on the part of the federal government (Keller & Zinner, 2015). Having consistent and reliable systems in place can ensure that those who need federal services will have them. Expediting the slow adoption process surrounding FEAF will greatly reduce the risks and hindrances behind providing such critical services to citizens.

Contribution to Information Technology Practice

The impact of this study on the practice of IT is that the findings may offer an improved understanding of how organizational practices can affect IT outcomes, specific to EA implementations. In particular, this study may offer benefits to federal agencies struggling to comply with the Clinger-Cohen Act of 1996 and provide potential strategies for overcoming current obstacles to that end. Much attention has been focused on eliminating waste in government, with a particular focus on duplicative systems and services (GAO, 2014). As such, the findings of this study may be beneficial by providing strategies to achieve compliance with FEAF, reduce waste in federal IT spending, and improve the efficacy of federal services to citizens.

Implications for Social Change

The implications for social change of this study include the improvement of government services to citizens. The literature reviewed for this study suggests that the implementations of FEAF are viewed by the government as a way to reduce waste and eliminate duplicative services and systems (GAO, 2014). As a result, more effective services can be made more readily available to those who need them when they need them. Ensuring that such services are in place can improve the stability and the efficacy of government agencies while providing services to citizens to maintain a high quality of life. This study also promotes fiscal and technical responsibility in government agencies.

As federal organizations come under greater scrutiny for security, efficiency, and reliability of their services, immediate actions must be taken to ensure that federal funding is not wasted on ineffective and inefficient systems (OIG, 2015). Identifying

effective strategies for overcoming implementation challenges related to FEAF provides a means of implementing sustainable and efficient systems and services to taxpayers who rely on various government services. The result is that funding will not be wasted on maintaining duplicative systems that put user information in peril and that can hinder or limit the services available to citizens who need them.

A Review of the Professional and Academic Literature

I reviewed academic and professional literature to identify themes related to EA and government IT planners' attempts to expedite the adoption of FEAF within government agencies. In the first section, I discuss the purpose of the study. Following that, I discuss the theoretical framework and identify supportive and conflicting theories. Next, I discuss five themes. The first theme I discuss is GST, its evolution, as well as supportive and contrasting theories. Second is EA and this includes a discussion of the benefits of EA as well as a description of FEAF and its role in government. The third theme, implementation strategies, covers general strategies for the implementation of EAs. The fourth theme in the following literature review is barriers to change, which begins an exploration of the challenges faced by IT architects when implementing large-scale changes. I conclude the review with the fifth theme, a discussion of other applications of the case study methodology.

Multiple sources used in the review of academic and professional literature: peer-reviewed journal articles, government reports, and seminal works found in the Walden University Library, ProQuest, EBSCO host, ProQuest, and Google Scholar and U.S. government websites. The following review includes 76 sources, of which 85% are peer-

reviewed, verified through Ulrich, and were published within 5 years of anticipated CAO approval. The search terms I used were *enterprise architecture*, *FEAF*, *federal enterprise architecture framework*, *enterprise architecture application methodologies*, *enterprise architecture benefits*, and *enterprise architecture evaluation*. Then, I increased my search focus using additional qualifiers for application to government agencies and to include qualitative case studies.

The goal of this study was to explore strategies used by government IT architects and CIOs who have been successful in expediting full adoption of FEAF in their respective agencies. Many of the studies found in my review of the academic literature examine the benefits of EAs and FEAF within an organization. Specifically, they cite improved alignment between the business and IT operations as well as improved management of risks and complexity management (Foorthuis, van Steenberg, Brinkkemper, & Bruls, 2016; Safari, Faraji, & Majidian, 2016; GAO, 2014). Other studies also examine strategies for selection, evaluation, and application of various EA strategies (Aarti & Karande, 2017). Thus, the literature establishes the practice of EA as an important tool that can add value and stability to an organization while also outlining various strategies for evaluation and implementation.

Such studies conducted research within the context of private, nongovernmental organizations, and architectures, but they lacked applicability to government organizations and FEAF. Specifically, the gap in the literature is that there are no studies that explore successful strategies for expediting the adoption of FEAF, which may be

helpful to government agencies currently struggling to overcome challenges that hinder their full adoption of FEAF.

Theme 1: A Review of General System Theory

GST was developed by Ludwig von Bertalanffy (1950) in his seminal work, “An Outline of General System Theory.” Von Bertalanffy (1950) recognized that the fields of biology and physics were among the most organized and well-understood disciplines in academia and the physical sciences. He noted that the patterns of predicting, describing, and organizing used in each discipline were also applicable to other fields. Central to the theory, von Bertalanffy identified three key concepts: (a) the whole of a system is greater than the sum of its parts, (b) the whole of the system will define the nature of its components, and (c) theories and behaviors that describe one system can also be applied to other systems. In later work on the theory, von Bertalanffy (1972) further emphasized that examination of systems and their interactions was better suited to explain complex and dynamic systems. As such GST provides a broad and flexible conceptual framework that is directly applicable to the research question.

General system theory applies to this study because government organizations are themselves complex systems that include interactions between technology, humans, and other higher-level government agencies. IT architects can use GST to develop a holistic understanding of such systems and to control interactions of those components (Sayin, 2016). Similarly, Hoyland (2012) used GST to evaluate and develop an EA for the U.S. Department of Defense. By analyzing the various components of the agency, the author developed an architecture that supported the system, the agency, internal processes, and

Department of Defense goals as well as requirements made by external government agencies. This study used such a lens to analyze which interactions between system components yield effective strategies for the expedited adoption of FEAF. Such systems include the individual government agencies, FEAF, and the federal government management agencies. To that end, the study focused on the interactions of system components of complete and holistic FEAF implementations. As GST allows for the application of effective practices in one system to be applied to another system, the study then compiled those practices for use in other agencies that still have yet to fully and holistically implement all components of their FEAF system.

GST has undergone various changes and developments by its original author and by other researchers as they applied it to various fields. Von Bertalanffy initially developed the theory to establish an overarching means to holistically describe and understand the concept of the organization of a system and was generally applied in biology and physics (Drack & Pouvreau, 2015). Over time, it evolved into a more general view of system behaviors that von Bertalanffy believed applied to all systems and not just the physical sciences (Rousseau, 2015). Fundamental to the theory is the belief that a system is identifiable as a function of what it does as a whole and not the totality of its components (Caws, 2015; Drack & Pouvreau, 2015). Also key to the theory was understanding the interactions and controls of those components, how those components interact, and how they can be controlled. Some key influences were rooted in derivations from other holistic philosophers such as Cusanus, Kant, and Spengler (Drack & Pouvreau, 2015). While initially applied to the disciplines of biology and physics, the

theory has also been applied to social theories as well as the field of IT. Specifically, Pieters (2017) used GST as a lens to examine the effect of social perceptions on IT privacy practices. Erichsen et al. (2013) used an adapted version of the theory called *social-technical systems theory* to describe the interactions of students with technology in a complex social system, a doctoral program. The evolution of GST has allowed for the inclusion of multiple disciplines in both the physical and social sciences. Most importantly, it allows a researcher to include the additional context of human interaction with technology, as noted by Erichsen et al. (2013). That had direct applications to this study as the main focus was on how the human component of a system can leverage observed behaviors in one system to modify or apply to another.

GST is an applicable and highly dynamic theory that can be easily and logically adapted to any discipline. As GST has evolved, it has been used as a lens by other researchers to describe, control, and study the behavior of various types of systems such as social systems (Mazzei, Ketchen, & Shook, 2017). It is of particular interest in this study as the implementation strategies used had to consider various aspects of the organizational culture and its effects on the overall EA system. Mazzei, Ketchen, and Shook (2017) made use of GST to describe organizations as a system that interacts with other external systems such as customers or even other organizations. They also emphasized the utility of a holistic view of systems that GST allows when applied to organizations by stating that, in organizations, such systems are leveraged to align and achieve a specific set of goals (Mazzei et al., 2017). Given the similarity to EA, GST

offers a framework that allows for an iterative understanding of the systems being studied.

Another aspect of GST useful to researchers is its holistic view, which allows for a much better organization of complex systems by the overall function of the system (Caws, 2015). Researchers can define boundaries of a system based on function while at the same time exploring the behaviors and parameters that guide the system's behavior. Thus, the theory allows for iterative understandings to be developed, which helps researchers avoid jumping to conclusions because each level of definition, while related to adjacent levels, still has independence. Because of its iterative nature, GST allows researchers to define subsystems or various systems within systems. GST lends itself in particular to examining seemingly different parts of a single system. For example, within an organization, GST allows for the definition of the hierarchy of the organization as well as the cultural systems and IT systems. Given its ability to also define interactions of systems, GST also offers researchers a platform on which they can build understandings as to how systems evolve and how certain components of a system can either hinder or benefit the overall function of that system.

Central to GST is the concept of holism, self-organization, and the behavior of how systems interact with one another (Drack & Pouvreau, 2015; Robey & Abdalla Mikhaeil, 2016). Any theory that examines the holistic nature of systems and that emphasizes the importance of context and interactions of the components of a system is considered to be a supportive theory. One such theory is Actor-network theory (ANT), which is part of the Science, Technology, and Society movement established in the early

1980s (Vicsek, Király, & Kónya, 2016). Similar to GST, ANT emphasizes the importance of the interaction of networks and how the identity of those networks is largely dependent on what they do and not on their internal components (Cavalheiro & Joia, 2016; Vicsek et al., 2016). Self-determination theory is also another supportive theory in that it also requires researchers to understand the relationship of people or systems and their environment as well as their relationship to other systems (Deci, Olafsen, & Ryan, 2017; Manganelli, Thibault-Landry, Forest, & Carpentier, 2018).

The concept of reductionism breaks complex structures or ideas into their smallest individual components and examining them in isolation. Reductionism has been criticized by many for its lack of perspective excessive focus on a single mechanism (Reich, Garrison, & Neubert, 2016). That runs in stark contrast to GST's relational and holistic view. Reductionism is described by Chen (2016) as falling on the opposite side of the logical spectrum from system theory. It stated that technology develops in complete independence from society and is itself the primary driver for social change (De La Cruz Paragas & Lin, 2016). As GST examines the entirety of a system and defines it according to its function and interaction with other systems, the reductionist concept and specifically technological determinism were considered to be contrasting theories and concepts.

Theme 2: Enterprise Architecture and General System Theory

GST and EA are closely interrelated as each can be used to examine an organization and how each of its subcomponents contributes to an overall goal. EA is used to holistically describe an organization, a complex entity that must execute multiple

tasks while aligning those tasks to specific goals of the organization and is widely believed to bring value to an organization (Hazen, Bradley, Bell, In, & Byrd 2017; Bernus et al., 2016; Gebre-Mariam & Fruijtjer, 2018). GST is often used in conjunction with the concept of EA as both attempt to describe systems and their interactions. In further support of the idea, some researchers have described EA as a “systems science” that can be used across multiple disciplines to achieve its goals (Bernus et al., 2016). Such a description of EA is of particular importance as it equates EA with systems thinking and offers a description of it that aligns well with GST. It also suggests that within the IT industry, there are clear and accepted associations between GST and EA.

EAs can manifest themselves in various frameworks such as FEAF, TOGAF, and the Zachman Framework, among others (Romero & Vernadat, 2016). Despite the various frameworks, each strives to achieve the same goals and provide the same benefits, complexity management, change management and alignment of organizational goals with current resources and processes through governance (Negin & Kari, 2016; Niemi & Pekkola, 2016). Using GST as a conceptual framework, EA enables IT architects to examine each of the components of the larger system along with their interactions. Thus, EA can describe the collection of the systems that make up that organization as a whole (Gampfer, Jürgens, Müller, & Buchkremer, 2018). Such views can be used to analyze and create models that assist IT architects in managing and controlling the interactions of those subsystems and in the management of complexity that such interactions will bring.

Kandjani, Tavana, Bernus, & Nielsen (2014) used GST to describe how EA capture holistic views of organizations and are used to align and control the interactions

of subsystems or components of those systems to benefit the larger system, the organization as a whole. Such studies underscore the scale of the challenges that are faced by IT architects. As Olsen and Trellsråd (2016) also described, those are bi-directional challenges of scale, where one complex system, when viewed as a system in of itself, can also be seen as a component of a larger system. Conversely, a single component can be broken down into multiple subsystems. However, unlike the reductionist perspective, even when broken down, systems are not viewed in isolation. De Vries, van der Merwe, and Gerber (2017) stated that those collections of systems are still identified by their function and relationship to other systems or a system as a whole. That multifaceted view of the system, the interaction of its components, is representative of the key GST premise that any system is greater than the whole of its parts.

Safari, Faraji, & Majidian (2016) described EAs in much the same manner, specifically, as a way to manage the components of an organization as well as the relationships and interactions between them. Further supporting that definition, Negin and Kari (2016) described the same role for EAs, specifically that they are high level, holistic views of collections of systems. Through the lenses of GST and EA, the organization can be seen as the larger system. The system has a set of goals and requirements. Those requirements, in turn, define each of the internal systems or components, which then defines their function.

The benefits of such control were studied by Foorthuis, van Steenberg, Brinkkemper, and Bruls (2016), who stated that the effects of moderating those interactions had positive benefits on the organization as a whole and specifically cited

information exchange between components of an organization. When viewing the organization as a system that interacts with other systems such as societal and economic systems, Vargas et al., (2016) noted how critical it was for such systems or organizations to function well within those larger systems. They specifically noted that the efficacy of such interactions would be dependent upon the ability of the system to leverage the synergy between components and subsystems. They stated that to achieve that, organizations would have to implement and effectively manage EAs (Vargas et al., 2016).

Such interactions become increasingly more complex to manage as they increase in number, particularly as the organization grows and also increase costs (Holub, 2016). As a result, during such periods of growth, those organizations may begin to experience difficulties extracting value from the technology on which they rely (Rijo, Martinho, & Ermida, 2015.). Thus, a holistic, complexity management structure is needed. Leveraging the holistic nature of GST, EA is viewed by some researchers as the de facto manner in which to manage such complexities (Niemi & Pekkola, 2016). Similar to the way in which GST allows for the development of models of understanding of complex systems, the same can be applied in the development of EA.

EA can be seen as a logical adaptation of GST as it offers IT architects the ability to design models that represented real-world entities. Those models can then be used to help develop a representation of the organization, which, in turn, leads to a better understanding of the organization itself. That is due to the fact that EA captures the essence of an organization, what it is, what it does, and how it accomplishes its goals

(Niemi & Pekkola, 2016). Through the lens of GST, that organization can be viewed as a system. The roles and directives of that organization then define the nature of each of the supportive subsystems of the primary system. EA, as a model is the collection of that information.

Complexity management is key to developing an understanding of any complex system and is a key basis of GST, related theories, and applications of the theory. Thus, GST becomes an important tool as it is well suited to lending itself to help researchers organize and analyze complex systems (Marshall, 2017). That is because GST lends itself well to the adaptation of abstract concepts into a form that allows for better visualization and consumption for human understanding (Broks, 2016). Complexity, specifically in EA, is often associated with higher costs as well as greater difficulties in adapting to change and higher costs associated with such changes (González-Rojas, López, & Correal, 2017). Furthermore, such complexities, specifically with regard to EA, can also result in challenges in resource management (Haghighathoseini, Bobarshad, Saghafi, Rezaei, & Bagherzadeh, 2018). Thus from multiple perspectives, financial, technical logistical, and complexity management become critical to the success of an EA implementation.

Studies have shown that complexity management through EA can offer IT architects an opportunity to optimize architectures (van Outvorst, de Vries, & de Waal, 2016). Such assessments can offer organizations the opportunity to evaluate the current status of EAs and adapt more quickly, thus enabling the organization to adapt more quickly to changes in its operating environment. Such adaptability is of particular

importance as it is a component that some researchers have indicated is a missing in many current systems (Liu, Hu, Li, & Jia, 2014). Bernus et al. (2016) re-emphasized the point by stating that as a systems science, EA addresses those complexity issues by introducing the concept of simplification and organization of complexity into coherency. That is another way of stating that EA allows IT architects to develop understandings of their complex architectural components and their interactions. Such interactions, in turn, can be leveraged to achieve other synergistic or symbiotic benefits such as improved agility and alignment between the IT infrastructure of an organization and goals of that organization, including non-technical areas.

Similar to managing complex infrastructures within organizations, EA can also help in managing the complexities of new projects. Tambouris, Kaliva, Liaros, and Tarabanis (2014) stated that up to 85% of e-government projects fail to produce results or meet their original objectives. They stated that given its nature, it allows those who are participating in the project to establish a set of requirements that are derived directly from the needs and functions of the organization itself. Thus knowledge gleaned from EA and GST can also apply to the development of new systems in such a way that many risks can be mitigated.

One key component that needs to be leveraged when considering change within an organization is the corporate culture (Aleong, 2018; Tseng, 2017). Aier (2014) stated that the application of EA is highly reliant upon the support and guidance that is present within an organization. The author continued to suggest that management entities need to be identified within the organization, or as GST would view it, a system, which can then

be used to control and influence how the EA can be applied to that organization. The governance aspect of EA offers a solution to the issue for IT architects. IT governance can have control over a number of aspects of an organization. It is a broad management tool that allows organizations to control the current architecture to ensure that current processes support strategies and goals of the organization (Guetat & Dakhli, 2016; Shanks, Gloet, Asadi Someh, Frampton, & Tamm, 2018).

Adding to the complexity, the nature of modern businesses and organizations requires them to be able to quickly adapt to change. However, given that organizations have large-scale IT systems, processes that align with organizational goals, such a process must be carefully guided to ensure that changes introduced, maintain that alignment (Weichhart, Molina, Chen, Whitman, & Vernadat, 2016; Pirta & Grabis, 2015). Within EA, the process is known as governance and is key to an EA framework (M. de Vries et al., 2017). Governance is a proactive activity that assesses potential changes to aspects of the organization to determine what risks are introduced, how the changes affect or improve the alignment of organizational goals as well as their alignment with the current architecture, policies, and procedures (Pirta & Grabis, 2015). Lang (2016) stated that governance can take various forms within an organization. In some instances, governance boards are made up of exclusively of external individuals, designated as administrative boards, and others are more intimately related to the organization called administrative/management boards, which are made up of both internal and external individuals (Lang, 2016). In the latter, each represents a different aspect or division of the organization. That group oftentimes will evaluate new

technologies or changes that are proposed to the organization. It is their job to assess those changes not only with regard to the organization as a whole but to act as subject matter experts for the teams that they represent. That ensures that each of the changes that are introduced to the organization has been vetted in detail against how each of the individual components of an organization function. As such, it attempts to establish a representative opinion and evaluation of any new initiatives or changes that are taking place within the organization (Turel, Liu, & Bart, 2017).

Given the potential benefits of EA and its use within private industry, the U.S. government with the introduction of the Clinger-Cohen Act of 1996, decided that EA could also be used within the government sector. As such, in 1999, the first version of the FEAF was published and was later updated to version 2 in 2013 (OMB, 2012b). The second version of the EA included an expanded set of reference models which further expanded and reorganized from the original five reference models. Version 1 of FEAF defined performance, business, service, data, and technical reference models. Version 2 maintained the performance and business models but broke the technical level into application, infrastructure, and security reference models (OMB, 2012b). The stated reason for making such changes was that the new version of the FEAF framework would enable better adherence to the common approach mandate which improved definition and alignment of strategic goals as well as improved services within federal agencies. Furthermore, it also emphasized shared functionalities and interoperability between services could also be leveraged to not only reduce waste and costs but to improve existing services through better-shared architectures (OMB, 2012b). That marked a

fundamental change in the way that government services could be viewed, from both external and internal perspectives. As with GST, such an EA view of government systems seeks to leverage the synergy of systems. Perhaps even more importantly, it also focuses on the exchange of information between those systems as a means to achieve its primary goal.

As federal agencies faced reduced budgets and increased scrutiny on spending, various the federal government again stressed the need to use FEAF to reduce issues associated with waste and duplicative spending (GAO, 2014). However, as noted by reports by the OIG, some federal agencies had yet to take full implement the mandated architecture and thus still faced some significant issues as a result (OIG, 2015, 2017). Thus, the role of EA within federal government agencies was largely recognized as key to fiscal and functional responsibility within federal agencies.

Unlike private industry, federal organizations, are entirely reliant on public funds (Smith & Phillips, 2016). Thus, there is a key difference in some of the most fundamental drivers of such organizations. Whereas private organization is profit-driven, federal organizations are driven by the need and mandated responsibility to the general public. Given that such a central driver for change and motivation exists, it follows that the government should also have an EA that aligns it with the public interest. Thus, we begin to see differences in the roles that EA will play in each. For example, within the federal government, there is no motivation for profit, such as that which can be seen in private organizations.

Thus, we also see a difference in the architectural frameworks that are used by each. The first example is The Open Group Architectural Framework (TOGAF), a broad framework that breaks down the EA problem into four key components the business, applications, data, and technology (Gill, 2015; Harani, Arman, & Awangga, 2018). TOGAF is a general framework, or in GST terms a system, upon which an EA can be developed. It is based on the technical architecture framework for information management developed in the early 1990s. It endeavors to provide alignment between the organization and technology (Hodijah, Sundari, & Nugraha, 2018). It defines its own iterative implementation strategy, architecture development methodology, which are identical to the core concepts supported by FEAF. Those phases are broken down into the architectural vision, the definition of the business architecture, definition of the information systems architecture, and the technology architecture. It identifies what it refers to as opportunities and solutions to address the issues discovered in aligning those categories and finally defines a migration strategy. The process then iterates throughout the life cycle of the EA.

Among its strengths is that TOGAF allows for a specific focus on application development. However, given its general nature, it fails to specifically define the particular deliverables that result at the end of the process (Tao, Luo, Chen, Wang, & Ni, 2017). Again, due to its generic nature, it does not define processes unique to federal organizations. Specifically, TOGAF focuses on IT and guides IT architectures around business needs, whereas FEAF brings together both the business and the IT architectures and promotes a more holistic evolution.

The Zachman Framework for Enterprise Architecture (ZFEA) is ontology that breaks the view of the enterprise down into questions of perspective namely, what, how, when, who and why (Lapalme et al., 2016). It aligns well with GST in that some researchers describe the ontology as allowing them to view organizations as a larger system of smaller subsystem or a “system of systems” (Varaee, Habibi, & Mohaghar, 2015). Since its inception, it has become one of the most commonly used frameworks in the arena of EA (Hermawan & Fika, 2016). It is intended to describe the theoretical nature of the organization that it supports (Lapalme et al., 2016). Those perspectives can then be assigned to various roles within the organization. However, it is up to those implementing to derive which views or perspectives are to be included as that is addressed by the who and why questions that are key to the framework. Whereas FEAF focuses on segments, the Zachman framework takes a user perspective and tends to focus on the technical aspect of an organization rather than the organization as a whole. As such, it is not applicable in a federal environment.

Theme 3: Implementation Strategies

Given the specific mandates that US federal agencies have to follow in making use of FEAF, there is no opportunity or need to assess the various EA frameworks or to choose which is the best fit for an organization. Thus, the focus falls on the various implementation strategies that are used in applying EA’s in general. Aier (2014) stated that each EA implementation is unique to a particular organization. Its function and its culture and that the most appropriate methodology, therefore, depends on the organization itself. Nikpay, Ahmad and Yin Kia (2017) stated that implementations of

EA consist of a particular framework to be applied as well as an EA implementation methodology. They also emphasize that it is not a single step process and that the implementation of an EA does not simply end when the framework has been instantiated. As such, there are many separate processes that must be included in the implementation process. Before any other step can be taken the organization itself, must be well understood and analyzed so that the outcomes and the required work needed to leverage such alignments can be achieved (Nikpay et al., 2017). The next step involves the development of a transition plan that takes the organization from the current state to its future state (Rouhani, Mahrin, Nikpay, Ahmad, & Nikfard, 2015).

Rouhani et al. (2015) also stated that while there are specific EA implementation strategies such as EAP, TOGAF, DODAF, Gartner, and FEAF all methodologies share the all share key concepts such as the development of migration plans as well as the establishment as of current and target architectures. Thus, the study and delineation of each do not provide value as each implementation strategy only applies to that particular framework and no other. As such, the literature review focuses on the common themes and not the specific frameworks found in the literature with regard to implementation strategies. It should also be noted that an extensive search of the academic literature, showed few peer-reviewed articles covering specific EA implementations such as TOGAF, EAP, FEAF and the same was also noted by Rouhani et al. (2015).

Many architects make use of implementation strategies based on either key categories of business or EA function. Lee, Oh, and Nam (2016) identified six categories that implementations need to consider in order to establish a full representation of an

organization, its functions, its goals, and constraints: (a) laws and regulations, (b) top management support, (c) EA management systems, (d) EA guidelines, (e) organizational structures, and (f) EA performance. Those categories describe the organization and are common within the works of other authors on the subject of EA implementation. They have a direct correlation between how an organization operates and the goals in which it endeavors to achieve. With regard to the federal government, the legal requirements have a particularly important role as they are often what dictates how an organization functions and the rules by which it serves its community. As such, a great deal of time and effort must go into ensuring that the organization aligns with such directives as failure to do so may have significant legal and operational consequences.

Top-level management is also a critical factor as the leadership of an organization has a direct effect on the perceptions and willingness of users to follow new initiatives and dictate behaviors and even perceptions of individuals within the organization (Lee et al., 2016). Emphasizing the point, some studies indicated that leaders that are unable to adapt to new technologies are themselves poor role models for those that they expect to adopt new technologies (van Wart, Roman, Wang, & Liu, 2017). The other implications that van Wart et al. (2017) also stated that such issues can also be due to a trickle-down effect that ineffective adoption of technologies by those who influence others can have. That puts leadership into a key position as leadership, in the form of governance, also has the authority to make significant changes as needed to both the architecture as well as the direction of the organization. Thus, their input and participation become critical. Failure

to achieve, which can result in issues such as implementation challenges due to resistance to change as well as resistance from within organizational culture.

Alternatively, architects can use attributes successful in other EA implementations to guide their EA implementations. Rouhani et al. (2015) identified a number of attributes that have been successful in the various implementations. In all, they identified 19 attributes (Rouhani et al., 2015). Among them were management support, optimal alignment, and clear guidelines and tools to support not only the implementation but the continued support for the EA framework. Of specific note and similar to the Lee et al. (2016) study, they emphasized that the EA implementation process continues throughout the life of the organization and does not stop once an architecture is in place. It is a system in of itself that grows and changes to ensure that the organization has the proper framework in place to meet its organizational goals. As such, those components need to be carefully considered when implementing the design so that such attributes persist throughout the life of the organization and the EA itself. Doing so ensures that the EA that is selected has the tools and organizational support that are required to maintain its relevancy and efficacy. Thus, establishing a key principle in the implementation of an EA is that the EA should be designed and implemented in such a way that allows it to change and grow along with the organization that it supports.

Taking an alternative perspective, architects can design and implement an EA by addressing challenges. Bakar, Kama, and Harihodin (2016) analyzed implementation from the perspective of challenges faced within a recent set of EA implementations. Some of the higher-level challenges they and other studies have identified are with regard

to weak governance, unclear communication, inadequate financial backing, poor support and insufficient training (Bakar et al., 2016; Cram, Brohman, & Gallupe, 2015). Thus, the strategy that can be extracted from such an observation is that not only should the EA contain governance, but care should be taken to design the governance in such a way that it has strong support and authority.

Thus, it would require considering organizational culture and working with leadership to ensure that part of the culture that they promote is adherence to the governance process and the determinations and decisions that the governing body makes. When interpreted, those fall in line with the previously examined studies. For example, weak governance and poor support and inadequate financial backing all reflect a general lack of support from high-level administration and leadership. Similarly, the authors also identified insufficient training as an indicator of that proper planning, and organizational cultural aspects have also not been considered (Bakar et al., 2016). As such, there is a clear indication that despite what perspective is taken, that certain components need to be in place prior to and through the initial implementation and lifecycle of an EA.

Another potential EA implementation technique is to implement the proposed architecture using cycles and phases, specifically action research. Nogueira, Romero, Espadas, and Molina (2013) examined the application of the Zachman framework using the action research technique. It made use of cycles that represent key components of the desired architecture, such as business, system and technological models of the Zachman framework (Espadas et al., 2013). Each cycle contains iterative phases. Those phases consisted of activities such as defining the problem, planning actions, taking actions,

observing, learning from observations, and cycling back through the process to correct issues as they were detected.

Such techniques have also been demonstrated by other researchers. In a similar study also based in action research conducted by Bernaert, Poels, Snoeck, and De Backer (2016) first identified a set of requirements for EA implementations consisting of control, a holistic overview, organizational objectives, suitability and collaborative across the organization. Those requirements are then applied to the acting, planning, and evaluating the cycle's characteristic of action research. Similar to other techniques, they also identify specific categories that the EA should address in the action research cycles. They define control as the authority to effect changes to policy procedure and physical systems. The holistic overview that is used is the definition of EA; it is used to describe the organization as whole defined by what it does and not simply the sum of its constituent parts (Bernaert et al., 2016). The objective requirement lays out the specific goals of the organization, whether it be services provided or profit. The suitability component dictates the requirements that the EA implementation is appropriate for the organization, its culture, and the vision that exists for its systems and its overall function (Bernaert et al., 2016). Finally, the enterprise-wide component refers to the application of the architecture to the entire entity or organization so that interoperability can be achieved throughout the entire organization and not a single sub-component or components.

Another means of deriving implementation strategies is to highlight successful attributes of well implemented and functional EA implementations. Lange, Mendling, and Recker (2016) conducted a study analyzing the factors as well as the metrics of

management techniques of enterprises architecture implementations. In so doing, they identified various factors that they found contribute to overall success in EA implementations that should be considerations when an EA is being applied to an organization. While they did not focus specifically on implementation strategies, they stated that certain factors needed to be considered and understood when implementing an EA for an organization. The first principle they discussed involved the establishment of an enterprise management infrastructure. Such a tool or structure can be leveraged throughout the lifecycle of the EA itself, including implementation. Key to the principle is clear and consistent support of high-level management to the EA and the ongoing practices that it involves.

The second principle involves stakeholder awareness. That involves selecting and engaging various stakeholders within the organization and ensuring that they have a voice and can provide meaningful direction (Lange et al., 2016). One means of achieving such is through various governance structures. Those structures can involve governance surrounding the evaluation of current and new technologies as they relate to organizational goals and current internal policies procedures and standards.

The third principle stated that the EA output must live up to what it is designed to do. That means that the benefits that EA is meant to provide must actually come to fruition in some measurable form (Lange et al., 2016). That is important as the engagement of stakeholders and creating an organizational or corporate culture that supports the effort to implement and maintain the EA relies on their view of its utility and benefit to their respective departments and the organization overall.

The fourth principle is referred to as secure stakeholder commitment. It refers to a long-term commitment from all stakeholders within the organization (Lange et al., 2016). As stated previously, EA is an ongoing process, one that must evolve with the organization taking into consideration both internal and externally changing operating requirements and goals. As such, the EA must function as a tool that changes and grows with the organization and one that continues to provide benefit. If such consideration cannot be provided, the EA will quickly become less relevant and less useful, and support will attrition accordingly.

As seen in similar studies, there are many common factors associated with the success of implementing an EA highlighted in the article. Specifically, the authors cited high-level support from managers and leadership, long-term commitment as well as ensuring that the EA itself is dynamic and capable of providing the benefits that it has promised and yielded in other circumstances (Lange et al., 2016).

Another aspect of complexity within modern organizations occurs in the projects that are undertaken that are guided by and support the EA. To that end, architects can take a guidance perspective of developing implementation strategies based on challenges that many IT architects face in their implementation projects. Olsen (2017) conducted a study of EA implementation within the Norwegian healthcare sectors where the study focused on challenges that were faced by the implementation itself instead of looking at what strategies can be used most effectively. They identified five key challenges gathered from interviews with participants in the project (Olsen, 2017). Those challenges were lack of management understanding and commitment, communications challenges, the

unclear role of EA within the organization, organizational challenges, and difficulties with EA tools (Olsen, 2017).

The first challenge that the author notes is a lack of management understanding and commitment. Specifically, the author discusses that an understanding of EA and overall support significantly lacked within the leadership of the studied organization (Olsen, 2017). Such inadequacies were a challenge that was echoed by all other studies reviewed in the Olsen study. The author went on to assert that management specifically lacked an understanding of the utility and benefit, which they asserted caused the EA tools and functions to not be used (Olsen, 2017). Olsen also noted that the overall view of EA by leadership was not overly positive or appreciated. That is an important aspect of an EA implementation as the management team is often times the driver and the motivator for change within an organization. Thus, failure to achieve such an understanding can result in the same poor understanding being imparted onto the individuals who must work within the EA.

The second challenge, Olsen (2017) discusses, is a lack of quality communication within and from senior management. It specifically refers to educating and motivating leadership about the benefit of adopting an EA. Those communication challenges are critical in that; the respondents felt as though they could not communicate the value of the overall EA to leadership in order to garner support. Olsen noted that expressing the business value of EA to leadership was particularly challenging, and as a result, poor funding and overall support would often result. Another challenge in the communication arena was that participants found it difficult to communicate the concept of long-term

profitability that EA can provide. Thus, it was difficult to communicate the importance of long-term views to leadership as they tended to view issues such as profit and loss in the short term only.

The third challenge identified by Olsen (2017) is that the architecture itself did not have a clearly defined role within the organization. The role of enterprise architects within the various components of the project lacked definition. The end result was that enterprise architects were oftentimes not included in important discussions or projects as IT staff was not clear as to when or how to utilize them. They stated that a general lack of policies and procedures surrounding the EA and the implementation led to those types of problems as such rules often dictate the specific roles of EA within an organization. Those rules also dictate how and when individuals should engage the enterprise architects on a project.

The final challenge, Olsen (2017) indicated, relates to the difficulties individuals found in using EA tools. The tool was said to be complicated and was difficult to understand. Many users were not familiar with the tool and did not have proper training in its use. Thus, it was suggested that a significantly greater amount of training be given to users in order to reap the benefits of such tools.

Theme 4: Barriers to Change

Within IT and specific to EA, Lee, Oh, and Nam (2016) stated that EA implementations represent significant organizational changes. When endeavoring upon any large-scale change such as the implementation of EA, it is critical that resistance to such a change be evaluated as some researchers indicated that it can contribute to failure

rates of 70% for such projects (Bradutaanu, 2015). Bradutaanu (2015) also stated that the source of those changes can come from all levels of the organization and result from both internal and external influences such as organizational culture and economic influences. Other researchers identified that fear of the unknown, delving into new uncharted territories is also a strong motivation for such resistance, but also can be rooted in the organizational culture itself (Shimoni, 2017). Thus, organizational culture and individual psychology are two key aspects that should be carefully considered in the implementation of an EA.

When looking at the individual, personal, and psychological aspects are directly involved in resistance to change (Laumer, Maier, Eckhardt, & Weitzel, 2016). Laumer et al. (2016) defined four dimensions or reasons that individuals resist changing in IT settings, routine seeking, emotional reaction, short-term focus, and cognitive rigidity. Furthermore, those factors can, in many cases, have an even greater influence on resistance behaviors than do age, experience, or gender (Laumer et al., 2016). Those fears can lead to an individual not wanting to make any changes, even if they are needed as they may harbor fears that introducing something new may actually make the situation worse. As such, it becomes critical to include consideration for how to identify and remediate those issues proactively before the implementation, and actively remediating once the implementation has begun if discovered after the implementation has begun. If such fears are shared by peers, the issue can worsen as peer opinion also has strong influences over how new technologies and their usability is perceived (Huang, 2018).

Onimole (2017) stated that one way to make such achievements is through better training for managers of staff for whom the greatest change will have to be endured. To support such an effort, additional training should be given to staff to make them more aware of the upcoming changes and to give them the skills that are needed to function within the new processes and procedures (Onimole, 2017). Taking such steps is important as it allows IT, planners, to address resistance to change within organizations at one of the primary sources, the individual. It is important to address such issues from multiple perspectives to avoid creating a single point of failure in the solution. It is similar to the practice within finance and IT of diversification, where the aforementioned single point of failure is mitigated through diversification of risks. Other aspects of the problem can also be found within how organizations provide leadership to individuals with regard to the change that they are asking their workforce to undertake (Bradutaanu, 2014).

Leadership is critical in those instances and can take many forms and should be dynamic and well suited to the situation. For example, Bradutaanu (2014) stated that while an authoritative style may provide some benefit when dealing with new employees that need direction, it may actually do harm to the project when employees are already under pressure or are feeling a high level of stress (Bradutaanu, 2014). In those situations, management, may want to consider a more supportive means of motivating staff by employing a strong and effective leadership style where employees have a voice and significant agency in the implementation process (Bradutaanu, 2014). Dunican and Keaster (2015) also emphasized the importance of leadership with regard to combating resistance to change and stated that many organizations still fail to adequately prepare

internal leadership teams to adequately address the resistance. The authors suggested that inclusion of concepts such as mindfulness and intolerance of ambiguity may help with such instances where individuals are reluctant or resistant to the changes being presented to them (Dunican & Keaster, 2015).

From an organizational perspective, change may be complicated by the fact that many organizations must adhere to local, state, and federal regulations. As a result, there can be a significant concern when introducing a new EA that such an alignment, no matter how deficient, may either not work or perhaps made even worse. Despite the fact that such fears are present in individuals, the fact that those individuals are leaders makes it an organizational-wide challenge. Such avoidant managers within organizations, Roundy, Dai, Bayer, and Byun (2016) identified as having a prevention focus. However, given that those individuals are decision-makers, their fears and dispositions toward change have direct effects on the organizational strategy (Roundy et al., 2016).

As such, it is important to examine the effects of organizational resistance, whether at the individual level or the organizational level. However, there is one additional area that this study has found that contributes to organizational resistance to change. It is a phenomenon that takes place within federal and nonprofit organizations that are subject to significant legal and mandated regulations. As a result of those strict and immutable regulations, the EA can, in some cases be rigid and not amenable to change. The issue is exacerbated when those regulations are not uniformly defined across the organization and add to the overall complexity of the impending changes in the eyes of employees (Reed & Higgins, 2018). Thus when one regulation is interpreted

differently by different departments within an organization, a great deal of effort must be expended to reach a consensus on how such rules are interpreted.

Such regulatory issues, particularly in expanding businesses, can pose significant financial risks that may exceed those of direct systems failures (Ibrahimovic & Franke, 2017). Those risks can be sufficiently substantial as to threaten the viability of an organization as was seen by Citigroup, who during a 2 year period lost over \$130 billion (Wilmarth, 2014). Some studies stated that those requirements alone can drive organizations' need for proper governance (Gordon, 2016). As governance is a key part of any EA implementation, it requires that governance not only be a part of the EA but that it may help address some larger-scale organizational resistance during the implementation stage. Other studies have also indicated that heavy regulation can hinder the growth of an organization despite existing development strategies (Dawson, Johnston, & Stewart, 2017). Some resultant or avoidant behaviors can be fostered, as the development of certain policies that avoid situations where regulatory rules are either difficult or expensive to adhere to in the course of their activities (Dawson et al., 2017).

Given that resistance surrounds the alignment of IT and business drivers, additional perspectives to such a challenge can be gleaned by examining challenges users face in the adoption of new technologies, such as the technology adoption model. It is applicable because a significant part of EA involves the alignment and governance of existing and in particular new technologies. Huang (2017) stated that systems within an organization are often in continuous use after implementation, and their efficacy is

dependent on their evolution. Given the nature of constant change in that context, resistance to those changes can have a direct effect on the implementation of an EA.

The technology acceptance model was originally introduced in 1989 by Fred Davis (Teeroovengadam, Heeraman, & Jugurnath, 2017). Its original intent was to predict the probability of technology adoption of individuals based on their perceptions of new technology and how it is perceived by those who are asked to adopt it (Sánchez-Mena, Martí-Parreño, & Aldás-Manzano, 2017). Given its nature, it relates to both GST and EA in that; it examines how one system the user can adapt integrate new technology into a symbiotic relationship, thus creating a larger system. Adoption motivations can be broken down into various perspectives, including how well the individual perceives the utility of a technology (Verma, Bhattacharyya, & Kumar, 2018). Thus offering a means to measure potential resistance to a proposed change. It is of particular importance to EA adoption in that EA is considered to be a tool that can be leveraged to help an organization to operate more efficiently, but the same can also be said for the individuals who must work within the framework. Data from studies indicated that reaching individual users with technological changes is key to technology adoption, particularly when it can be viewed in such a way as having a direct benefit to how applicable it is to that user's role and whether or not they perceive a benefit in its adoption (Brandon-Jones & Kauppi, 2018). Similar studies also make use of what is called *uses and gratification theory*, which examines individuals perceptions of media and theorizes that individuals tend to make use of media that they find relatable or beneficial to them (Hui-Fei & Chi-Hua, 2017).

Concerns with change can be viewed as adversity to risk. Thus, the idea of risk management can be leveraged by an EA, and its implementation strategy to address such concerns. Risks exist in all aspects of an EA and should be addressed as they are discovered, whether in the design phase or as the implementation occurs. Later discoveries of such issues do come at a cost as making such considerations at the implementation stage may raise implementation costs and may restrict freedom of development (González-Rojas et al., 2017). Some researchers describe the identification and mitigation of risk as one of the key benefits of EA , specifically EA governance(Shanks et al., 2018). Those must be aligned with the business; it is an important consideration both in terms of risk management but also in the viability of any EA implementation. In addressing the risk of the EA itself, IT architects can approach the issue of resistance to change from multiple fronts such as resistance to change from the individual or the organizational level.

Theme 5: Sample Applications of the Case Study Methodology

Other researchers have used the case study methodology to explore the various aspects of EA, its benefits, and various implementation strategies. As Duong and Pekkola (2017) noted, the most frequently used method for evaluating EA within academic literature has been the case study methodology. The case study methodology allows the researchers to examine the end result of those implementations and to determine which made significant contributions to the outcome. It was particularly applicable as this study intends to explore and identify such strategies. To support and validate the decision, in

this section, I have examined how other studies have attempted to do the same using the same methodology.

Iyamu (2018) made use of a case study methodology to define a means of applying the Zachman EA framework to an organization examined using a case study methodology. The intention of the article is to address some of the challenges faced by organizations specific to implementing the Zachman framework. Through the use of semi-structured interviews, the authors solicit 17 sets of deliverables that would be needed to properly implement the Zachman framework. From those deliverables, the author derives strategies for implementations (Iyamu, 2018). For example, when addressing the challenges of defining deliverables for the business product catalog, the author derives a strategy that defines first that a catalog should be included in the EA and second, that the catalog should be a collection of the various rules and motivations that drive the various products that are listed in the catalog (Iyamu, 2018). Thus the authors successfully extract high-level strategies from participants through the case study methodology.

Another case study was conducted regarding the implementation of EA within Czech enterprises. Albrecht (2017) conducted a case study where individuals are interviewed in order to establish the motivation for enterprises to adopt an EA and to assess the current state of such EA (Albrecht, 2017). From those results, Albrecht (2017) was able to elicit the expectations that each participant had for the benefits and end results of the application of the EA. Some of the common themes with other academic literature highlighted were the expectation that alignment between IT and the business

drivers would be established addressing the corporate culture and organizational change and the definition of an overall organizational strategy.

Jallow, Demian, Anumba, and Baldwin (2017) used the case study methodology to examine the benefit of implementing an EA framework to guide project requirements management. In order to develop the framework, interviews are conducted with participants and the criteria for such was based on subject matter expertise within the research question. The end result is an extraction of the practices that an EA framework can offer to yield benefit with regard to the gathering of requirements for various projects. Thus the basis for case study methodology is well established in the academic literature.

Transition and Summary

In the previous section, I introduced the research question and discussed the assumptions, limitations, and delimitations of the study, specifically surrounding the limited population of federal agencies and the FEAF. I also discussed the value that implementing the FEAF can provide for federal organizations. Implementation of the FEAF can provide organizational stability and consistency of operations. Similarly, I also explained how such attributes could contribute to society as a whole as critical federal services become more readily available to individuals who need such services the most.

I also introduced the conceptual framework of this study, GST. GST describes systems holistically and defines them by their functions and not their constituent parts (von Bertalanffy, 1972). The review of the academic literature took a system view of EA and the means in which they are selected and applied. Each EA is in of itself a system

that interacts with other systems. When looking to examine and implement those systems, GST dictates that researchers take a broad and holistic view of both EA and the systems in which they operate that requires the development of an understanding of one of the key subsystems in the larger system, the organization. To that end, I have described EA, which in turn are descriptions of an organization and how it behaves as a whole. As well as how EA's are themselves systems and how they function within larger systems. I also explored how such systems can be developed and implemented using the same high level and holistic strategies that are used to describe those organizations. I then examined the internal resistance that can be found within the various components of such systems from individuals to the organization itself. Finally, it also supported the selection of the research methodology used in this study that can yield the best results. Particularly in the realm of EA, the case study methodology allows for the greatest extraction of experiential information possible.

The previous section also included a review of the academic literature with regard to the research question. I discussed various themes that I discovered that apply to this study. Those key themes include a review of the conceptual framework, including its origins and derivations. I also discussed the concept of EA and how it applies to the FEAF. I followed this with a discussion of various implementation strategies such as the technology acceptance model. Another theme discussed was barriers to change, which can prevent or hinder the adoption of the FEAF. Finally, I examined other applications of the multiple case study model that supported my decision for its use in this study.

In Sections 2 and 3, I delve into detail regarding my role as researcher and expand upon the research method and research design of the study. I also discuss the population of the study, which includes qualifications for participants. Following that discussion, I address the ethical considerations that are required when working with live human subjects within a study. I also outline the means in which I collected the data and how it is organized. Finally, I discuss how I ensured the quality of the data I have collected, specifically addressing attributes such as dependability, credibility, transferability, and saturation.

Section 2: The Project

Purpose Statement

The purpose of this qualitative multiple case study was to explore the strategies used by federal IT planners to expedite the implementation of FEAF. The snowball sample for this study consisted of IT planners responsible for implementing and adhering to FEAF in three government agencies that have successfully implemented FEAF and are located in the Washington, DC, area of the United States. Federal organizations provide services to all U.S. citizens and employment, health insurance, and economic support to the communities of those employees. When such organizations cannot meet their goals, they fail to support the citizens that rely on those services and negatively impact the economies of those communities. The findings from this study may contribute to positive social change by identifying strategies to expedite the application of architectures. Such strategies will eliminate waste and redundancies and contribute to a more effective and stable operating environment while consistently and reliably providing critical services to citizens and local communities.

Role of the Researcher

In qualitative research, the role of the researcher is critical and has direct influence over the data collected; the researcher is a participant in the study (Sprague, Scanlon, & Pantalone, 2017). As the researcher, I functioned as the principal data collector. I was also responsible for collecting, analyzing, and writing the final interpretation of the data. I have worked in the field of IT for 18 years and have held various roles from system administrator to IT architect. I lived and worked in the

Washington, DC area for 10 years and worked at a private nonprofit organization that was overseen by the Federal Communications Commission. During that time, I worked on projects with the goal of maturing organizations and establishing EAs. Part of the process required me to work according to the standards of the National Institute of Standards and Technology and the Federal Information Security Management Act (FISMA), as well as other constraints such as the federal acquisition requirements that dictate how federal agencies procure goods and services, a complex and time-consuming process that can have direct effects on perceptions and motivations of participants in such projects. As such, I have become familiar with the topic of EA. However, prior to this study, I had not worked with any of the participants.

Another key component of research is establishing an ethical baseline to not only ensure the integrity of the data but that the research conducted is done in a manner that protects the participants and their rights. To adhere to this concept, I made use of the protocols defined in the Belmont Report (Department of Health, 1979). I also used interview protocols. Heydon and Powell (2018) stated that such protocols can be used to establish rapport and trust with participants. The Belmont Report establishes a set of guidelines for researchers to follow that protects the participants in studies. Those guidelines are based on three key principals: (a) respect for persons, (b) beneficence, and (c) justice (Department of Health, 1979). To adhere to the first principle, respect for persons, I made it clear to the participants that their participation was purely voluntary, and they were free to leave the study or interviews at any time, thus allowing them full autonomy. In protecting the participants' privacy, I aligned the process with the principle

of beneficence where no harm was allowed to come to the participants as a result of their participation. Finally, the concept of justice in the Belmont Report dictates that the participants should also benefit from their participation in the study (Department of Health, 1979). As such, I shared my findings with them, so they could apply strategies derived from the study in their own work.

As stated earlier, a researcher brings bias to a study (Scanlon et al., 2017). However, researchers can mitigate the effect of such biases by employing a number of techniques: making use of multiple data sources, use of member checking, and reflecting on the interview with the participants (Umeokafor, 2015). To mitigate bias, I diversified my data sources by including participants from various positions and agencies in the federal government. While member checking helps to mitigate bias in a study, Closs and Hadi (2016) stated that member checking is one of the most commonly used and effective ways to establish rigor in a qualitative study. As such, I also used member checking to ensure that rigor was present in the study.

Participants

Case studies rely on participants for their information and allow for the examination of a specific phenomenon in its original context (Gunasekaran et al., 2018). Rymaszewska and Gunasekaran (2017) emphasized that the most relevant participants are those who make use of the technology in question. Similarly, Roache and Kelly (2018) stated that participant selection in a multiple case study is key to collecting relevant views of specific experiences relevant to the phenomenon being studied. Finally, Unicomb, Colyvas, Harrison, and Hewat (2015) stated that, in case studies, participants

are important because their experiences provide details unique to the phenomenon as they pertain to specific and relevant experiences. I selected participants for this study who have the most relevant views and experience with FEAF. Participants in this study were full-time IT staff members with experience and knowledge of FEAF and its implementation and maintenance in their organization. I selected participants from federal organizations that have implemented FEAF and that are located in the Washington, DC, area of the United States. Those individuals in their current roles must have made architectural decisions based on FEAF. Participants must also have had at least 10 years of IT experience.

After IRB approval, I began recruiting participants. Engler-Stringer, Schaefer, Ridalls, and Muhajarine (2018) suggested that recruitment methods be via a means familiar and comfortable to the participants. Alto and McCullough (2018) stated that resources on the internet, such as Facebook or Craigslist, are an excellent source of potential participants given the high level of access U.S. adults have to the internet. Other researchers have also used digital collections and stated that such resources save both time and money on the part of the researcher and allow for better participant selection (Viktor et al., 2018). I used Facebook, LinkedIn, and various federal websites to identify and retrieve contact information for potential participants subsequent to IRB approval.

Establishing a relationship with participants was critical because I needed to ensure a level of trust and validity with the study. Haahr, Norlyk, and Hall (2014) stated that the ability of a researcher to establish trust in such a relationship is directly linked to how they address issues of the methodology being used. I discussed with the participants

how they were protected in this study. I described how their responses were anonymous and that the research is intended to provide some sort of benefit to them as well. Given that the researcher is a key instrument in any research, it becomes important that the researcher follow social norms the participants are accustomed to in order to make them feel more comfortable and establish a relationship. That may include avoiding the application of pressure and allowing participants sufficient time to respond (Downey, 2015). Downey (2015) stated that doing so also gives an opportunity for respondents to ask questions or deliberate their responses, which can also yield significant information. As such, I included considerations in the research design that are critical to eliciting genuine and detailed responses. To establish a level of trust, I collected consent forms and then worked with the participants to answer any questions they had prior to starting the interview. I discussed the topic in general as well as the overall purpose of the study. Cheng, Fu, and de Vreede (2017) stated that the establishment of trust has significant influence over the quality and accuracy of data. In order to establish this trust, I ensured frequent and detailed communication in a means that was both comfortable and familiar to the participants. In summary, research suggests that making such associations allows for the breakdown of trust-related issues that may hinder the information-gathering process (Fleming, Barrington, Perez, Donastorg, & Kerrigan, 2015; O'Grady, 2016).

Research Method and Design

I used a qualitative research method for this study because it was best suited for the elicitation of information from participants with regards to experiences that can be expressed in their own words (Almalki, 2016; Levitt, Bamberg, Creswell, Frost,

Josselson, & Suárez-Orozco, 2018). Almakli (2016) stated that qualitative research allows a researcher to draw meaning from the detailed experiences of participants. Such statements support my decision to extract information and strategies from the experience of the participants regarding strategies they have either enacted or seen as effective in their implementations of FEAF in their organization. Further supporting the decision, McCusker (2015) stated that qualitative methods attempt to understand the experiences of participants, thus offering additional support to my reasoning for selecting qualitative methods for this study. Specifically, I sought to understand how participants experienced successes with the various strategies they implemented in their agencies' adoptions of FEAF. Furthermore, I also sought detailed and rich descriptions of both the end result and the process of implementation that, as Levitt et al. (2018) indicated, was one of the key benefits of using qualitative methods.

Qualitative methods make use of logical induction to inform the study and to guide conclusions (Osbeck, 2014). Researchers attempt to derive meaning from one event in an attempt to apply it to a larger context, which is key to organizing and contextualizing human behaviors (Osbeck, 2014). Qualitative methods also allow for the inclusion of human perception (Vass, Rigby, & Payne, 2017). I extracted meaning from the participants' stated experiences that are of particular importance to this study as I asked participants to infer which strategies used had a positive impact from their perspective.

Barnham (2015) stated that quantitative methods make use of specific measures and statistical information and are intended to test theories or hypotheses. Hope and

Dewar (2015) added that quantitative research is also most appropriate when there are large amounts of numerical data involved in a study. Based on the absence of numerical data and given the exploratory nature of this study and lack of theory or hypotheses, quantitative methods were deemed an inappropriate choice. Park and Park (2016) asserted that qualitative methods are better suited for discovery; given that I sought to discover successful strategies used by the participating agencies, quantitative methods did not fit well with the goal of the study. Furthermore, Haegele and Hodge (2015) stated that quantitative methods are based on a positivist view, which defined as being free of social influences. Given that I was examining a phenomenon in its social context, social factors were important. As quantitative methods do not allow for such a consideration, it was also, for that reason, that such methods were deemed inappropriate.

I also considered a mixed-methods approach for this study. Mixed methods research is defined as the use of both qualitative and quantitative methods within a single study (Kong, Yaacob, & Ariffin, 2018). Given that there were no quantitative methods in this study, along with the absence of numerical data, it was deemed an inappropriate method. Furthermore, Mabila (2017) stated that mixed methods encompass an interaction of the two methodologies. Because there was no quantitative data in this study, and there were no quantitative methodologies used, a mixed-methods approach was unsuitable. Sligo, Nairn, and McGee (2018) asserted that mixed-methods approaches are best suited for complex research questions; they attempt to consider both the qualitative and quantitative aspects of research questions and attempt to statistically validate the themes

and triangulate data. Given the lack of numerical correlation in this study, a mixed-methods approach was further found to be incompatible with this research.

Case studies allow researchers to study a phenomenon and the experiences of those who are involved (Ridder, 2017). Individuals can be interviewed, and data can be elicited from their observations of the phenomenon. Building on the case study design, the multiple case study design allows researchers to repeat the process and to collect data from multiple separate groups that have experienced the same phenomenon. Anderson, Leahy, DelValle, Sherman, and Tansey (2014) stated that the multiple case study design allows researchers to examine the same phenomenon in different settings and to increase the applicability and confirmability of the findings. Furthermore, Ridder (2017) stated that using multiple cases allows researchers to examine additional aspects of a phenomenon as the difference between cases can also yield useful information. Vohra (2014) stated that the use of the multiple case study methodology further enriches the data and provides additional reliability. Based on the aforementioned information, I decided that a multiple case study design was the most appropriate design for this study.

Another alternative to the case study is the ethnographic study. Trnka (2017) stated that ethnography is the study of a phenomenon that involves the immersion of a researcher within the study. As the researcher, I would not be immersed within the group being studied, so it was an incompatible feature of ethnography with this study.

Researchers using ethnographic designs explore and seek to understand certain behaviors within a society or societal setting (Draper, 2015). However, in this study, there were no societies or behaviors to be studied. Coombs and Osborne (2018) stated that

ethnographies examine the lived experiences of participants. In this study, I did not seek to explore the experience of an individual, which was one contributing reason for not making use of an ethnographic design.

Van Manen (2017) suggested that phenomenology may not necessarily reveal any richness to the recounted experiences of participants. Conversely, in this study, I sought rich and detailed experiences. Gentles, Charles, Ploeg, and McKibbin (2015) stated that phenomenology examines the nature of reality and a single lived experience from the point of view of an individual. However, this study sought to examine strategies implemented within organizations on FEAF adoption and not that of a single individual. Quay (2016) stated that another aspect of phenomenology is that it focuses on individuals and the experiences that are unique to them. However, this study did not seek a unique experience; rather, it sought strategies used by various agencies in their application of FEAF. Other researchers have also indicated that phenomenology focuses on the individual and posits that no one other than the individual that has partaken in a particular experience can describe the phenomenon (Charlick, McKellar, Fielder, & Pincombe, 2015). Within this study, I did not seek to explore a single event, nor did I seek to gain a specific perspective; rather, I was looking for multiple perspectives from multiple individuals with different experiences. As such, phenomenology was not well-suited for this study.

One of the challenges of the case study design is the achievement of data saturation. Fusch and Ness (2015) stated that one means of achieving data saturation is through triangulation. To accomplish saturation, I collected public documents as

instructed by participants when available and correlated that with the information they had given and further compared that to the academic literature compiled in the literature review. Another means to achieve data saturation in qualitative studies is by systematically tracking themes and subthemes for repetition (Hancock, Amankwaa, Revell, & Mueller, 2016). To assist in my tracking of themes, I used notes and reviewed the data to ensure that no new information was being provided. No additional themes were emanating from the interviews, which suggested data and thematic saturation. Nascimento et al. (2018) suggested that immersion in the data also allows for the detection of data saturation. To achieve this in my study, I ensured that I spent significant amounts of time with participants through member checking and confirmation of my interpretations of responses. I also ensured that themes were tracked in NVivo software to support the analysis.

Population and Sampling

The population for this study included IT planners responsible for implementing and adhering to FEAF in government agencies which have successfully implemented FEAF and are located in the Washington, D.C. area of the United States. Those individuals are full-time employees with a minimum of 10 years of experience in the field of IT. They currently work within a federal agency that has fully implemented FEAF.

In order to collect the desired information, I implemented snowball sampling. According to Marcus, Weigelt, Hergert, Gurt, and Gelléri (2017), Snowball sampling is an approach that uses nonprobability, participant referral approaches to determine participants of the study. Baily (2019) stated that snowball sampling is particularly useful

when the populations to be interviewed are elite, small, or difficult to locate. Von der Fehr, Sølberg, and Bruun (2018), also support the same by stating that such types of sampling can be used to find hidden populations through otherwise unknown social networks. Snowball sampling is also beneficial as it diversifies the sources (Marcus et al., 2017). Such types of sampling are achieved by asking one participant to recommend another individual who may also have information pertinent to the study. Specifically, as I conducted interviews, I asked participants for recommendations for individuals who are key stakeholders or decision-makers with regard to FEAF strategies within each organization. One key benefit of the snowball sampling technique is that it limits the procedural overhead and burden on the participants themselves, thus making participation more convenient than using other methods.

Santos and Santos (2017) stated that the use of key stakeholders in making IT decisions has a significantly positive impact on outcomes. Shanks, Gloet, Asadi, Frampton, and Tamm (2018) stated that governance decisions and architecture boards should include key stakeholders, who represent key areas of the organization. It suggests that key decisions about IT projects and strategies are narrowed to a specific set of individuals. Offering a sizing perspective, Thiel, Winder, and Buchner (2018) stated that larger governance boards can be problematic and less effective, given their size. Thus, the population for this study was limited to key planning and decision-making individuals recommended by the participants once initial contact has been made with a potential participant who is ultimately responsible for the development of such strategies. TOGAF recommends that such boards have no more than 10 members. As such, I interviewed all

key planning and decision-making individuals identified by the previous participant for each organization. That resulted in the inclusion of as many individuals as possible who make up the population of IT planners involved with developing such strategies. Doing so enabled me to better achieve saturation as the majority of individuals who are involved with strategy and planning decisions have been included in the study. As those individuals must come to an agreement in order to apply those strategies, I expected and found only a small variance in the yielded strategies. Those variances can be attributed to individual perception and interpretations of strategies. In this study, saturation became evident after multiple interviews, member checking and document triangulation revealed no new themes or strategies.

Qualitative studies do not generally have predetermined sample sizes (Blaikie, 2018). Sim, Saunders, Waterfield, and Kingstone (2018) stated that sample sizes in qualitative studies are emergent and evolve and that they determined by data saturation. Boddy (2016) stated that even a single case can elucidate a certain subject. Furthermore, Rijnsoever (2017) echoed the same sentiment by stating that the focus should be on data saturation rather than the sample size. Malterud, Siersma, and Guassora (2016) indicated that more focused studies require smaller sample sizes. Thus, in this study, given the snowball sampling and specific population, the sample size was determined by data saturation from data collected from multiple federal organizations that are also targeted through the use of snowball sampling.

Fusch and Ness (2015) asserted that data saturation is not simply a question of the quantity of the data, rather the richness and depth of that data. In order to achieve such

richness in my interviews, I used a set of interview questions that probe the phenomenon and pull deep level details from each of the participants. I achieved that through multiple follow-up conversations in the form of member checking, where participants were contacted after the initial interview to confirm my interpretation of their interviews. Researchers indicated that it is at the discretion of the researcher in qualitative studies to determine when saturation has been reached (van Rijnsoever, 2017). In pursuit of saturation, I tracked all information during the data collection process and determined when data began to repeat, thus suggesting saturation. The process was also supported by rich and probing questions designed to elicit detailed information that can be later organized into themes. That, in turn, assisted with the determination of theme saturation. Additionally, during interviews, themes, and information were organized into codes. Those codes were then analyzed, and a determination was made by the researcher as to whether or not theoretical saturation had been achieved (van Rijnsoever, 2017). Woods et al. (2016) stated that the use of software to track themes can help to improve the quality of data analysis in their study of such software that included the NVivo application. To achieve that and to introduce traceability into the study, I made use of the NVivo software suite to input and monitor themes to assist me in determining saturation.

Interviews are key to any qualitative study, as they are the primary means of collecting data. In their study, Gagnon, Jacob, and McCabe (2015) emphasized the same point by stating that comfort and familiarity of location for interviews are key to eliciting detailed and rich information from participants. They also asserted that other locations, such as conducting interviews in the home, are not recommended as there may be

multiple distractions (Gagnon, Jacob, & McCabe, 2015). To that end, the collection of the information from participants was conducted after business hours via the personal phone number of participants. I chose that as not only as a requirement of the snowball sampling process but also as a convenience for the participants and to better accommodate scheduling but also due to the fact that using phone interviews allow a familiar means of interaction between the researcher and the participant. Furthermore, it offers the participant a sense of control over the conversation as they can terminate whenever desired, thus providing additional comfort to the participant. Doing so allows the interview to take place in the participant's home location. The comfort of the surroundings can impact the interview itself and as such interviews should be done in environments that reflect a similar culture and setting to which the participants are accustomed as well as concepts such as privacy and safety (Gagnon et al., 2015). Ramli, Tilse, and, Wilson (2017) emphasized the same by including such considerations in their process, by ensuring that interviews that they conducted in their research made cultural, language and location considerations to ensure the trustworthiness of the data they collected. To ensure that I made as many cultural considerations as possible, prior to the interview, I reviewed any and all public documentation related to the topic ensure that I was familiar with the language, terms and specific concepts that may apply to their organizational culture. Grenier and Dudzinska-Przesmitzki (2015), discussed the importance of security and privacy to the participants and stated that it is an important factor in establishing trust. By speaking with the participants through a familiar medium and making multiple contacts with them, and most importantly by discussing their

privacy and security concerns with them, I was able to establish such trust in order to ensure that they were comfortable disclosing the most detailed information possible.

Cope (2015) stated that case studies can contain two or more cases when researchers wish to examine complementary aspects of different cases. In this study, I selected three organizations (three cases) for study. Boddy (2016) stated that even a single case can be sufficient to elucidate a certain subject. Thus, in this study, I examined identical, complementary aspects of their implementations of FEAF. Gentles, Charles, Ploeg, and McKibbin (2015) stated that case or participant selection in qualitative research is determined more by the quality and depth of the interaction of the researcher with the participant in gathering the required data than the number of cases. In each case, I spent significant time with participants both in the initial interview, which contained focused questions that yielded rich and detailed responses and also in follow-up member checking sessions. As such, a rich and detailed collection of data was collected. Rijnsoever (2017) suggested that sample size or the number of cases selected is a function of saturation and that no specific rules are in place to determine the proper number of participants in qualitative research. Given the limited size of the federal organizations and the further limiting subset of organizations that have successfully implemented FEAF, three organizations were selected in order to achieve saturation.

Ethical Research

When conducting research, there are ethical considerations that need to be made with regard to the participants of the study. As dictated by the Belmont report, those are

respect for the individual, beneficence, and justice (Kowalski, Hutchinson, & Mrdjenovich, 2017).

Williams and Anderson (2018) stated that respect for persons recognizes that individuals have the right to make decisions as to their participation in the study. In promoting respect for persons in this study, all participants were informed through consent forms that their participation in the study is strictly voluntary and that they could leave at any time, for any reason without notice. Doing so ensured participant awareness of their right to discontinue their participation in the study at any time, thus underscoring the voluntary nature of the study. As a part of the process, I asked that participants email me or contact me by phone to let me know if they are interested in participating and that they can do the same at any time to let me know that they wish to withdraw. I documented the right to do so by obtaining informed consent forms from each participant prior to conducting the interviews. The informed consent covered the purpose of the study, and it described the manner in which the research would be conducted. Additionally, the informed consent document also described any potential benefits, risks, and reinforce that their participation in the study is completely voluntary. It also included both my contact information as well as that of the Walden Research Participant Advocate. The same form also included a description of all of the actions that I would take to ensure the participants' privacy. Finally, the informed consent document indicated that there would be no incentives, financial or otherwise for participation in the study.

Beneficence and justice, as described by Laage et al. (2017), are involved in providing benefit for those who participate while minimizing risk. In support of those

concepts, this study posed no additional risk to participants beyond that which they would encounter in their daily work lives, and those same individuals will benefit from the information gathered in the study. In addition to expressly defining risks and benefits in the informed consent, this study will share the information, conclusions, and opinions gathered through the study with all participants. The study will provide them insight into how their peers have addressed and adapted to the challenges involved with the implementation and maintenance of FEAF compliance and implementation.

Loe, Winkelman, and Robertson (2016) stated that institutional review boards ensure that participant protections are in place for studies. In order to ensure that all that the actions that I take meet ethical requirements, I presented my proposed actions to the Walden Institutional Review Board for evaluation and received approval. That approval number is 01-22-19-0583146. Furthermore, all participant information has been anonymized and stored in a secure location in the researcher's home on an encrypted external drive, stored in a fireproof locked safe to protect participant privacy for five years after the study. Both the fireproof safe and the encrypted hard drive were exclusively be dedicated to storing study-related information. Only documents or materials that are related to the study are be stored in the safe. The NVIVO project files were stored on the aforementioned encrypted hard drive. The file path for this study points to that secured drive, thus not storing any study information in any other location. I did not conduct interviews until I received IRB approval to do so. All communication and required documentation as well as the IRB approval number are listed in the Table of Contents and included in the appendices. The only location where personally identifiable

information was be stored is on the secured and encrypted device to which only I have access. Furthermore, I have password-protected all documents that contain any personal information of the participants.

Data Collection

For this study, the collection of data included the data collection instrument, collection, and data organization techniques. In qualitative case studies, the researcher is the primary data collection instrument. The idea is supported by Levitt et al. (2018) as they stated that the researcher plays a critical role in the data collection and can have significant influence over how the researcher collects and interprets the data. Similarly, Crocker, Boylan, Bostock, and Locock (2016) also observed in their qualitative study that the researcher's role and experience could also have a measurable effect on the data collection process. Yates and Leggett (2016) also noted the importance of such an influence as they stated that the researcher has an immersive and intimate involvement with the data. In this study, as the researcher, I served as the primary data collection instrument.

The interview protocol is another data collection instrument (Taylor, Fornusek, Ruys, Bijak, & Bauman, 2017). Heydon and Powell (2018) made use of an interview protocol to ensure that the amount and quality of the data are maximized through the use of best practices. Hamilton, Powell, and Brubacher (2017) stated that interview protocols can also help establish trust and rapport with those who are being interviewed. In this study, I used an interview protocol to guide semistructured interviews. In line with those views, I developed an interview protocol to capture the most detailed information

possible from participants that promotes trust and comfort while adhering to the research question. The interview protocol can be found in Appendix A.

Within qualitative methods and in particular with case study designs, the semi-structured interview is used which makes the researcher a primary data collector who in turn can have significant influence over the collected data (Dowling, Lloyd, & Suchet-Pearson, 2016). Dohaney, Brogt, and Kennedy (2015) suggested that when conducting interviews, researchers can take detailed field notes to make observations that can lend context to the information that is yielded from the interviews. Furthermore, Phillippi and Lauderdale (2018) stated that such notes ensure richness to the data being provided. Riveros, Verret, and Wei (2016) made use of field notes to enhance theme coding and to also enrich the quality of the data in their interviews. Thus, I took detailed notes during the interview and during my thematic analysis.

Varpio, Ajjawi, Monrouxe, O'Brien, and Rees (2017) stated that member checking is one technique that will enhance the data researchers collect by improving reliability. Iivari (2018) stated that member checking will also provide additional levels of trustworthiness of the data. I made use of a number of techniques to ensure that the data collected was reliable, trustworthy, and valid. Specifically, I made use of two key data sources through the implementation member checking and public document reviews. I achieved that by meeting with participants subsequent to the initial interview to review the accuracy of my interpretations. Birt et al. (2016) stated that doing so also helped to ensure that the data collected from participants is free from the interpretive influence of the researcher and can help to ensure the validity of the data. In pursuit of validity, I also

conducted a member checking review to ensure that the conclusions reached when reviewing the data reflects participants' intended meaning. In accordance with the recommendations of Birt et al. (2016) with regard to the collection of documentation, I asked the participants to bring any publicly available supporting documentation that they feel may be pertinent to the interview. That includes only public documents that described directives, policies, or procedures. Iivari (2018) stated that member checking will also allow for better accuracy and collection of detail in the interviews. As such, I developed a set of interview questions that sought specific details as they relate to this study. I have Interview questions as well as an interview protocol I prepared for participants which can be found in Appendices of this study.

Heath, Williamson, Williams, and Harcourt (2018) stated that the primary data collection technique for qualitative studies is the interview. They further asserted that interviews are particularly effective in gathering detailed information as such personal interaction is a means of establishing trust and rapport with the participants (Heath et al., 2018). Jamison, Sutton, Mant, and De Simoni (2018) stated that interviews also allow for the capture of nonverbal cues during the interview that can also enhance the data collection. Broadway-Horner (2018) stated that interviews also allow for further analysis of subtle cues in speech, such as hesitation and pauses that allow the researcher to pursue additional lines of questioning, thus enriching the data collection. Thus, I made use of interviews as my primary data collection source. I also only collected documentation pertaining to FEAF and the organization's strategies that were publicly available from locations recommended by participants. I also ensured that I did not make use of any

organizational resources in the recruiting or interviewing process. That includes agency phone numbers, locations, and computing resources; interviews did not take place during any work hours of the participants.

Once I received my IRB approval number, 01-22-19-0583146, I began to send out solicitations to potential participants through private means such as Facebook and LinkedIn; I did not interact directly with any agency. The individuals sought, hold key planning positions within the IT departments of the organizations, and are considered IT planners. Initially, individuals were contacted through social media such as LinkedIn or Facebook, subsequent referrals made by those participants were pursued through the same means or personal email addresses. As individuals contacted that were interested in participating, I confirmed their interest and addressed any questions that they had regarding the study, myself, or their participation. Prior to conducting interviews and after getting a signed consent form, I asked for referrals for other individuals within the same organizations who may also have insight into the research question and who would be willing to participate in the study. I did so to determine if saturation was feasible, thus managing the time of the participants and the study in an optimal manner. Similarly, I conducted interviews in parallel, whenever possible, to optimize time.

Prior to participant interviews, I sent a consent form describing the benefits and protections provided to participants with regard to the study. Upon receipt of the signed letter of consent, I recorded the names of individuals in an encrypted NVivo file that is stored exclusively on an external hard drive and kept in a fireproof and locked safe to which only I have access. I then scheduled the time slots with the participants for the

semi-structured interviews. I recorded the audio of the interviews with a digital audio recorder. Each interview was conducted according to the protocols located in Appendices A and B.

Connelly (2016) stated that member checking can be used to establish credibility of data through the use of prolonged engagement and triangulation. Triangulation is a means of analyzing data collected from multiple points of view (Varpio et al., 2017). This study involves the collection of organizational documents as they pertain to the interview and research questions. I used triangulation to align information gathered in the interviews with the collected public documents during the time spent in the member checking sessions. Celestino and Bucher-Maluschke (2018) stated that data triangulation can further enhance the validity of the collected data. Liao and Hitchcock (2018) stated that member checking also supports data triangulation, which is also included in this study. At the time of the interview, I took direction as to where I could download any relevant, publicly available documents. Morse (2015) stated that member checking can also enhance the confirmability of the data as significant time is spent with participants where both data and interpretations are confirmed. I made use of member checking to verify that the data gathered in the interviews represented the participant's words and meaning. I scheduled member checking sessions with participants within 2-3 days of the initial interview that gave participants the opportunity to discuss my interpretations of the data they provided in the interview and make any corrections or add information that may not have been captured in the interview. In those meetings, I discussed their responses as well as my interpretations to review for accuracy and to ensure that I have captured the

intent of their statements. A significant disadvantage of such a technique is that additional time had to be spent both on the part of the researcher as well as the participants. Thus, making scheduling and convenience more complex. Alternatively, the technique did provide a much more reliable and repeatable set of results from the interviews.

Data Organization

Data management is critical within qualitative studies (Hardy, Hughes, Hulen, & Schwartz, 2016). Hardy, Hughes, Hulen, and Schwartz (2016) stated that, once the analysis of the data begins, only then do themes begin to become more evident. As such, it is critical to organize data to ensure that such themes are captured. One effective way of achieving secure and consistent data management for such studies is through the use of a database or qualitative data management software (Woods et al., 2016; Houghton, Murphy, Meehan, Thomas, Brooker, & Casey, 2017; Robins & Eisen, 2017). Woods et al. (2016) suggested that the use of such software will improve the tracking and integrity of the data collected. The authors further suggested that the use of such software packages also allows the researcher to demonstrate the rigor of research more easily when needed. In support of those ideas, I made use of a database to record and track themes as an effective way of organizing information for this study as it contributes to security and accuracy. Specifically, I used the NVivo software to store data such as individual names and contact information and to identify and track themes and to store my field notes and transcriptions. Information gathered in the interviews was recorded on an audio device, and those audio files were attached and stored within the NVivo application. I also took field notes regarding observations of the participants during the

interviews. All observations were recorded digitally on a laptop connected to the encrypted storage drive. That allowed for all observations made to be recorded to a secure storage device that stored in a fireproof safe for five years after the study has completed. Finally, data within the software was be organized according to categories and themes that evolved as I analyzed the data. I had separate categories for field notes, interview transcripts, and audio recordings.

Data Analysis

Thematic analysis gives the researcher the ability to interpret meaning and patterns from data (Smith, McCullough, Critchlow, & Luke, 2017; Brooks, McCluskey, Turley, & King, 2015). Crowe, Inder, and Porter (2015) suggested that thematic analysis enables researchers to identify meaning within data. It can be a powerful tool for the extraction of data from qualitative sources. Brooks, McCluskey, Turley, and King (2015) echoed the same sentiment by asserting that thematic analysis yielded useful codes and additional meaning from collected data. I sought to extract patterns and best practices from the feedback of participants; as such, it was the optimal choice for one of my primary data analysis techniques. I collected the data through semi-structured interviews and then used NVivo to store and help me find themes within the responses.

I also used data analysis triangulation in my study. There are four types of triangulation: method triangulation, investigator triangulation, theoretical triangulation, and data analysis triangulation (Fusch & Ness, 2015). Renz et al. (2018) stated that data analysis triangulation can be used to improve the ability of the researcher to interpret the data that is collected by verifying aspects of that data in relation to multiple other data

sources. Other researchers have noted that the use of data triangulation also improves the validity of the data and the conclusions of the studies (Desmond et al., 2018). I used the same technique to analyze the data collected from interviews, as well as observational data taken during the interviews and finally from publicly available documents I was directed to during the interview process. Furthermore, Fusch and Ness (2015) stated that the use of triangulation can also be used to determine data saturation. Thus, I collected public documentation as directed by participants with regard to their organization's FEAF implementation to help derive, enrich, and delineate new themes and to help me determine when saturation had been reached. In seeking saturation, in my data analysis process, I collected the data gathered from the semi-structured interviews; once they had been transcribed, I entered all of the relevant information into NVivo for further analysis. I then looked through the data for themes and compared the results to current literature on the topic of FEAF, EA, and implementation strategies. Chowdry (2015) stated that thematic analysis is key to converting raw data and observations into understandings. As such, I developed themes as they presented themselves within the transcripts of the interviews as well as within the documentation that I collected. In the process, I also maintained a list of themes that are prevalent within the current literature on EA and FEAF implementations. I evaluated the data and determined if a new theme was being presented or if the data represented an existing theme within the literature. I achieved that by reading the interview transcripts as well as the public documents. As I determined a new theme, I created an associated entry with the relevant information within NVivo in order to document and track that theme. I looked for specific words as they related to the

themes found within the current literature and also looked for new themes that emerged within the interviews themselves. I then broke down and coded the themes and relevant data within the NVivo software. I included any relevant descriptions and attached documents to support the development and list the criteria of each theme. I used my interview questions as well as key aspects of FEAF itself to determine key themes within the responses gathered. I compared the automatically generated results of themes within the NVivo software. Specifically, I examined how each of the generated themes pertained to the questions that were asked. I then compared the results of the individual responses to see if there are any commonalities between the automatically discovered themes, the public documents, and the interview questions. The result were the key themes that I then further evaluated and reviewed and compared against the current research literature.

Reliability and Validity

Leung (2015) stated that in quantitative research, the reliability of a study refers to the ability of the researcher to establish repeatable processes and consistent results (Leung, 2015). The validity of a study ensures that the findings of the study genuinely represent the concept of the phenomenon being studied (Dikko, 2016). In qualitative research, reliability and validity are achieved through establishing credibility, transferability, dependability, and confirmability (Rapport, Clement, Doel, & Hutchings, 2015; Korstjens & Moser, 2017). The credibility of a study is the qualitative analog of internal validity in quantitative studies and refers to the quality of the data and how well conclusions reached within a study represent the underlying data (Connelly, 2016). The concept of transferability refers to the applicability of the study and its conclusions to

other, broader populations (Rapport et al., 2015). Dependability refers to how well the research process is documented and is repeatable and how consistent the data remains over time (Connelly, 2016). Confirmability refers to how well the research and conclusions within a study can be replicated (Moon, Brewer, Januchowski-Hartley, Adams, & Blackman, 2016; Korstjens & Moser, 2017).

Dependability

Dependability is demonstrated by maintaining a record or audit trail of research activities executed during the study (Moon et al., 2016). Moon et al. (2016) suggested that dependability is found in the details of the design and the research methods and that to elucidate those efforts that personal notes and reflections on the part of the researcher can increase dependability as it outlines the steps taken toward achieving dependability. Thus, I kept a reflective journal throughout the research process. Within the journal, I logged the actions that I took with regard to the procedures that I followed while conducting the interviews, analyzing themes and patterns, and drawing conclusions. Moon, Brewer, Januchowski-Hartley, Adams, and Blackman (2016) echoed the same sentiment by stating that the use of personal journals and notes enhance the collected data and in turn, enhance dependability. Korstjens and Moser (2017) also stated that transparency in the research process allows for audit trails and as a result, improved dependability and confirmability. As such, I collected all data, transcriptions, video, and audio files as they pertained to the research and included them for review in the research and appendices of this study. They were maintained within the NVivo software where they can facilitate audits and transparency and ultimately improved dependability.

Credibility

As credibility reflects how well the research and conclusions of a study represent the actual phenomenon, it plays a critical role in the quality of the study (Connelly, 2016). Connelly (2016) stated that credibility can be established through the use of prolonged engagement, member checking, and triangulation (Connelly, 2016). Liao and Hitchcock (2018) stated that prolonged engagement through member checking and multiple contacts enriches the credibility of the data collected. Additionally, Morse (2015) also recommends prolonged engagement to establish internal validity or credibility. That is because it gives the researcher an opportunity to evaluate multiple aspects of the phenomenon itself and also the relationship of the participants to the phenomenon. Member checking, subsequent to the initial interviews, allowed much of the prolonged engagement, I made use of member checking to verify that the data gathered in the interviews represented the participant's words. Each of those steps, the interview, and the member checking constituted a prolonged engagement that met the credibility requirements established above.

Transferability

Transferability can be achieved in qualitative studies by decontextualizing the theories presented in the study from the specific instance being sampled and through thick descriptions of the context of the study that allows for the transfer of concepts to other instances (Rapport et al., 2015; Connelly, 2016; Morse, 2015). Rapport et al. (2015) stated that transferability can be introduced into a study when sufficient contextual information is present in the data. Similarly, Connelly (2016) suggests that transferability

can be achieved in a study through the richness of the data. Morse (2015) describes the need for thick descriptions that offer multiple opportunities for readers of the research to relate to the findings. To achieve each of those, I documented the context in which the responses are given during interviews. I also followed with additional clarifying questions as needed. I then transferred the information gathered from field notes as well as notes gathered during the interviews themselves and include them in the final study. I also tracked the details of each interview to ensure that I was consistent in the level of detail and richness of the data that I am collecting.

Confirmability

Confirmability is key to establishing neutrality in research (Connelly, 2016). Confirmability in qualitative studies can be achieved through the use of detailed notes and audit trails through the use of reflective journals and well-documented procedures (Moon et al., 2016; Connelly, 2016; Korstjens & Moser, 2017). Connelly suggests that confirmability can be demonstrated through detailed notes on the part of the researcher with regard to decisions with regard to the research. Doing so allows readers to evaluate procedures and helps others to reproduce the results of the studies. Similarly, Moon et al. (2016) stated that detailed notetaking established a traceable link between the collection of the data and the conclusions that are reached with context provided by ancillary tools such as journals and audit trails, thus enhancing confirmability. As such, researcher bias can be mitigated and evaluated by the reader. To that end, I documented all of my procedures within the study with regard to the interviews, the context of the responses, and the general background of those being interviewed. Korstjens and Moser (2017)

stated that confirmability also involves eliminating or stating biases so that their effect on the research can be determined by the reader. The authors went on to suggest that bias can be elucidated or mitigated through reflexivity, or self-reflection of biases. Within this study, I kept a personal journal of the research and interview process. That allowed me to examine and review my own biases and practices.

Data Saturation

Data saturation can be achieved in a study when researchers detect that no new information is yielded from participant interviews or other data collection methods or there is sufficient data collected to replicate the results of the study (Fusch & Ness, 2015; Turner-Bowker et al., 2018; van Rijnsoever, 2017). Fusch and Ness (2015) suggested that leveraging the data collection method to reach data saturation through detailed and rich notes. To achieve that, I made use of member checking to ensure that the themes that are discovered within the data are in fact, accurate and representative of the perspectives and intentions of the participants. Similarly, Turner-Bowker et al. (2018) stated that data saturation can also be determined by capturing and tracking conceptual data and conducting thematic analyses. Van Rijnsoever (2017) stated that in many cases, determination of saturation in qualitative studies is at the discretion of the researcher to review their notes and themes. However, the researcher should be clear in defining what saturation is in relation to the study and how it will be achieved. I also spent time eliciting detailed responses from the participants and recorded themes in the NVivo software to help identify when themes began to repeat within the sample. To the same end, I also

made use of triangulation through review of documents participants directed me to in order to further elicit themes.

Transition and Summary

In the preceding section, I described the purpose of this study, which was to elicit strategies from successful implementations of FEAF that could be applied to agencies that still struggle to implement the mandated architectural framework. I selected an exploratory multiple case study methodology to elicit the relevant information. I made use of thematic analysis and track themes and information collected through semi-structured interviews through the NVivo software. I made use of member checking and triangulation to ensure that reliability, dependability, credibility, transferability, confirmability, and data saturation were achieved. I have also outlined the steps that I took in order to ensure the safety, privacy, and protection of my participants by following steps outlined in the Belmont study as well as adherence to the Walden University IRB procedures.

In the following section, I discuss the themes discovered during the semi-structured interviews. I relate that information to the current stated of the research and themes discovered in my review of the academic literature. I then evaluate how those themes can be applied by planners of IT within federal agencies. I then outline areas where further research is merited.

Section 3: Application to Professional Practice and Implication for Social Change

Overview of Study

The purpose of this qualitative multiple case study was to explore the strategies used by federal IT planners to expedite the implementation of FEAF. It was my intention to collect or derive a set of best practice strategies for agencies that have yet to reap the benefits of FEAF. Agencies are required to have FEAF in place to comply with the Clinger-Cohen Act of 1996, but many agencies, despite their best efforts, remain unable to reach that goal. This study endeavored to find strategies and make them available to other organizations that still have yet to experience the benefits of FEAF.

Presentation of the Findings

The overarching research question was: What are the strategies used by federal IT planners that expedite the adoption of FEAF? During 10 participant interviews, specific and clear themes emerged from the collected responses. The following section of my study details key themes that emerged from those interviews. There were five primary themes: (a) leadership support, (b) cultural integration, (c) understanding the framework, (d) political override of key initiatives, and (e) organizational knowledge retention.

There is a subsection dedicated to derived strategies that were elucidated by feedback from participants and data collected. To analyze the data, I used data analysis triangulation as well as data gathered from interviews, public documents, member checking, and field notes. Those collected themes represent strategies that have shown the most success in overcoming the challenges faced by IT practitioners in the federal government who are attempting to implement and support FEAF initiatives.

Theme 1: Leadership Support

The first theme that emerged from the data was that leadership plays a critical role with regard to motivating and moving forward initiatives related to the adoption of FEAF. Leadership is key to implementing FEAF because it dictates the expectations for outcomes. Strong and effective leadership also has an influence on attitudes toward change, specifically with regard to FEAF adoption. All 10 participants stated that the role of leadership in FEAF initiatives is key and that organizational leaders must provide clear and concise guidance to the rest of the organization, as shown in Table 1. The same was also supported by 13 public documents to the same effect.

Table 1

Minor and Major Themes of Leadership Issues

Major/Minor Theme	Participant		Document	
	Count	References	Count	References
Leadership support is key	10	22	13	11
Misrepresentation of empowerment by leaders	9	5	8	16
Leadership has own motivation	9	11	4	4
Lack of leadership accountability	9	4	2	2
Leadership fails to lead by example	8	15	3	13
Leadership does not understand FEAF/EA	8	14	6	15
Leadership not amenable to change/new concepts	6	8	2	2

Eight participants stated that leadership individuals should lead by example as they serve as role models for the organization and, given their leadership position, their actions set expectations and have a direct impact on those they lead. Leaders in organizations are the decision-makers. They are individuals who will evaluate those who work for them based on how well they have achieved the goals set out for the

organization. Thus, their expectations and actions are viewed as significant by individuals within the organization.

One participant stated that prior to his organization's adoption efforts, interest in his recommendations regarding architectural changes and standards were largely ignored. He stated that knowing the correct way forward may not matter if leadership has other priorities. He also indicated that fighting for such initiatives may not be an option free of negative consequences. As such, his experience further supports the idea that leadership having its own agenda is not conducive to progress in implementing EA or FEAF frameworks. Additionally, a sense of not having control over one's own job or environment can be pervasive when leadership is not empathetic or too politically or milestone minded. Similarly, eight participants indicated that their management prior to the adoption of FEAF failed to lead by example.

Nine out of 10 participants stated that, prior to their successful adoption, they viewed leadership as having its own set of drivers that they needed to meet first. The same nine participants also indicated that leadership support was key to any new initiative in an organization. The same theme was also supported by four public documents provided by participants. Nine participants stated that in past experiences where FEAF implementations failed, it was due to misaligned leadership goals. The same participants indicated that only after leadership achieved its own specific goals, would FEAF become a potential topic of discussion.

Six out of 10 participants stated that, prior to implementing FEAF, it was as if management avoided anything new or anything it did not immediately understand. The

same was reiterated by six participants who indicated that such leaders tend to stick with what they know and try to adapt their interpretation of FEAF and EA concepts in general to what they know, thus violating the spirit of the FEAF concept. Such mixed messages to the organization suggest a lack of organizational maturity and weak or ineffective leadership practices. Such practices demonstrate a more milestone mindset by leadership and their planning than that which is suggested as part of a FEAF compliance mindset. Such thinking can cause a number of issues as time goes on that also lead to friction with regard to following FEAF or changing interpretations. As eight participants stated, that was a lack of understanding and support of FEAF by leadership. That lack of support by leadership led to a sense of malleability of the interpretations and requirements of FEAF among the same participants.

Feedback from all 10 of the participants also indicated that most federal organizations are under regular audit from internal and external entities due to FISMA requirements. Such audits and the presence of internal and external influences can cause issues when attempting to determine how to move forward. When audited, systems or processes either pass the audit or are given a certain period of time to achieve compliance. Thus, FISMA establishes a level of accountability that is reported to agencies, such as the GAO or internal audit groups, and come with consequences for not achieving compliance. Nine participants stated that such a lack of accountability was a key cause for previous failures to adopt FEAF prior to their final successful effort. As such, if leadership is too milestone-focused, meeting FISMA regulations often takes priority over FEAF specific implementations, despite the fact that FISMA also requires

organizations to have a well-defined EA. FISMA does not specifically refer to FEAF or any other EA in terms of required frameworks. FISMA only sets an expectation that an organization defines an EA. Thus, many times in federal agencies while FEAF implementations exist, it is difficult to ensure that FEAF is fully and properly implemented, particularly when the concept is frequently buried under layers of other initiatives such as FISMA. Eight participants stated that prior to successful adoption, leadership did not express much interest in FEAF or view it as useful because they did not understand it. A theme that was present in eight participant responses was the fundamental failure of leadership to not only understand the concept of FEAF but also a tendency to respond only to those issues they are held accountable for. The same participants indicated that often the perceived presence of an EA by leadership met the needs of those FISMA audits, and the concern from leadership regarding EA and FEAF stopped there.

One participant expressed concern that, prior to adoption, FEAF concepts were either subject to interpretation or misunderstood by management. Nine participants indicated that higher-level managers oftentimes view specifics, such as making FEAF work within FISMA requirements, as a problem for lower-level managers and architects to define and resolve. Nine participants stated that this posed a problem because it was done under the guise of empowerment. Specifically, with regard to that sentiment, one participant said,

If you are told to do something and no one else knows that you have been given the authority to do it, you are completely ignored until someone announces it and really empowers you. Otherwise, no one will believe you.

The concept of misappropriation of empowerment was also supported by eight documents provided by participants. Those participants suggested that, in reality, it was more delegation or deflection of responsibility and completely lacked the delegation of the authority to execute. Conversely, the absence or misapplication of empowerment can also spread between teams and slow projects and implementations.

Another observation related to leadership was that policies and procedure documents were slow to be created and were often not updated, and there was no accountability at the leadership level for such failures. They stated that leadership was not involved at a documentation or policy level. Thematically it was clear that participants recognized that management styles or abilities often do not match the resources they manage. Thus, poor management was the cause for a general discomfort for change and a lack of understanding of how new ideas and technologies could be of benefit.

Within the discipline of IT, the importance of leadership is well-documented, and the results of this study confirm such criticality. Van Wart, Roman, Wang, and Liu (2017) supported the theme of strong leadership with regard to significant initiatives, as they suggested that managers lead by example and those who adopt the changes they mandate and are actively seen working within those frameworks have greater success with such implementations. That can also dictate how staff interpret what is useful to them to do their jobs. The importance of such knowledge was echoed in a study

conducted by Teeroovengadam, Heeraman, and Jugurnath (2017), who suggested that managers' lack of understanding of how new technologies or ideas can benefit them can result in a complete absence of willingness to adopt that technology or make meaningful changes. Another aspect of effective IT practice is empowerment of staff to achieve goals set forth in efforts such as implementing FEAF. Akinola, Martin, and Phillips (2018) stated that empowerment also involves giving authority to those delegates. Any lack of empowerment will negate the positive momentum of the implementation effort. Chen et al. (2019) suggested that strong and effective empowerment (empowerment that must include the delegation of power) of team members can passively extend from one team to another. Similarly, Ibrahimovic and Franke (2017) stated that issues of resistance could manifest when multiple external regulatory demands are present and interpretations vary.

The theme aligns and contributes to the literature on IT practice—specifically with regard to the technology acceptance model, where perceived usefulness of a concept will dictate user acceptance (Teeroovengadam et al., 2017). Moreover, Hui-Fei and Chi-Hua (2017) suggested that individuals are affected by their perception of what is useful and meaningful to them as individuals over what may be beneficial for the organization. Underscoring that sentiment, Hoert, Herd, and Hambrick (2018) stated that there was a significant effect on employees when leaders did not lead by example; it can also have a negative effect on project outcomes without leadership support, as it will affect the staff's perception of how useful the changes are. Odważny, Wojtkowiak, Cyplik, and Adamczak (2019) suggested that a lack of leadership maturity can lead to increased risk and lack of flexibility in an organization. Thus, when staff members are presented with the need to

make a change, there may be some resistance. Furthermore, Eckhardt, Laumer, Maier, and Weitzel (2016) stated that people are prone to routine seeking and that, while such resistance is normal, it can be problematic and result in what they deemed as cognitive rigidity, where individuals are not open to new ideas. If leadership fails to enforce those changes or they themselves do not follow through due to a lack of accountability, then other issues arise. Vriens, Vosselman, and Groß (2018) stated that the absence of accountability can lead to problematic decision making and even ethical issues, which aligns well with participant observations. Lee et al. (2016) found that top-level management is key to adoption and sustaining new technologies. While FEAF is not a new concept in and of itself, for organizations that have not yet adopted it fully, it is, in fact, a new concept.

The theme of strong and effective leadership aligns well with GST. Von Bertalanffy (1972) stated that each system supports the other and when one fails, it can adversely affect other systems. Furthermore, Caws (2015) stated that a system is defined by what it does. In the case of leadership, IT, and the business, the entire organization is defined as a symbiotic system because each would be meaningless without the other systems. The totality and value produced by that relationship are greater than the sum of each individually. Leadership dictates the path forward for an organization and establishes the goals and milestones that each department must reach in order to meet the needs of the organization as a whole.

Von Bertalanffy (1972) stated that systems interact and depend on one another to define a larger synergistic system. When one system—leadership—does not provide

quality interaction for the other system—those being led (IT and the business)—the system as a whole suffers. However, if those interactions can be aligned to achieve a common goal, then a greater synergy can be achieved through the cooperation of those two systems. In fact, such synergy is an absolute, and success cannot be achieved without it. Drack and Pouvreau (2015) stated that GST is defined by a combination—essentially that the output of synergy defines the system based on what it does. Bringing the same idea into the focus of practice was a theme raised by Pluscauskas, Henderson, Milburn, and Chakraborty (2019), who stated that full leadership and full engagement of the organization are key for success for those types of projects and support. Leadership groups also lend key insight and guidance to those they lead throughout the process; thus, the input they have with regard to the process and their commitment and level of engagement are critical in motivating and energizing other parts of the system (Pluscauskas et al., 2019).

Theme 2: Cultural Integration

Because EAs touch all levels of an organization, such architectures also have an effect on outcomes for all aspects of the organization. Thus, for an organization looking to adopt an EA, changing the culture is critical. Eight of 10 participants stated that FEAF must be a part of the organizational culture in order for adoption, continued use, and benefit, and the concept was also supported by nine public documents provided by participants, as shown in Table 2. Those documents highlighted the importance of having a focused and coordinated mindset when attempting to implement a FEAF framework in an organization. They also suggested that without broad-spectrum support—from IT, the

business, and general operations—such implementations are likely to fail; EAs, and FEAF in particular, touch all aspects of a business.

Table 2

Minor and Major Themes of Cultural Integration With Supporting Metrics

Major/Minor Theme	Participant		Document	
	Count	References	Count	References
FEAF must be in corporate culture	8	15	9	10
Strong policy and procedure are important	8	9	5	5
Governance leads to cultural change	8	8	7	9
Governance provides control	5	7	4	8
Departments have own drivers/siloed	3	2	2	2

Three out of 10 participants stated that prior to adopting FEAF, culturally, each group within their organizations tended to only consider their own needs on new projects and did not see the need for such changes. One participant stated, “Some groups become isolated and single-minded and feel as though they are separate and apart from the rules that other parts of the organization follow.” When viewed from an organizational level, such problems can enable the development of technological silos. Those three participants described each group as being unique and only thought of their own goals, independent of any other group, essentially providing organizational resistance to change.

Eight out of 10 participants stated that governance provided control that would avoid much of that isolation of groups. Furthermore, 8 out of 10 participants also indicated that strong documentation in the form of policy and procedure was critical in getting consistency within the organization in such a way that would not only support FEAF initiative but would also meet one of its key requirements. Participants also noted

that from a FEAF perspective, when a new business initiative is taken on, there was often a disconnect between the strategic plan level of FEAF and the systems and application-level that IT is expected to maintain.

The understanding of organizational culture confirms the common knowledge and understanding within IT that cultural integrations are key to successful initiatives and in particular in FEAF implementations. Aleong (2018) asserted that corporate culture plays a critical role when making changes within an organization. Similarly, Aier (2014) stated that such efforts are reliant on persistent support of the organization as a whole are also critical. FEAF encompasses an organization as a whole, which includes its culture. The culture of an organization also defines how well individuals relate to technology. Furthermore, having a single unifying culture helps to avoid silos within an organization and isolated decision making that is not governed or aligned with FEAF implementation. Roundy, Dai, Bayer, and Byun (2016) confirm the same as they stated that such types of group isolation were something that can take away focus from such efforts and have an overall negative effect on project performance. Gupta, George, and Xia (2019) stated that departmental cultures can pose a significant barrier to the adoption of various practices. They also indicated that making such changes can be a difficult task as individuals, as well as groups, are not always amenable to change (Gupta et al., 2019). Making the types of changes that FEAF requires, includes multiple disciplines and multiple departments to share an understanding of the requirements. Thus, having that type of information passively present in the culture significantly contributes to a positive outcome. Navimipour, Milani, and Hossenzadeh (2018) confirm that organizational culture has a

direct impact on the overall performance of the organization. Thus, aligning well with the concept of FEAF and EAs in general as each encompasses the organization as a whole.

Effective IT practice requires standards that consistently achieve specific goals. In order to do so, a system must function according to a set of agreed-upon rules, and the culture defines those roles. Kim and Toh (2019) support the same idea in their study, stating that culture and the experience of individuals with regard to internal cultures can dictate behaviors, whether they are effective or even deviant. That also ties in with strong leadership as the same study indicated that leaders will create such cultures based on their past experiences (Kim & Toh, 2019). The theme of cultural integration is also supported by concepts such as the technology acceptance model. Teeroovengadam, Heeraman, and Jugurnath (2017) asserted that through the technology acceptance model, usability and reliability are significant factors in how people view technology or associated changes. Adoption of FEAF relies on that concept for its implementation and its continued existence and support. A study by Avgar, Tambe, and Hitt (2018) represents support of the concept in that they stated that the ability of individuals to learn new technologies, specifically in new implementations is a key indicator of success in the endeavor.

Culture is a system of itself that categorizes and guides behaviors. Thus, the idea of establishing a guiding culture within an organization also fits well within the GST conceptual framework as it gives a system a purpose, a focus, and a function. GST puts specific emphasis on holism and in particular, how systems interact with one another (von Bertalanffy, 1972). The theme of cultural integration falls into the conceptual framework of GST in that it attempts to ensure that various systems work together as a

whole. Also, in line with GST, that cultural consistency gives the system, as Caws (2015) asserted, an identity, one defined by its function and its totality. With groups working together under a common culture, one that takes into consideration the needs of each of the groups, a synergy is leveraged in a way that would not be present otherwise.

Furthermore, it also allows for better interaction between systems, which is another concept within GST. An organization is made up of various departments or systems that contribute to a larger outcome or task. Thus, the concept of corporate culture fits well into the GST paradigm. In further support of the theme Casey, Griffin, Flatau-Harrison, and Neal (2017) stated that corporate culture can change the way that individuals understand or interpret their environment, which in turn can change the way that they function as a group or individuals.

Theme 3: Understanding the Framework

In order to understand a strategic goal or specific concept, common terms and a generally common understanding must exist among those who are expected to execute supportive tasks. Eight out of 10 participants stated that the conceptual understanding of FEAF was either limited or nonexistent among staff responsible for managing and implementing FEAF, including leadership, and the same was also mentioned in five public documents to which the same participants referred, as shown in Table 3. In part, those participants felt that it was also attributed to confusion with FISMA an initiative that often times take a much more prominent role in discussions and training. Five out of 10 participants stated that training is a key aspect of successful and effective FEAF and EA implementations. Another sentiment expressed by 5 out of 10 participants was that

training was critical to consistent and successful long term FEAF implementations. The same participants also stated that prior to successful adoption, there was no formal training for FEAF concepts within their organizations and understanding was poor or nonexistent. Many times, such training is obtained externally and at the cost of the organization. Furthermore, 4 out of 10 participants stated that prior to the organization's commitment to FEAF, the training they received was too general and not specific to that organization. As a result, when those who receive training return, they would then have to interpret and apply the concepts that they have learned according to their own personal interpretation of what they learned. That can result in incompatible viewpoints and interpretations of FEAF concepts during implementation. Furthermore, with a lack of regular training, the concept of FEAF may change or evolve without any adaptive changes within the organization. Thus, there is no regular update to that understanding which can result in a failure or eventual aging out of the initial FEAF compliance efforts as such implementations are not a single milestone rather a process with a lifecycle.

Table 3

Minor and Major Themes of FEAF Understanding With Supporting Metrics

Major/Minor Theme	Participant		Document	
	Count	References	Count	References
IT Staff does not understand FEAF	8	20	19	22
Leadership does not understand FEAF	8	11	5	7
Training is critical to adoption	5	7	4	11
Initial training vague/subjective	4	4	2	2
One and done mentality	2	2	3	4
Existence of specialty silos	5	6	4	5

Five participants found that when key planning staff was sent to training specific to FEAF, a positive mentality was pervasive, and many changes followed. All 10 participants indicated that their organizations had, in one means or another, implemented a FEAF training strategy that was also incorporated into their new hire or onboarding process. Establishment of such training programs was achieved either by expected certifications during their employment or by having regular in-house training to keep individuals apprised of best practices and changes to the concepts. That also helped to keep FEAF concept within their consciousness when planning and working with other standards such as FISMA.

Two of the 10 participants also noted that another misconception of leadership is that, once FEAF is in place, that a milestone has been reached and the topic can be dropped, which represents a lack of understanding of FEAF. Such a misinterpretation, the same participants stated, was a lack of planning and insight. Implementing FEAF is not just a single task; rather, it represents one step in an entire lifecycle. Once the framework is implemented, it must be maintained. The idea also coincides well with another theme found in the literature where Lee et al. (2016) indicated that long term support is key to the success of any EA implementation. Thus, long term planning is important.

The theme contributes to knowledge in the discipline in that it supports a concept observed by Bakar, Harihodin, and Kama (2016), who stated that training is key to the success of implementing EAs, particularly for those who are involved in the actual technical and lower level implementations. Furthermore, Cram, Brohman, and Gallupe (2015) discuss in their study, that such a lack of importance and understanding as to how

such changes can benefit the organization as a whole, can also result in a lack of funding for such efforts, further cementing the sense that FEAF efforts come second to others. As architectures age, they can become less relevant, as they may not adapt to the changing business requirements. A lack of training can keep recognition for the need to adapt out of the consciousness of staff and thus may give the impression that no further adaptations or changes are needed once an architecture has been implemented. Aligning with that theme, Nogueira, Romero, Espadas, and Molina (2013) stated that such EA efforts are cyclical and not static and that once in place, support and maintenance mechanisms must be in place to support them.

Further contributing to effective IT practice, is the idea that an effective collection of systems creates synergy, essentially groups working in a single effort, toward a single goal. A theme found in a study by Lee, Oh, and Nam (2016) aligns with that sentiment in that full representations of all aspects of such frameworks is required for all individuals to be able to work toward the same goal. Lee, Oh, and Nam (2016) asserted that EAs represent organizations as a whole. Thus, it follows that no single organization can function if its constituent parts are not working toward the same goal. Braduțanu (2015) suggests that with so many influences on an organization, having a single directive will help those systems within the organization maintain an identity and a focus that aligns in such a way that technical implementations can begin to show better rates of success. Eckhardt, Laumer, Maier, and Weitzel (2016) echoed the same sentiment as they stated that one reason for such a lack of cohesion exists within an organization's understanding of the concepts, specifically the FEAF are also based in individuals' discomfort with

change. Onimole (2017) also supported this idea in stating that better training for individuals who are most affected will offer those individuals an opportunity to learn and become more comfortable with new concepts. Thus, such resistance can be defeated. Such ideas and practices underscore the importance and the relevance to FEAF training with regard to the success or failure of its implementation.

From a GST perspective, teams can be viewed as small systems within a larger system. When those systems, do not interact effectively due to a lack of training or understanding of what needs to be done, the end product is not one of a synergistic effort. Mazzei, Ketchen, and Shook (2017) emphasized that organizations benefit from a GST perspective in terms of holistic function. That means that training can be leveraged and applied to other systems. The cross-application of training and concepts can be viewed as what von Bertalanffy (1972) described as the ability of GST to take one description of behavior and use it as an accurate description when applied to another system. Thus, the idea that one concept that helps to manage a system can be applied across other systems to similar effect, and it assists in developing systems to control the interaction of those systems. Similarly, Sayin (2016) stated that GST helps to develop a more holistic understanding of a system and its subcomponents. Such holism can be broken if any one component of that system does not interact effectively with other parts of the same system. Thus, such a strategy ensures that there exist compatible interfaces between systems that allow for a better holistic outcome for the system, in this case, the organization as a whole.

Theme 4: Political Override of Key Initiatives

All 10 participants noted that there was significant turnover in higher-level staff that could be attributed to political appointees and the nature of high-level positions in federal agencies, as shown in Table 4. As one of the ten participants noted, his organization had four CIOs, three security directors, and four CEOs in his 10 year tenure at his organization. Five out of 10 participants noted that with each individual appointment, the process for evaluating qualifications is not the same as with an individual who simply applies for a general management or IT job. Such a lack of IT or modernized education regarding FEAF was mentioned in eight public documents referred to by participants. Those five participants expressed concern that organizations were being led by people who only understand single-minded and older business management concepts and not the intricacies associated with new and modern organizations. Those participants also noted that as new CEO's are brought in, an entirely new set of organizational goals and culture are usually introduced, literally overnight.

Table 4

Minor and Major Themes of Political Influence With Supporting Metrics

Major/Minor Theme	Participant		Document	
	Count	References	Count	References
High leadership turnover	10	18	16	21
Integrate FISMA for success/consistency	10	12	5	5
Political agendas interfere	9	10	10	15
Political override kills morale	5	7	4	11
Leaders lack IT qualifications	5	5	8	13

However, the issue of political appointees and a constantly revolving door of C-level executives make the implementation of standards an issue, particularly when one key reason for appointing that person is to bring an organization into FISMA compliance. One example from a participant was that a new CIO was brought in to correct a number of noncompliance issues relating to FISMA. Within a few days, a new set of goals were set up with regard to remediating FISMA audit findings and existing FEAF compliance projects were reduced in urgency. He stated that the remediations to the audit findings were milestone-based and that they would only be what he referred to as a Band-Aid fix, that would not pass the audit the following year. However, the CIO who was appointed for those changes had moved on within a year almost immediately following the changes that he had initially set out to make. That is in part due to the fact that there are no mechanisms in place that would allow for existing issues or outstanding initiatives such as FEAF related compliance to be addressed directly and independent of a specific person or position.

Five out of 10 participants reported that the effect on the staff of such changes in direction were devastating. That type of negative sentiment can become instilled in workers when their managers and leaders demotivate them to take on tasks other than those that they as individuals feel are important for true compliance. They come by that observation through a natural set of events where time and time again such initiatives or new ideas are squashed by individuals who are not IT career-minded and that are solely in place to achieve a specific political goal. Those the same participants noted that such practices also cost the organization time and money since FEAF initiatives also needed to

be in place in order to consistently comply with the FISMA regulations for which leadership was held accountable. Five participants noted that the lack of morale resulted in IT turnover of what was reliable, and quality staff also began to rise. The same participants asserted that the turnover occurred because many of the individuals that worked within the organization simply could not tolerate the constant changes and compromises that they had to make within their beliefs of how to properly manage, design and protect systems. The same participants also expressed concern that they would be held accountable in the event that such Band-Aid fixes failed while the individuals responsible for putting them in place would likely no longer even be with the organization or even within government.

Gandy, Harrison, and Gold (2018) recognized in their study that turnover can cause great disruption within organizations. In line with what Shimoni (2017) asserted, that turnover is another type of organizational resistance, even if indirect or passive or political in nature. Similarly, Eckhardt, Laumer, Maier, and Weitzel (2016) identify the lack of identification of such problems by leadership and an absence of compensatory action as short-term planning. The result of such short-term thinking is that it interrupts or, in some cases, inhibits forward momentum and ultimately progress on any large-scale project or effort. Similarly, Panagopoulos, Hochstein, Baker, and Pimentel (2018) assert that turnover in organizations can have a significant impact on the ability of an organization to achieve key goals. That includes such factors as employee morale and awareness on the part of employees as to the priorities of initiatives and expectations (Panagopoulos, Hochstein, Baker, & Pimentel, 2018). Thus, if staff or employees are not

motivated, or if they are de-motivated, then efforts of large or small scale will be negatively impacted.

This study supports findings in the literature on IT practice that stated that such problems are prominent specifically within federal organizations and organizations that are guided by federal directives or guidelines, specifically FEAF. Such problems cause turnover and lack of consistent direction for organizations and are the result of or result in poor understanding of the regulatory rules and processes that guide federal organizations. The same idea falls in line with a study conducted by Ibrahimovic and Franke (2017), who noted that poor regulatory understanding and subsequent failure to comply could also have a significant financial cost for an organization. A study by Wilmarth (2014) also demonstrated the risks associated with such poor understandings in a study of a company that lost over \$130 billion due to such poor regulatory compliance and understanding. Gordon (2016) supports the idea of having a governing body in place that can handle such issues while management changes. Thus, the findings of this study confirm those same previously identified findings and also provide additional support for the idea that fluid leadership and directives contribute to poor project or performance on key initiatives.

The strategy relates well to GST in that it allows for a holistic identity to exist for an organization that is not dictated by any single individual or component. Drack and Pouvreau (2015) also assert that no single system can be defined by only one component. Thus, establishing that a problem within one part of the system, specifically in the case of staff directives, can have an effect, either positive or negative on the rest of the system

given the nature of GST. Robey and Abdallah Mikhail (2016), stated that GST emphasizes holism. Specifically, according to the principals of GST, a system is defined by what it does and not by its constituent components (von Bertalanffy, 1972). Thus, if the definition of the organization changes, its constituent components must also be able to adapt. When they cannot, they no longer function or interact as effectively as they once did. Thus, the system as a whole will suffer. However, by integrating the identity of the system into each of the components and requiring the key leadership components of that system to at least in part be compatible, the entire system can be saved, and alignment between the various components can be maintained. Hoyland (2012) made use of GST, specifically to implement EA within government, thus demonstrating its applicability to both IT and specifically to federal implementations of EA. Finally, staffing and constantly changing directives from GST perspective can be viewed as an interruption of the critical symbiosis between systems that Verma, Bhattacharyya, and Kumar (2018) asserted is critical in GST.

Theme 5: Organizational Knowledge Retention

FEAF as an EA and conceptualization that does not happen overnight or even in a single iteration. FEAF, despite defining specific components, is designed to adapt to an organization, its processes, and its political structure and influences. Thus, the description of that organization is not simply a current state. An organization is also shaped by its experiences, what actions were most effective, which were detrimental, what has worked, and what has not worked from both a business and a technical point of view. Eight out of 10 participants stated that in order to implement FEAF, broad organizational knowledge

is important to have while designing, implementing, and sustaining FEAF in federal organizations with the theme supported by eight public documents referred to by participants, as shown in Table 5.

Table 5

Minor and Major Themes of Organizational Knowledge With Supporting Metrics

Major/Minor Theme	Participant		Document	
	Count	References	Count	References
FEAF must be in corporate culture	8	20	7	12
Mentorship preserves cultural knowledge	8	8	7	9
Key to preserve organizational knowledge	8	10	8	10
Departments are siloed	5	7	4	11
Staff attrition	4	4	5	7

Four participants mentioned that with issues such as retirement and attrition that a great deal of institutional knowledge can be lost with the departure of those individuals. One participant mentioned that over 30% of his full-time staff would reach retirement age within the next 5 years. Optimally, when new individuals come in, they may bring with them a knowledge of FEAF and EAs in general. However, understanding the organization, its history, organizational culture, and internal processes is critical to implementing FEAF and is something that individual cannot bring. One participant stated that individuals who have such knowledge are often expert problem solvers as they have intimate knowledge of cryptic or little-known policies and procedures that may be key to the success of a FEAF implementation. Eight participants stated that such knowledge is key to all stages of the life cycle of a FEAF implementation. Those same eight participants stated that for them, one of the effective means of establishing retention of

knowledge was to place such individuals in teaching or mentoring positions. The same participants stated that knowledge includes key aspects of organizational drivers and complex regulatory concepts that are gained through learning experiences and are not amenable to documentation. Thus, such people are critical as part of an organizational system.

Another issue raised by 5 out of 10 participants was that, prior to having such practices in place, their IT and business departments became siloed. The result they described was one of information hiding, tension, and uncooperative behaviors between departments. That, in turn, led to a number of failures specific to FEAF and FISMA compliance as teams could not work together to achieve a common set of goals, even if that were in the best interests of the organization.

Another challenge discussed by four participants was that there are many individuals who possess significant amounts of organizational knowledge who leave the organization and that knowledge leaves with them. Again, one of the four participants stated that up to 30% of his entire organization's employees were eligible for retirement within the next 5 years. As the government is intended to provide relatively stable and consistent work, individuals often times can stay at stable organizations for years if not decades. During that time, they collect a wealth of professional experience within either the professional domain but also within their current organization. While the same participant did not expect to see all 30% of the staff depart at one time, it does mean that the institutional knowledge of those individuals will go with them when they leave if not captured somehow.

This study confirmed knowledge within the discipline that indicates that working in federal environments requires knowledge of a wide range of policies, procedures, and regulatory guidance that focus on rules and regulations. It also confirms that such rules are frequently complex, and often times are learned rather than understood via direct documentation. Dawson et al. (2017) suggested that not knowing about such regulatory or policy issues can be problematic and cause great confusion within an organization. The same is echoed by Wilmarth, (2014), who stated that such failures can also result in significant financial penalties. Such failures can come as a result of individuals or even leadership focusing more on the milestones of the rules rather than the spirit of those policies or even underlying logic. Such an issue is made even more problematic as the employee pool changes over time, as one generation takes over from the next. Hillman and Werner (2017) correlate the same, stating that over the next 10 years, unprecedented numbers of baby boomers will retire and take their knowledge with them. Thus, as time goes on, organizations can lose their technical and functional histories along with the lessons learned that come with that history. As such, they can find themselves stuck in a cycle of making the same costly mistakes because there is a lack of organizational history or knowledge.

This study may contribute to the literature on IT practice in that it brings together a conceptual framework that includes both psychological, organizational, and regulatory considerations in the implementation of a specific type of IT architecture. Supporting the same idea, Hazen, Bradley, Bell, In, and Byrd, (2017) stated that an EA describes an organization, its operation, and its purpose. It is essentially a collection of systems. This

study also ties together the need for historical background of problems faced within such implementations with existing literature. Siewert and Louderback (2019) asserted that the loss of key individuals represents significant problems for an organization as key information is lost along with those who leave an organization. Brătianu (2018), asserted the same, emphasizing the importance of such knowledge, citing its importance in helping the organization maintain its wholeness. That information tells a story that helps create the identity of the function of the organization. This study attempts to add to that literature by raising its awareness again and offering potential solutions.

Von Bertalanffy (1950) described a key concept of GST as information about one system can be applied to another with significant success and accuracy. In the case of FEAF and within this study, GST can be applied to examine the effect of one system, employees and their knowledge, essentially their ability to effectively function and achieve a greater goal as a group rather than a single individual or group. Thus, using GST to examine the complex interactions and synergy required to make such implementations, a functional and effective reality lends itself well to the GST conceptual framework. GST also supports the idea that systems creating something greater than their own sum and also describes the synergistic interaction of systems. The author of GST stated that the study of systems and their interactions was well suited to explain complex and dynamic systems (von Bertalanffy, 1972). Erichsen et al. (2013) also supported the concept as they examined systems and related the interdependence of systems to achieve a much larger goal in complex environments. Given the complexity of federal IT systems

as well as the complexities of the environments and the groups that must support them, the theme aligns well with the GST conceptual framework.

Applications to Professional Practice

Leadership Training and Buy-In

One strategy derived from all 10 participants responses indicated that they had the most success in FEAF initiatives when they were able to educate leadership and align their FEAF goals with FISMA. They did so through training and educating leadership while also in and emphasizing the ability to leverage FEAF to provide artifacts for FISMA compliance, which ultimately led to greater leadership buy-in. Those practices and efforts established understanding and subsequent buy-in from leadership. The same theme was also present in the literature, as Onimole (2017) suggested that better training of management and those most affected by change can remediate issues associated with motivation and buy-in. Furthermore, a study by Rouhani et al. (2015) stated that clarity from leadership and strong support had a strongly determinative impact on the outcome of project and initiatives. That requires, spending time with those in leadership positions and putting FEAF in terms that they can understand, specifically relating it to FISMA. One participant stated that in some cases it was almost easier to leave the term FEAF out of most of the discussions altogether as leadership oftentimes is pressed for time and generally require quick and easy to understand concepts presented to them. One key concept that was discussed in the interviews was educating leadership about FEAF by putting it in terms of FISMA. If items within the FISMA requirements could be tied to FEAF concepts, then the difference between the two concepts became almost irrelevant.

Leaders have an almost parental and guiding role in how those they lead, behave, and interpret initiatives. Thus, the importance that they place on compliance is essentially transmitted through them to those under their charge.

Governance

To overcome challenges related to organizational culture, eight participants stated they had the most success in introducing FEAF concepts and processes into the corporate culture by establishing governance boards, specifically architectural and change review boards (Table 2). Governance level discussions allow for regular communication and cooperation through governance processes themselves and policy. Guetat and Dakhli (2016) support the same idea in their research as they suggested that governance processes allow for control over multiple aspects of a single organization. That means it brings together different parts of an organization and allows for alignment. Additionally, Gordon (2016) supports the same sentiment by stating that governance, which functions according to guiding policies and procedures, also allows for better control of risks for the organization which includes technical or compliance risks. Thus, the derived strategy that participants found that contributed to the successful adoption of FEAF was the establishment of governance. One board specifically mentioned was an architecture review board. The architecture review board can encompass a number of different relationships between the business and IT. It asks various questions, such as whether or not certain technologies can be reused. As an example, that question alone can eliminate the proliferation of software titles within an organization where multiple software licenses are purchases that essentially serve the same purposes, supporting both FISMA

and FEAF concepts of audit and reporting of inventories and fiscal responsibility.

Secondly, doing so also promotes understanding between IT and the business. It allows each department to hear what the implications are for the changes that they are requesting. It also presents an opportunity to ensure that resources are available for certain projects and that all proper reviews are completed, with resources allocated, prior to beginning a new FEAF related project.

The use of guiding policies and procedures for those governance boards aligns with a theme found within a study by Pirta and Grabis (2015) that stated that policies and procedures are essentially a recipe for individuals to follow and dictates behaviors and outcomes. Thus, with regard to FEAF, it plays a critical role. To that end, IT governance allows for the enforcement of a set of policies and procedures that must be followed. Those policies and procedures are a platform where concepts such as FEAF and FISMA can be brought together in a single compliancy effort for new and existing projects. For example, if introduced as part of the corporate culture, new projects and new initiatives are sent through the ARB. That is where due consideration is given key aspects of FEAF, as well as other related aspects of FEAF such as how well the new technology will support the business as well as the value considerations of the investments that are made. When such considerations are integrated into the corporate culture, they become automatic and are much more easily implemented and supported in the long term, where they yield the most value.

Integrate FEAF Training

Braduşanu (2015) suggests that resistance to change comes from all levels of the organization. All levels of the organization must go through departmental orientations. Such a process presents an opportunity to integrate FEAF training, its importance, and its concepts into the consciousness of all levels of the organization. Integration of FEAF training at the time of hire and throughout employment was a strategy that was suggested by 10 participants to be most successful in their final FEAF implementation. Another common strategy derived from participant responses suggests that having a strong IT onboarding policy and procedure in place along with specific organizational training related to FEAF will make FEAF part of the thought process of all planning processes moving forward (Table 3). A similar theme was also echoed by Olsen (2017), who asserted that not having proper training in the tools to implement such strategies or architectures was a strong deterrent to making meaningful change. Five participants stated that having training included in policies and procedures that offer commonalities between groups, goes a long way to resolve issues related to technical silos that can often manifest in IT organizations (Table 3). The same theme supported by Bakar et al. (2016) who stated that lack of training can have significantly detrimental effects on any EA implementation.

Key Initiatives

To address the inconsistencies and circular work related to C-level and IT turnover, each of the 10 participants stated that their agencies demonstrated great success in implementing a strategy of developing FISMA compliance standards and policies that

integrated FEAF (Table 4). All 10 participants stated that key to compliance was to use FISMA as the auditing component to FEAF and to support it with preexisting policy and procedure. Thus, each of those issues could be addressed as they arose, in between C-level appointments independent of the agenda of the individual who occupied the CIO position. Furthermore, CIO's of federal organizations are accountable for FISMA audits, which are given high visibility in the current federal IT environment. Thus, as part of their appointment, those initiatives are critical to the success of their tenure even in the presence of other motivations, political or otherwise. When mandates can be separate from any individual or were made part of the goals of transient staff, nine participants noted they were much more likely to be implemented and challenging their importance and urgency would be difficult. All 10 participants stated that putting goals in terms of FISMA through FEAF implementations was key to a successful implementation of FEAF that it also allowed for consistency consistent between leadership changes (Table 4).

Institutional Knowledge Retention via Mentorship and Documentation

Eight participants noted that institutional knowledge retention and organizational knowledge was key to having a coherent FEAF architecture implementation and maintenance plan (Table 5). Eiriz, Goncalves, and Areias (2017) stated that through the use of joint activities between learners and teachers within an organization, that such information can be retained. There were various ways that participants achieved that goal. However, there were common themes within. Four participant responses indicated that employee retention is important, employees are key reserves of experience and relationships, and in of themselves can represent a system that assists in achieving goals

(Table 5). Eight participants stated that making use of a mentor-mentee relationship went a long way as a strategy to achieve retention of institutional knowledge. Those same eight participants noted that many times on projects, the tendency is to have one senior person manage the project alone. However, that puts not only the project but the impromptu project manager at a disadvantage. The first problem is that the project has a single point of failure. That is because all of the knowledge resides with one person. Even if documentation is present, in the absence of that person, the documentation may not be readily available and may lack context, thus reducing its usability. However, those same participants noted that when that person is paired with another more junior person, a number of benefits result, particularly as questions and context can be addressed. First, a single point of failure is eliminated. The information about the project and its management is shared with another person. Secondly, that person is also allowed to view the relationships that are made that contribute to FEAF project, and information is shared demonstratively, thus absorbing institutional knowledge. When combined with good documentation of projects, the process functioned as a successful strategy for maintaining organizational knowledge. Matthies (2017) stated that there is a tremendous amount of important information that is contained in such project documentation and information exchange. Furthermore, when the project manager leverages key relationships and explains their actions to the more junior person, transitively, information is exchanged. Most importantly, relationships are formed between the mentee and those key individuals who can represent potential roadblocks to the initiatives. The case is the same whether those are new implementations of FEAF or simple maintenance of existing

implementations. Thus, having a program where a senior member mentors a more junior member and shares institutional knowledge is one strategy for keeping knowledge in existence and a leverageable tool. Supporting the same, Siewert and Louderback (2019) asserted that the loss of key individuals in an organization is a much greater problem than simply replacing the function they serve, thus lending import to the exchange of knowledge.

Of equal importance, eight participants noted that with regard to organizational knowledge, they achieved success in FEAF implementations and maintenance when sufficient documentation via policy and procedure were in place that outlined the challenges and processes that needed to be followed to achieve success within the organization (Table 2). While policies and procedures are helpful, there is a certain amount of information that is not always available with regard to how those policies are interpreted or if there are certain requirements to them that may not be listed in the original policy and procedure document. Thus, institutional knowledge again comes into play. Matthies (2017) also asserted the importance of documentation for information retention for the success of projects. If additional documentation can be generated within each department that takes general policies and procedures and creates specific and more detailed subcategories for them and how they relate to that department and how to implement them, the process becomes much more simplified.

Those same eight participants use another component of that strategy by creating a log that described how they achieved key milestones within the project. That practice retains institutional knowledge by recording key events within each project. Bitelli, Gatta,

Guccini, and Zaffagnini (2018) suggested that documentation in projects can be a rich source of information that can lend context to a project. While it may be something as simple as a technical log, it also includes key information about how milestones and key aspects of the project were achieved. It includes knowledge of how long it takes for procurement to make purchases, how the procurement process works as well as where to go to get permission and buy-in to move ahead with implementations or changes. That then could be leveraged as a historical reference for future projects and also offers the potential to develop a lessons-learned approach to future endeavors. Eight participants asserted that success in such a strategy involves good record keeping with regard to projects and initiatives. It also requires that there be a culture that allows for critical discussions and evaluations of projects. Just as with the construction of a building, there are documents that show various zoning approvals and procurements and permits filed, the same can be done with FEAF initiatives. That can then be used to generate an algorithm that can be applied to future projects that is more likely to capture various procedural challenges before they become issues. In another study conducted by Brătianu (2018), refers to institutional knowledge as key to procedural knowledge, specifically stating that it contributes to the holism of the organization, thus also aligning well with GST. The author further goes on to stated that such knowledge captures many key aspects of the organization that are only captured by experience or within specific language and experiences (Brătianu, 2018).

Implications for Social Change

This study may contribute to social change as it may enable federal agencies to provide more effective and secure services to citizens. In the process, it may also optimize time and financial resources so that taxpayer money is better spent. Federal agencies rely largely on their IT infrastructure. When they ensure that infrastructure is effective and trustworthy, it may be leveraged to provide new and innovative services where it could not before. Thus, with the improved efficiency and structure of FEAF, federal agencies may become centers of innovation. As the government is oftentimes largely in view of the public, their achievements may then be publicized and used to inspire actions in private industry as well.

The federal government is often times where individuals go when they need help. When a federal organization is able to provide dynamic and effective services without bureaucratic hindrances related to poor or ineffective infrastructure, two things may result. The first is that the people that need services are getting those services that they need, that they have been promised and that they have paid tax dollars to receive. That helps avoid a behavior that Erdogan, Ozyilmaz, Bauer, and Emre (2018) described as learned helplessness. That means that individuals, after being faced with multiple failures, no longer attempt to even try as they assume the result will always be the same. Thus, such changes may work toward restoring faith in federal services to get help to individuals that need it most. With improved reliability and efficacy of the underlying systems and organizations, the services may be delivered more effectively. The result is that the public is not swayed by the impression that they will not get what they need, thus

will not try, they will not assume that the service that they need from the government is not worth the wait or the hassle that may result. That means that federal services may become more accessible and usable to more people. The end result is that more people may benefit from such services.

Inspiring federal IT practitioners will enable the federal government to expand passively and to connect better with private industry. Currently, there are a number of organizations that rely on access to federal information systems. That includes census data that schools and state governments may use to better serve their local communities. The federal government is in a unique position to collect certain types of data in large quantities that other private agencies cannot do. When it is no longer hindered by legacy systems or incompatible data exchange formats, that information may be offered to the public and put to good use, particularly, when that information does not contain personally identifiable information. Census data may also be more easily provided to universities where currently only certain private companies have the resources to aggregate the data and charge exorbitant fees for access to the information.

Culturally this study may benefit society in that it also shows that many IT problems are not always related to technology. This study revealed that having a good understanding of individuals in organizations has a significant benefit to the organization as a whole and the ability of that organization to leverage its IT resources. A better understanding of individual perceptions and psychology may lead to better retention within organizations and lower turnover, thus making organizations more stable and making staff more informed.

Those strategies for applying EAs within the organizations may do much the same in private industry as well. Many organizations function according to external user demands and respond accordingly. However, sufficient thought may not be given to how to meet those new needs. Thus, the importance of EA and having an effective means of implementing it may contribute to establishing better business practices. Those practices include better protection of individual data. that, in turn, may increase the trust in those businesses, which may result in a more robust and reliable economy, thus providing benefit to society.

Recommendation for Action

Leadership and in organizations must learn to lead by example and to support FEAF efforts. IT practitioners must plan around transient leadership and integrate FEAF into FISMA initiatives. Efforts of this nature can be bolstered by educating leadership and putting individuals into those positions that understand FEAF and IT as well as the business. The same individuals are also responsible for putting the correct mindset into the corporate culture so that FEAF is present in all aspects of organizational functions. Organizations also need to take steps to continuously educate their staff as well as their leadership in FISMA and FEAF concepts. Specific to FEAF, IT planners, need to better link FISMA and FEAF to one another and to provide more consistent support, through training and ongoing documentation. Organizations as a whole must put in place policies and procedures that ensure that FEAF efforts are not ignored due to political appointees or transient leadership staff. Finally, organizations must retain key knowledge through mentoring and peer relationships and document this in additional policies and procedures.

In my research on the subject, I noted that there was a significant lack of updated literature and guidance on FEAF published by the federal government, specifically from the Office of the CIO as to how to better plan, execute and understand the environment in which such architectures will be placed. Such efforts should include clear guidance as to how to produce and maintain quality documentation along with fundamental maturity requirements for each organization. That could be achieved through dissemination of information through conferences and the establishment of centralized support organization that could advise agency leadership and IT staff. More importantly, such agencies could offer support and track FEAF in federal organizations. The same would also allow that agency to track progress and also quantify the benefits of those practices.

While there is an awareness of FEAF, there is little official documentation as to the statistics of the adoption of those practices and an agency such as that suggested above may also be able to provide that information. Instead, an emphasis on FISMA has been put in place, that pressures organizations into providing artifacts and not providing quality results. However, only certain organizations respond positively to that pressure by following those strategies to develop their FEAF implementations. Others only place emphasis on being able to meet auditing requirements without the context of a well-defined FEAF implementation. Thus, a clarification on the part of the government with regard to how FISMA and FEAF can be synergized is recommended.

Recommendations for Further Study

In earlier sections, I identified various assumptions, limitations, and delimitations of this study. This study focused on a specific architectural framework, population, and

subset of agencies. Future studies may expand upon such bounds and include private industry as well as the federal space. Future research could also benefit from an expanded demographic population that extends outside of the DC metropolitan area. Such an expansion could offer insight into the applicability and validity of the findings contained in this study on other industries and organizational types.

I also recommend further study on EAs. Currently, there are many options from which to choose and practitioners have few means of evaluating the ways in which an EA should be developed. Many times, practitioners become mired in attempting to match an existing EA with one that is already in existence. While the idea yields benefit in that each company need not start from scratch, it also forces organizations to attempt to adapt their business to a pre-defined or templated EA. Thus, studies that can provide general concepts for general architectures should be pursued to allow for individuals to more easily customize their EA implementations without getting caught up in trying to juxtapose an EA on to their organization.

I also would recommend that further study be conducted on the psychological and organizational aspects of federal IT agencies with a focus on IT departments. Von Bertalanffy (1968) stated that when two systems can integrate, their value and function can, if properly aligned, be greater than the sum of their components. As such, studying the environment, the culture of the federal space is important. This study revealed that there are maturity issues within many federal agencies, along with a strong resistance to change. Thus, studying the psychology of those organizations, the individuals, and what motivates them would be a significantly important area to study.

Another recommendation for study is to examine how such large entities such as federal organizations can establish a more common set of data exchange standards, that are both safe and secure. That would allow for better sharing of information and also de-duplication of systems as many agencies collect or develop the same information and do not share it.

Reflections

As an IT architect who has worked with federal organizations as well as not for profit and private organizations, I see many of the same themes in all of my experiences with EA. When I started this study, I expected to see a much greater base of well-established FEAF implementations. However, I discovered that many if not most federal organizations struggle to keep FEAF updated if they have implemented it at all. Without support from leadership and without buy-in and belief from those who work at the organization, FEAF implementations will almost always fail. It is not a failure of the concept; rather, the delivery of the product itself. We must consider the most complex and frustrating part of IT when considering implementing such structures, and that is the human component. Resistance does not come from the network, nor the server, rather the individual or individuals within the organization. Such resistance can come in many forms. It can come in the form of a lack of understanding, FEAF or a simply a fear of change and of admitting weakness.

In soliciting participants for this study, I was surprised by how many individuals stated that they could not participate as they had left their FEAF support roles or even government work in general. Thus, I saw that there is a tremendous amount of

psychological inertia within government with regard to best practices and FEAF. However, those willing to move past that initial discomfort, have contributed to the practice of IT through their participation in this study.

Summary and Study Conclusions

FEAF implementation is a complicated process that needs more support from high-level federal IT practitioners. FEAF is predicated on a number of difficult to quantify measures. Thus, it is difficult to determine when an implementation is complete or even successful. Additionally, the role of the enterprise architect in federal organizations varies significantly. Thus, better definitions of the role would go a long way in helping to promote the synergy that FEAF was developed to achieve.

Leadership support is generally lacking for FEAF as most organizations opt to comply with FISMA over having a strong FEAF implementation. A pervasive mindset of achieving milestones for FISMA has had a negative effect on both FEAF and FISMA initiatives and will continue without proper guidance.

When systems, in particular, federal systems, can run efficiently and securely, services improve and are more often utilized. This also instills trust in government and builds a better reputation for agencies. When these aspects are not present, federal agencies begin to lose efficacy and, in some cases, relevance. As such, it is critical that accountability and continuity for long term FEAF implementation and support become a part of federal culture.

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Appendix A: Phone/Skype Interview Protocol

Topic: Strategies utilized by federal organizations that have successfully implemented FEAF.

Collected data source(s):

Interviews (in person or via phone) Collected document

Audio/Video/Multimedia Observation

Interview Protocol

Date and Time		
Location		
Participant ID		
Step 1	Consent form, privacy documents signature	Prior to interview, provide all consent forms to participant. Ensure that prior to conducting the interview, that this document has been signed and is in the possession of the researcher.
Step 2	Introduction of the researcher	My name is Michael Caruso. I am a Doctor of Information Technology candidate at Walden University. I have been working in the field of IT for about 18 years on both technical and management roles. I want to thank you for taking time out of your schedule to participate in this study.
Step 3	Identify the purpose of the research study	The purpose of this study is to explore successful implementation strategies as they pertain to FEAF.
Step 4	Relate why participation is needed	The data that I will take from today's interview, along with any organizational documents will help provide answers to my research question and provide partial fulfillment of the degree of Doctor of Information Technology from Walden University.
Step 5	Beneficence discussion	Information from this study will be shared with you and others in the professional and

		academic community. It will help expand knowledge of effective practices in the implementation of FEAF. Your participation in this study is voluntary and is without compensation.
Step 6	Discuss privacy protections and ethical boundaries	To ensure your privacy is protected, I would like to get your permission to record this interview and to take notes regarding our interactions and your response. In this process I will make an introduction only using your participant ID and ask you to confirm your permission. May I begin recording now?
Step 7	Begin audio recording	My name is Michael Caruso. Here with me is <participant ID>, today is <Day, Date, Time>. Can you please confirm that I have explained the motivation and background for this study and that I have covered the motivation for your participation as well as the benefits and that I have your permission to record this session and take notes?
Step 8	Explain Confidentiality of the study and participants	<p>At any time during this interview you can stop me to ask questions or terminate the session and/or your participation in this interview.</p> <p>Information gathered during this interview will be treated as confidential. There will be no disclosure of any of this information to your employer or any other individuals.</p> <p>I would like to request that you refrain from using any specific names of individuals or organizations in order to protect the privacy of others. In the event that such information is present, I will remove that information from the transcripts so that no one discussed can be identified in any way.</p> <p>To reiterate, all information collected in this interview will only be used in this</p>

		<p>study and for no other purpose. No identifying information or specific responses will be included in the final study.</p> <p>Any information gathered during this will be protected. Digital information will be kept for a five-year period on an encrypted and password protected drive. Physical documents will be stored in a locked fireproof safe for a period of 5 years, at which time they will be securely destroyed.</p>
Step 9	Ask participant if they have any questions	Before we begin do you have any questions for me?
Step 10	Begin interview questions	<ol style="list-style-type: none"> 1. What strategies have you used to ensure your understanding of FEAF in order to support adoption? 2. What strategies have you used to measure progress and define completion of FEAF adoption? 3. What methods did you use to identify, define and document critical services to transition them over FEAF architecture? 4. What strategy did you use to define and standardize systems and processes to establish functional integration as defined in FEAF? 5. What strategies have you used to evaluate and manage staff and technology resources in order to adhere with FEAF? 6. What strategies did you use to define, implement governance to manage the architecture to support FEAF? 7. What strategies did you implement to ensure that the governance process of FEAF and its authority was presented to the organization?

		<p>8. What strategies did you utilize to establish and manage system development and technical standards for implementing FEAF?</p> <p>9. What strategies did you use to manage system and resource utilization within the organization when implementing FEAF?</p> <p>10. What strategies did you use to implement audit and reporting services to support FEAF?</p> <p>11. What strategies did you use to overcome cultural roadblocks to adoption of FEAF?</p> <p>12. What strategies did you find successful in establishing full leadership and organizational support for FEAF adoption?</p>
Step 11	Review notes and ask for any clarifications	
Step 12	Ask participant if they have any questions, pose follow up questions	<p>How long have you worked at this organization?</p> <p>Have you found that any of those strategies have failed?</p> <p>How do you follow up in the event that such efforts fail?</p>
Step 13	Collect any physical documents the participant can provide	This concludes the interview portion of our meeting today. At this time would you like to provide any organizational documents or other media as it pertains to your role or the questions asked?
Step 14	Conclude interview	Thank you again for your time. As part of this process I would like to schedule a follow-up conversation to review your responses and my interpretations? Would you be amenable to this? What is your preferred method of scheduling and contact?

Appendix B: Interview Questions

1. What strategies have you used to ensure your understanding of FEAF in order to support adoption?
2. What strategies have you used to measure progress and define completion of FEAF adoption?
3. What methods did you use to identify, define, and document critical services to transition them over FEAF architecture?
4. What strategy did you use to define and standardize systems and processes to establish functional integration as defined in FEAF?
5. What strategies have you used to evaluate and manage staff and technology resources in order to adhere with FEAF?
6. What strategies did you use to define, implement governance to manage the architecture to support FEAF?
7. What strategies did you implement to ensure that the governance process of FEAF and its authority was presented to the organization?
8. What strategies did you utilize to establish and manage system development and technical standards for implementing FEAF?
9. What strategies did you use to manage system and resource utilization within the organization when implementing FEAF?
10. What strategies did you use to implement audit and reporting services to support FEAF?

11. What strategies did you use to overcome cultural roadblocks to adoption of FEAF?
12. What strategies did you find successful in establishing full leadership and organizational support for FEAF adoption?