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Strategies Federal Government IT Project Managers Use to Migrate IT Systems to the Cloud

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This is to certify that the doctoral study by

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has been found to be complete and satisfactory in all respects,
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Walden University
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Abstract

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MBA, Capella University, 2012

MS, Capella University, 2004

BS, Old Dominion University, 2002

Doctoral Study Submitted in Partial Fulfillment

of the Requirements for the Degree of

Doctor of Information Technology

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Abstract

Several processes, security, and confidentiality challenges cause the slow adoption of cloud computing within the federal government. Information Technology (IT) senior leadership in the federal government is concerned about the slow adoption of cloud computing because it impedes federal IT systems management. Grounded in the technology acceptance model, the purpose of this exploratory multiple case study was to explore strategies federal government IT project managers used to select systems to migrate to the cloud. Participants consisted of 10 IT project managers from 3 federal organizations in Virginia and Washington, D.C., responsible for migrating federal government systems to the cloud. Data were collected using semi-structured phone and video teleconference interviews and 37 organizational documents. The participants' interview transcripts were analyzed using inductive coding. Three major themes emerged: mission owner readiness, leveraging industry expertise, and application categorization. A recommendation for IT project managers is to determine the processes needed to place specific systems in the cloud by leveraging industry best practices to address sluggish transitions to the cloud. Information technology managers can use the findings to understand the policies, the support needed, the training, communications, and cloud transitions strategies to improve federal government organizations' cloud transition initiatives. The implication for positive social change includes the potential to lead to home and workplace reductions of the carbon footprint by consolidating data and allowing data to be stored, managed, and processed remotely at a data center instead of locally.

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Dedication

I dedicate this work to my Lord and savior Jesus Christ, my parents Diane and Robert, my husband Hensley, my children Saquan, Hensley, and Zahir and my siblings LeTesha and Crystal for their unwavering support and motivation to keep pushing me through this life-changing process. I am thankful that multiple situations that surrounded me aided my decision to keep moving forward, and I have my family to celebrate my achievement of completing this process. Being a female minority that was once told that I was not college material makes me feel so accomplished and proud that my mom told me I could do anything if I put my mind to it. I pray that this Doctoral degree will not be the last degree of my family, but will be the first of many.

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There are several people that I would like to thank for their support. Initially, I want to thank my committee chair, Dr. Jon McKeeby, for sharing his personal story about his challenges while pursuing his doctoral degree, which motivated me to keep going. Dr. McKeeby always extended his encouragement to me when unforeseen life changes happened that delayed my progress with completing my research and provided feedback that was always straight forward. Without Dr. McKeeby's inspiration, I know I would not be writing this today. I would also like to thank Dr. Don Carpenter for his expertise and attention to detail during this process. He provided thoughtful comments that triggered my understanding to make the improvements needed to rejuvenate my writing and thoughts. Additionally, I would like to thank Dr. Steven Case for his words of wisdom at the very beginning of my program and during the residencies that helped me with embracing what to expect and how to get through difficult phases of my journey. I would also like to thank my past and present peers for the weekly motivation and example of perseverance. Thank you to the accomplished participants that were able to take time out of their busy schedules to provide valued input to my study. I hope that my research will be appreciated and used as a common reference. Lastly, I would like to thank my immediate and extended family for giving me the willpower to complete this process.

Table of Contents

List of Tables

Section 1: Foundation of the Study

Background of the Problem

Adopting cloud computing may assist federal government organizations with multiple ways of sharing information. Cloud computing is a virtualized IT resource that can be scaled according to the type of service, payment options, and privatization (Schniederjans & Hales, 2016). The focus of this study was on federal government organizations that have strategies to select systems to migrate to a cloud environment.

Cloud computing is defined as a centralized collection of hardware and software services that are administered to customers via a network connection regardless of the device being used and where it is located (Alharbi, Atkins, Stanier, & Al-Buti, 2016). Through the wide-ranging use of cloud computing, the limitations of mobile devices are nonexistent, and both the user integration with applications and the applications are enhanced (Chen, Zhang, Li, Mao, & Leung, 2015). Cloud computing has become a popular environment because of all the benefits it provides to organizations. Kuang-Hua, Fu-Hsiang, and Wei-Jhou (2016) stated that cloud computing has many benefits such as reduced cost, access to services on an on-demand basis, and enhanced scalability. Cloud computing resources must now be simultaneously managed onsite and offsite since they are dispersed geographically throughout the world (Nzanywayingoma & Yang, 2017).

Problem Statement

The federal government agencies are slow to adopt cloud computing because of prolonged review processes and strict requirements related to systems security, confidentiality, and reliability (Moloney Figliola & Fischer, 2015). In September 2014,

the Government Accountability Office (GAO) reported that seven government agencies' cloud adoption had only increased by 1% since 2012 (Moloney, Figliola, & Fischer, 2015). Additionally, in the Gartner report ID: G00294396 from July 2016, a lack of a thorough cloud strategy was a frequently ignored barrier impacting cloud adoption (Smith, 2016). According to Aharony (2015), 36% of IT personnel do not have a cloud computing adoption strategy, which impacts their rate of adoption. The general IT problem is that federal organizations that want to adopt cloud technology are being potentially delayed due to a lack of transition strategies. The specific IT problem is that some federal government IT project managers lack strategies to select systems to migrate to a cloud environment.

Purpose Statement

The purpose of this qualitative exploratory multiple case study was to explore the strategies used by federal government IT project managers to select systems to migrate to the cloud. The targeted population of this study was 10 federal government IT project managers in three government agencies in the Southeast of the United States with strategies to select federal IT systems that migrate to the cloud. The implication for positive social change from the results of this study may lead to home and workplace reductions of the carbon footprint by consolidating data and allowing it to be stored, managed, and processed remotely instead of locally. A federal government cloud environment reduces the decentralized carbon footprint by placing the data at centralized data centers for multiple services such as software-as-a-service and platform-as-a-service.

Nature of the Study

This study was a qualitative study to explore the strategies used by federal government IT project managers to select systems to migrate to the cloud. I focused on applied and theoretical findings or discoveries based on research questions through interviews in natural conditions (Park & Park, 2016). Qualitative methods were appropriate for this study because I analyzed strategies for selecting systems in an IT natural environment and conducted in-depth interviews to delve into the experiences of the project managers. Quantitative researchers use surveys to collect numerical measurements about the topic (Ludwig & Johnston, 2016). I did not select the quantitative method for this study because numerical measurements from project managers were not collected. Mixed methods studies consolidate quantitative and qualitative data to present a comprehensive and cohesive viewpoint (Besomi, Leppe, Di Silvestre, & Setchell, 2018). Mixed method research was inappropriate for this study because the study did not require the use of quantitative data analysis.

The multiple case study design approach, as explained by Lazaro et al. (2016), is used to understand a real-life phenomenon through incorporating two or more perceptions of the same phenomenon using test and control groups. I selected this approach for this study to explore the decisions and the results of these decisions when selecting the IT systems that transition to the cloud amongst three federal government agencies. An ethnography study is a qualitative research method that has been adopted in multiple disciplines to study what different cultures and people do and why they do the things they do (Sharp, Dittrich, & de Souza, 2016). I did not select an ethnographic

design because this study did not require an investigation of cultures. A phenomenological research design is a qualitative research methodology that studies the human experience from the viewpoint of the participants living through the phenomenon (Valentine, Kopcha, & Vagle, 2018). I did not select a phenomenological design for this study because it did not require the perspectives of participants living through the phenomenon. This study required interviewing IT project managers who have specifically developed strategies to transition to the cloud. Therefore, to research the specific research question for this study, I used a qualitative multiple case study.

Research Question

What strategies are used by federal government IT project managers to select systems to migrate to the cloud?

Interview Questions

1. What responsibilities do you as an IT project manager participate in related to moving IT systems to the cloud?
2. What strategies did you use as an IT project manager organization to determine the processes that needed to be in place to select the IT systems to move to the cloud?
3. What strategies did you use as an IT project manager to quantify the requirements of moving IT systems to the cloud?
4. What are the critical success factors for effectively selecting IT systems to move to the cloud.?
5. What strategies do you use as an IT project manager to improve on the strategy to move systems to the cloud?

6. What type of strategies did you use to determine the training that is required to assist with effectively selecting IT systems to move to the cloud?
7. What strategies have you used to manage data and information management governance for moving IT systems to the cloud?
8. What external factors play a role in moving IT systems to the cloud?
9. What strategies did you use to determine how to migrate legacy systems to the cloud?

Conceptual Framework

The specific conceptual support for this study is the technology acceptance model (TAM) that was initially proposed by Davis in 1989. TAM is used for explaining the link between the actual use of the new technology and the behavioral intention (BI) of the individual to use the technology. Innovations can be perceived as positive or negative, depending on how they are introduced to the audience. Sharma, Al-Badi, Govindaluri, and Al-Kharusi (2016) found that perceived usefulness (PU) and perceived ease of use (PEOU) are the fundamental determinants of the attitude towards the acceptance of new technology. TAM has been employed to investigate the adoption of new technologies in a range of domains including gamification in e-banking (Rodrigues, Oliveira, & Costa, 2016), internet banking (Sharma, Govindaluri, & Al Balushi, 2015), e-collaboration (Polancic, Jost, & Hericko, 2015), and software development (Nel, Nel, & Cronje, 2016).

TAM shows how the perception of the implementer, which in this study is the project manager, can impact the transition to using new technology such as a cloud environment. Because my goal for this study was to understand the strategies of migrating IT systems to the cloud, it was best to use a theory to show how the BI of the

individual to use the technology can delay selecting IT systems that need to move to cloud environments.

Definition of Terms

Community Cloud: The community cloud infrastructure is provisioned for exclusive use by a specific community of consumers from organizations that have shared concerns (e.g., mission, security requirements, policy, and compliance considerations) (Shirazi & Iqbal, 2017). A community cloud is considered dispersed infrastructure for a unique group to share resources (Maqueira-Marín, Bruque-Cámara, & Minguela-Rata, 2017).

Hybrid Cloud: The hybrid cloud infrastructure is a composition of two or more distinct cloud infrastructures (private, community, or public) that remain unique entities, but are bound together by standardized or proprietary technology that enables more control over critical data and allows less critical data to be processed in the public cloud (Nowakowski et al., 2018). A hybrid cloud solution allows critical applications or systems to run on-premise at an organization in a private data center and also be available in a cloud environment located in a different location (Shakir, Abubakar, Yousoff, Waseem, & Al-Emran, 2016).

Infrastructure-as-a-Service (IaaS): IaaS is a model that provides actual physical infrastructure support that includes computing storing, networking, and other primary resources to users (Kaur & Chana, 2015).

Platform-as-a-Service (PaaS): PaaS is a model that offers building, testing, deployment, and hosting environments for applications created by users or otherwise acquired from them (Kaur & Chana, 2015).

Private Cloud: The private cloud infrastructure is a specific model of cloud computing for exclusive use by a single organization comprised of multiple consumers (Cohen & Nissim, 2018).

Public Cloud: The public cloud infrastructure consists of non-sensitive shared resources via the Internet used by multiple users and may be owned, managed, and operated by a business, academic, or government organization, or some combination of them (Adrian-Mihai & Ioan, 2017).

Software-as-a-Service (SaaS): SaaS is a software delivery model that helps users to access applications through a simple interface over the Internet (Kaur & Chana, 2015).

Assumptions, Limitations, and Delimitations

Assumptions

Assumptions in a study are underlying perspectives assumed to be true by the researcher and can generate biased viewpoints (Walsh, 2015). I assumed that the results from interviews at the large organizations would be unbiased and based on prior experience of each interviewed project manager, who is knowledgeable of the topic. All discussions with the participants were assumed to be useable and not be limited or flawed due to contractual laws or security policy or guidance. I assumed all information was discussed on an unclassified level preventing the leaking of any classified information. I

also assumed that all participants provided me their perspective on how to adopt cloud computing successfully.

Limitations

Limitations include hypothetical and procedural absences that bounds a study (Busse, Kach, & Wagner, 2016). This study was limited to private cloud environments within three federal government organizations. Private cloud environments can be classified or unclassified. Therefore, because I conducted this research at an unclassified level, no investigation was done into the classified private cloud environments. There were also limitations on how detailed processes were conveyed to keep the security posture of the private cloud environment robust.

Delimitations

Delimitations are defined as restrictions set forth by the researcher for the sake of the study (Fujimura, 2016). The first delimitation was cloud environments that are categorized as private clouds only. Cloud environments that are considered community, public, and hybrid cloud environments are not included in this study. The second delimitation was that I did not include private cloud environments that were not being fully used in a live production environment. Therefore, I did not include private cloud environments in a test environment in the study.

Problem Domain

The problem domain includes the fields of information technology, infrastructure, and security. Topics include: (a) cloud computing, (b) computer security, (c) software

development, and (d) big data. The range involves virtualized environments, securing data, processes of software development, and governance of data.

Significance of the Study

Contribution to Information Technology Practice

Cloud computing shows the extraordinary potential to provide inexpensive, burden-free administration, flexibility, and advanced resources that can be shared at will via the Internet (Ali, Khan, & Vasilakos, 2015). Project managers are responsible for creating strategies to select IT systems to move to the cloud environment, but strategies are not readily available. This study is significant because it may contribute to IT best practices by exploring strategies to migrate IT systems to the cloud. Decision-makers must have a complete understanding of the cloud environment by being aware of the similarities, intricacies, dependencies, portability and security of the services, data and applications offered by cloud providers (Opara-Martins, Sahandi, & Tian, 2016). Therefore, the findings from this study may be used for future research in migrating IT systems that offer standardized IT strategies for government and non-government organizations. This study may display the methods, processes, and procedures that are from a project management perspective.

I explored how parties involved in the IT systems migrating to the cloud had an impact on moving to the cloud. I also analyzed the recommendations that were provided by the project managers to convey their preferred strategies. A significant process model may assist both project managers and IT staff with effectively selecting IT systems to

move to the cloud environment and may allow the organization to see the techniques involved and then tailor the method specific to their organization.

Implications for Social Change

The implication for positive social change is that migrating to the cloud may reduce energy consumption. The United States (U.S.) government, in the past decade, has placed a heightened emphasis on organizations reducing carbon emissions as a way to mitigate global climate change (Schniederjans & Hales, 2016). The increase in energy consumption releases higher carbon and greenhouse gases into the environment, which has an impact on global warming. Several information and communication technology vendors have understood the true potential of cloud computing and predicted it as the preferable technology to overcome the energy crisis (Kaur & Chana, 2015). It has been estimated that U.S. organizations could move their traditional IT systems to cloud computing and save approximately 12.3 billion dollars by 2020 in energy costs, which is equivalent to 200 billion barrels of oil, and reduce carbon emission subsequently (Balasooriya, Wibowo, & Wells, 2016). For example, if the carbon footprint continues to increase as more computing devices are added to networks, climate changes become more severe, making the environment more unstable (Balasooriya et al., 2016). Reducing the amount of energy consumption by migrating to the cloud may ensure that our environment remains sustainable, and society becomes more energy efficient.

A Review of the Professional and Academic Literature

The purpose of this qualitative exploratory multiple case study was to explore the strategies used by federal government IT project managers to select systems to migrate to

the cloud and a thorough examination of journal articles related to cloud computing and TAM. In this section, I present a synopsis of cloud computing, study the arguments about moving to the cloud within the government, and discuss how the theoretical framework of TAM connects them together. My primary focus was to investigate migration to the cloud issues and the effect that strategies have on moving to the cloud. The goal of this qualitative exploratory multiple case study was to study a government agency in Northern Virginia and Washington D.C. area.

Deployment to the cloud can impact many related areas of technology. The literature review includes information on four main topics: (a) a synopsis of cloud computing, (b) clouds in the federal government, (c) the TAM and how it relates to cloud computing, and (d) the adoption of cloud technologies. My review of the background of cloud computing includes the history, usage, services, arguments on risk, related systems, successful and unsuccessful deployment strategies, and clouds in the government. In my review of the TAM, I focus on the adoption of cloud computing.

This literature review contains articles from Walden's Thoreau Multi-Database Search, ProQuest Central, ProQuest Dissertations and Theses Global, Google Scholar, and ScienceDirect. Ulrich was the sole source repository used to confirm the validity of the peer-reviewed references. The literature review includes 124 articles, which 120 (96%) are peer-reviewed and 106 (85%) articles are within five years of my anticipated graduation date.

When I searched the databases, I used the key terms *government* and *cloud computing*, to search articles specifically related to the government. I also used 2015 and

2019 as the year range for the most current information related to my research, which was within the 5-year time requirement for the literature review. Finally, I used Google Scholar and ProQuest Central to locate additional content related to government, cloud computing, and TAM.

Overview of Cloud Computing

Overview of cloud computing. Cloud computing is an on-demand suite of infrastructure, server, storage, applications, and information, which individuals, businesses, or corporations can rent for a fee (Basahel, Yamin, & Drijan, 2016). The use of various government legacy systems and infrastructure complicates the continuous maintenance and modernization of electronic government (e-government) systems. However, Joshi, Islam, and Islam (2017) suggested that if e-government infrastructure implementation is proficient, it could aid in the improvement of government services. Cloud computing technology is evolving and becoming more and more common because of financial and technical advantages (Halabi & Bellaiche, 2018). A majority of the cloud service providers offer multiple services in data analytics, artificial intelligence, machine learning, and high-performance computing (Makoza, 2015). Cloud computing can be traced back to two sources in the 1960s: J.C.R. Licklider and John McCarthy. In 1961, John McCarthy was the first to publicly suggest, based on the emerging timeshare computer model, that computing could someday be considered a utility (Mink, 2015).

Within the federal government, formal guidance had to address the importance of cloud computing. In 2011, the U.S. government published the federal government cloud computing strategy document to push the initiative of adopting the cloud computing

environment within the federal government (Kundra, 2011). The document described the requirement and sense of urgency for transitioning the federal government and provides the overarching strategy and guidance to move to cloud computing and data center consolidation (Kundra, 2011). To reform the federal IT posture, the U.S. government encouraged agencies to consolidate existing data centers, reduce the need for infrastructure growth by implementing a *cloud-first* policy for services, and increase their use of available cloud and shared services (Kundra, 2010). Dhasarathan, Thirumal, and Ponnurangam (2017) argued it is best to choose a great location that works well with the organizations cloud adoption plan, data regulation laws, and geographical location challenges. The Office of Management and Budget (OMB) released The Cloud Smart Strategy in October 2018 (OMB, 2018). The Cloud Smart Strategy focuses more on ways to secure the cloud, how to handle procurement and skillsets that are needed to implement and transition to the cloud.

Cloud risk. Cloud computing is an inexpensive value-added technology offering increased throughput, efficiency, reliability, and flexibility of computer systems, which allows organizations to redirect their focus to their business processes and strategies in support of their mission. (Ali, Soar, & Shrestha, 2018). Yet, security risk delays cloud computing adoption (Ahmed Nacer, Godart, Rosinosky, Tari, & Youcef, 2018). Therefore, some of the same risks that are associated with physical devices still exist, and many new concerns have developed. Ohmann et al. (2015) stated that cloud providers are concerned with unauthorized access to their cloud even though they continue to invest in securing their environments. Cloud providers also have the right to stop providing the

cloud capability without providing the data or service to another company that could store the data (Ohmann et al., 2015). Ohmann et al. (2015) also found that customers lose control of their data when the cloud provider manages the data. Batista et al. (2015) established quality measures such as quality of service (QoS) and service level agreements (SLA) to address the level of expectations. Therefore, these security issues present a challenge for consumers that need to guarantee the security of their data.

Security in the cloud. Cloud computing is a popular and noteworthy technology to both the public sector and in the military environment. (Dulik & Dulik, 2016) However, security has to be present in all layers of the network to ensure that data is not compromised. Sritapan and Eldefrawy (2018) explained that in order for the federal government to protect its assets, such as mobile devices or operating system cloud services, users should utilize multifactor authentication to strengthen security measures.

Additionally, if the enterprise owns the device, an enterprise-managed cloud service account should be mandatory, and all other unnecessary cloud services should be disabled (Sritapan & Eldefrawy, 2018). Hussain, Fatima, Saeed, Raza, and Shahzad (2017) observed that when considering the design layout of a cloud computing environment, the virtual machines (VMs) relationships are the most significant security concern. There are numerous attacks and manipulation of virtual environments forthcoming, and they will continue to rise as the platforms multiply and become more challenging to work with (Hussain, Fatima, Saeed, Raza & Shahzad, 2017).

Cloud services. Cloud computing has evolved as a utility offering resource sharing via a pay-as-you-go model (Rajganesh & Ramkumar, 2016). Today, cloud

services are available in many ways, including via the Internet. A cloud provider is an entity accountable for providing cloud services to cloud customers. (Jaatun et al., 2018). Therefore, this paradigm could provide government agencies with the capabilities that will provide the use of enterprise software, architecture, and services.

Cloud service providers (CSPs) have to obtain a FedRAMP authorization, as stated in the OMB memorandum, if they want to provide cloud service to the federal government (FedRAMP, 2017). CSPs also should read the Security Assessment Framework and know the FedRAMP's four process areas: Document, Assess, Authorize, and Monitor, which correlates to the NIST Risk Management Framework (RMF), which is apart of the NIST SP 800-37 (FedRAMP, 2017).

A cloud broker is an entity that negotiates relationships between the consumer and provider and assists the consumers with developing their technical requirements (Rajganesh & Ramkumar, 2016). The cloud broker also assesses the strengths and weaknesses of the infrastructure and security posture of the cloud provider and consumer. The broker will then recommend cloud providers that can best meet the customers' requirements.

The different deployment models also provide different types of services. The capabilities, termed services, are referred to as *layers*, which are IaaS, PaaS, and SaaS; Farah, 2015). Additionally, the National Institute of Standards and Technologies (NIST) has separated cloud computing into multiple categories that include networks, hardware, storage, software, and other services (Yongsiriwit, Assy, & Gaaloul, 2016).

SaaS. SaaS is a service model in which the applications are accessible from various client devices through the internet (Tomas, Thomas, & Oliveira, 2018). When using SaaS, the consumer does not manage or control the underlying cloud infrastructure, and the user applications are provided as services via the Internet and guarantee a quality of service (QoS) that meets the service level agreement (SLA) (El Kafhali & Salah, 2017). The QoS for enterprise applications allows users to log on from anywhere with an internet connection (Wang, Wood, Abdul-Rahman, & Lee, 2016). Goutas, Sutanto, and Aldarbesti (2016) stated that SaaS relieves the burden of concentrating on minute IT tasks such as implementing IT infrastructure and the administration of software to end-user devices. SaaS products include Google Apps, Salesforce, Workday, Citrix GoToMeeting, Cisco WebEx. According to Tan and Kim (2015), while IaaS and PaaS primarily pertain to behind-the-scenes IT functions, SaaS is primarily used by individual end-users.

The presence of SaaS has been throughout the federal government for many years now. An example of SaaS existed in 2007 when the Defense Connect Online (DCO) launch by Defense Information Systems Agency (DISA) was initiated (Pomerleau, 2015). DISA discontinued the DCO collaboration service on June 24, 2015. The new collaboration service is Defense Collaboration Services (DCS); Pomerleau, 2015). DCS provides secure web conferencing and instant messaging services over the Internet, on the Non-secure Internet Protocol Router Network (NIPRNet) and Secure Internet Protocol Routing Network (SIPRNet). Over 4 million DOD personnel and mission partners use the service in a data center utilizing DISA cloud-based service, milCloud.

DCS can is accessible by using the Common Access Card (CAC) by hard token holders and guests (DOD mission partners) users (DISA,2015).

PaaS. PaaS offers the cloud user the integrated computing foundation that includes operating systems, program developing environments, web servers, and database systems (Rajganesh & Ramkumar, 2016). PaaS delivers a platform that provides administration of applications that includes installation, execution, and management, excluding the need for hardware components, (Lee & Kim, 2018)). PaaS provides the means for users to develop and utilize various applications to deliver specific services (Krishna, Kiran, Murali, & Reddy, 2016). PaaS products include Amazon Web Services (AWS) Elastic Beanstalk, AWS CloudFormation. PaaS uses IaaS as a platform to offer middleware to the user. Middleware offers developer and testing capabilities as well as databases, management systems, and directory services (Mink, 2015).

As more cloud services are available, information technology experts have to understand the governance over various types of data. The Federal Information Security Management Act (FISMA) was first established in 2002 to enforce the importance of information security measures and controls within the federal government along with the development and documentation of a security program (Cervone, 2016). In 2014 it was renamed to the Federal Information Security Modernization Act (Cervone, 2016).

The federal government PaaS cloud is DISA's Forge.mil. Forge.mil is a group of enterprise services that includes SoftwareForge and ProjectForge, provided to DOD's IT community of interest to quickly deliver software, services, and systems by using collaborative development and IT project management throughout the lifespan of the

application (DISA, 2017). SoftwareForge is free for users that have the approval to access the site. The offering provides basic services with no possibility for other options. ProjectForge access is available by paying a fee, and permissions are at a granular level (Mink, 2015). Specific services include application version control, error tracking, release management, and monitoring and controlling requirements. It also provides global collaboration tools for virtual teams to share document repositories, wikis, and discussion forums (Mink, 2015).

IaaS. IaaS provides remote access to the physical assets used to provision storage, virtual machines, hardware, and networking components (Soltani, Martin, & Elgazzar, 2018). The user has no control over the physical network infrastructure but instead can administer over the service packages such as the operating systems, storage, applications, and some networking components such as host firewalls, which are created dynamically or tailored to the user's needs. (Gupta, Jain, & Amgoth, 2018). IaaS allows a cloud service provider to connect virtual machines and data storage into one platform, eliminating the need for detailed resource management (Arsovski, Arsovski, Stefanović, Tadić, & Aleksić, 2017) A well-known IaaS that the federal government offers is DISA's milCloud. According to DISA, milCloud is a cloud-services product portfolio known as the IaaS solution. It integrates Commercial off the Shelf (COTS) and technology designed by the government to provide a cloud experience in support of protected, rapid development, delivery, and preservation of DOD applications (DISA, 2017).

The milCloud portfolio includes four different services. On-Demand, Self-Service provides a web-based service capability for customers to place orders, modify

infrastructure components, and administer their applications. Broad Network Access allows a network connection to the DOD information networks (DoDINs). Resource pooling allows the integration of resources so that they can be shared and consumed with more flexibility. Rapid Elasticity allows the increase or decrease of resources using virtual resource pools (DISA,2017). DISA provides milCloud through consolidated infrastructure hosted at its Distributed Enterprise Computing Environments (DECCs), which reduces the infrastructure costs of operations (DISA 2017). IaaS products include Amazon Web Services (AWS) EC2, Cisco Metapod, Microsoft Azure, and Google Compute Engine (GCE). In this virtualized environment staff support can be minimal as well, but not eliminated.

Deployment strategies. There are four main deployment models for cloud computing resources and services: private clouds, community clouds, public clouds, and hybrid clouds (Shirazi & Iqbal, 2017). Although they are all clouds, they provide many different services. The public cloud allows complete access to all available services in the cloud, while access to private clouds can be managed by different organizations. Hybrid clouds provide a little of both private and public clouds. Community clouds are used by particular groups of people with a common interest (Akar & Mardiyan, 2016).

Private clouds. Private clouds give users immediate access to computing resources hosted within an organization's infrastructure, and the resources are only for that organization's use (Farah, 2015). The data usually still resides on the organization's servers, yet an outside service provider can host it as well (Tadili & Semma, 2015). A private cloud is for a specific group or an individual who manages it as a private cloud.

(El-Gazzar, Hustad, & Olsen, 2016). These models also can potentially require a higher level of security and control (El-Gazzar et al., 2016). Lastly, the amount of money to develop and maintain this cloud would be higher than in other clouds. (El-Gazzar et al., 2016).

Community clouds. Community clouds are developed by a group of organizations with like interest (Shirazi & Iqbal, 2017). This cloud may also be hosted by the common interest groups or an outside provider either locally or remotely (Tadili & Semma, 2015). The community cloud falls under the private cloud domain (Manuel, Al-hamadi, & Qureshi, 2015) since it is usually developed for specific organizations. Similar groups share the resources (Shirazi & Iqbal, 2017). Since it falls under the private cloud domain, it has a little more security than the public cloud.

Public clouds. Public clouds provide access to computing resources for the general public over the Internet. However, the resources are owned and operated by the cloud service provider (Farah, 2015). This option gives more power to the customer to create their customized experience. Public clouds allow easy access to cloud services, limit resource requirements, and staff to manage those resources. However, it also limits the user's ability to make changes to the supporting hardware, use resources at their full capacity, and data stored remotely by a service provider, may be more vulnerable (Nadeem & Qaiser, 2015). Public clouds also provide less security than private clouds, which contributes to the lower costs associated with maintaining it (El-Gazzar et al., 2016)

Hybrid cloud. The hybrid cloud computing platform is the integration of both public cloud and private cloud computing (Paul, Karn, & Rajesh, 2015). The hybrid cloud provides the benefits of convenience of a public cloud while still having control over the data that you would find in a private cloud environment (Charlebois, Palmour, & Knoppers, 2016). This feature can be increased or decreased according to the need of the customer. Yet the cost can significantly increase in a hybrid cloud computing environment because it requires more planning and configuration changes to the local and remote environments (Paul et al., 2015). When permissions are involved, some of the information is secured by the organization, while only authorized users can have limited access to other data (Stergiou, Psannis, Stukalova, & Guskov, 2016). Therefore, hybrid clouds provide more security than public clouds (El-Gazzar et al., 2016).

Benefits of the cloud. The benefits related to cloud base systems and services include improved effectiveness, productivity, and functionality that are potentially more cost-effective (Ali, Soar, & Yong, 2016). Cloud computing is now considered one of the commonly deployed services due to its relative advantages for organizations, firms, and enterprises (Seham, 2017). Cloud computing is in high demand because of its practical features that offer the ability to run data-intensive applications in various environments (Ali et al., 2016). Enterprise cloud services provide many benefits, including reduced costs, simple maintenance, and worldwide accessibility (Chandel, Ni, & Yang, 2018). When an organization considers if it wants to adopt cloud computing, it needs to associate the cost of adopting the cloud as opposed to remaining with local hardware systems (Ali et al., 2016). The associated costs should include remote business processes

and increasing bandwidth. Functional benefits include consistently offering services that are high performing, effortless, and potential for scalability and dependability. Other significant benefits of moving to the cloud include the below list Tang (2014):

- Scale of computing power is vast within the cloud.
- Virtualization expands the users reach to internal and external resources.
- Scalability is to cater to the user's requirements.
- Reliability of a cloud service provider introduces more resources to create a stable environment when there is an outage.
- Cost effective services are provided in a cloud computing environment because usage determines your costs.
- Compatibility is common due to the various services, applications, and platforms within the environment.
- Users can customize their experience according to their specific needs.

Disadvantages of moving to the cloud. While there are many positive reasons for moving to the cloud, there are also a few disadvantages to moving to the cloud. The responsibility of securing the data becomes a shared responsibility between the data owner and the cloud provider since the data no longer resides internal to the organization. The provider must maintain a secure infrastructure, and the user must continue to practice using strong accessibility and verification measures for their applications (Stergiou et al., 2016). The availability of the data could also still be an issue even though it resides at an offsite data center. Therefore, a centralized cloud data center still presents the weakness of being vulnerable because it is a single point of failure (Varghese & Buyya, 2018).

Although cloud computing is advantageous, there are several studies that found challenges and risks. (Vasiljeva, Shaikhulina, & Kreslins, 2017). A strategic risk plan will allow all stakeholders to adopt cloud computing services while considering the impacts that are operational and regulatory compliance risks (Novkovic & Korkut, 2017). The main factors inspiring and persuading the adoption of cloud computing in an analysis of Latvian small and medium enterprises were understanding the idea, advantages, and shortcomings of cloud computing and how it affects the goals of the business and future standpoint (Vasiljeva et al., 2017). The results of the study revealed that cloud computing could be beneficial to various businesses of all sizes as long as the organizations examine the data to be hosted in the clouds, align the business requirements with the services, consider a deployment model that includes security, technical, organizational, and legal risks, and develop training programs for the employees (Vasiljeva et al., 2017).

Additionally, there are a few common disadvantages of cloud computing. A study showed that technical and strategic challenges that included technically enforcing the right policies for original documents and duplicate documents, tracking the data flows and the strategic challenge of awareness and understanding the sensitive nature of how important it is to keep data confidential by both the owner of the data and the commercial service provider (Ghorbel, Ghorbel, & Jmaiel, 2017). Additional challenges of cloud computing relate to management, security, and the level of service (Shahzad, Golamdin, & Ismail, 2016). No matter how great the cloud provider is, technical issues are a possibility. Security and possibility of an attack are hazards because of the central location of all the company sensitive information residing in the hands of a third-party

cloud service provider (Shahzad et al., 2016). Therefore, the cloud service provider should have the means to secure the data and a reliable environment to avoid the loss of trust of the users of the cloud. (Shahzad et al., 2016). An organization must calculate the cost of moving to the cloud very carefully as well. Many cloud users find that cloud computing requires minimal management of hardware and software, and the requirements of the cloud computing users are easy to scale (Shahzad et al., 2016). Finally, customer service delays within cloud computing environments can make users skeptical about migrating to the cloud. Therefore, the inclusion of quality of service (QoS) will ensure services are available when they are needed (Mezni, Aridhi, & Hadjali, 2018).

Clouds in the Federal Government

Overview of clouds in the federal government. Agencies should consider whether the applicable organization is ready to migrate their service to the cloud. Most contributing factors for the use of cloud computing are technology readiness, human readiness, organization support, environment, security, and privacy (Amron, Ibrahim, & Chuprat, 2017). Many commercial organizations are moving to the cloud, while the federal government remains skeptical of cloud computing because of the security concerns related to a cloud environment. Data within the federal government has many classifications such as sensitive, secret, and top-secret, so confidentiality and accessibility to that data are highly critical. The federal government is mainly concerned with security, and because of regulations in the Federal Information Security Management Act (FISMA), cloud vendors face significant challenges in meeting these government

requirements. The Federal Risk and Authorization Management Program, or FedRAMP, is a government-wide program that provides a standardized approach to security assessment, authorization, and continuous monitoring for cloud products and services (FedRAMP, 2017). This program standardizes the risk assessment process for U.S. government agencies. The strategy encourages all agencies to adopt cloud technologies throughout the federal government. In the past, each agency had different approval paths and processes to assess the level of security of cloud solutions. The new FedRAMP approach shortens the time, required resources, and costs to assess cloud solutions. Any cloud service solution must have an approved FedRAMP assessment in order to get the authority to operate in the federal space. Furthermore, as cloud computing developed, the use of clouds to process and store data over the internet was created, so NIST provided definitions for those services to clarify what they offered to a user (Miyachi, 2018).

Like many modern organizations, the federal government seeks to leverage information technologies to achieve efficiencies; however, the availability of new technologies may prove insufficient to bridge the performance gaps resulting from leadership and cultural challenges (Hobman & Walker, 2015). Cloud technologies may increase efficiency, security management, and productivity in various organizations.

Before moving to the cloud, agencies need to ensure they specify their requirements for services to meet their expectations. Government commands that have project managers that can identify the Plan of Action and Milestones (POA&M) needed for the plan should negotiate appropriate Service Level Agreements (SLAs). SLAs are lawful contracts between the service provider and consumer that list requirements and

assurances to fulfill the contract for services (Hussain, Hussain, Saberi, Hussain, & Chang, 2018). Research suggests using models to migrate e-government services to a cloud environment (Ali et al., 2018). Furthermore, the research proposed recognizing and classifying e-services into Local Governmental Cloud "LGC", Regional Governmental Cloud "RGC" and Wide Governmental Cloud "WGC" domains. The final results of the research presented a methodology to monitor and revisit the organizations' cloud computing experience after the cloud computing adoption. The adoption of cloud services should include only the current required services for the organization with future elasticity.

Cloud provider. The government cloud provider that is selected to support the government cloud services comprises a cloud provider that is the best fit for the government environments and personnel. Additionally, trust in a cloud provider is very critical (Alhanahnah, Bertok, Tari, & Alouneh, 2018). In order to select a trusted provider, multiple inquiries can assess the quality of services related to the requirements of the organization as the metric to measure the quality. Users' requirements can help to create SLAs with cloud providers. Cloud Service Provider SLAs with customers usually include four main areas: Security, Performance, Data Management, and Personal Data Protection, and other factors.

Moreover, a cloud provider includes characteristics as a person, organization, or entity that provides cloud services to meet users' requirements (Lang, Wiesche, & Krcmar, 2018). Additionally, in cloud computing, the hardware and its associated pieces are the responsibility of the cloud service provider (Suneel & Guruprasad, 2016).

Dedicated resources also are held accountable to monitor and forecast the performance of the deployed application so that it can adjust to the resource requirements of the application. Therefore, a cloud provider can enhance its users' productivity.

Drivers for moving to the cloud. Many drivers can assist or deter moving to the cloud. In past research, drivers and associated barriers to the adoption of cloud computing were analyzed by the subject matter experts (SME) within Northern Ireland and the Republic of Ireland (ROI) (Doherty, Carcary, & Conway, 2015). Researchers found that cost was a key variable in driving the adoption of the cloud. The research also found that costs will reduce due to the organization not having to procure, secure, sustain, and provide human resource support to their own IT infrastructure (Doherty et al., 2015). Therefore, planning all the associated cost to support the cloud and the savings, increased the likelihood of moving to the cloud. Similarly, the research showed other drivers that impacted the adoption of the cloud.

The organization's perspective and network infrastructure can present barriers to the adoption of the cloud. The organization's openness to flexibility, throughput, improved computer resource utilization, and mobility determines the possibility of the adoption of the cloud (Doherty et al., 2015). The technical barriers are important to consider due to the changes to the network infrastructure and data that is associated with a cloud environment. As a result, without the willingness to be openminded enough to accept the cloud, the organization cannot even consider the other technical barriers.

Additionally, a study highlighted key factors to review when planning to transition to cloud computing in Australian regional governments. The results of the

study revealed (1) Internet connectivity which incorporates bandwidth, availability and reliability issues; (2) Data storage location including security, data backup, and data sovereignty issues; (3) Cost; (4) Integration; (5) Provider dependability; (6) Employees' knowledge; and (7) Transportability to analyze prior to moving to the cloud environment (Ali et al., 2018). These factors pointed out the importance of the status of the network environment to support the devices, data, and the ability to be transported. It also warns about the required security to control and protect the data for daily operations and support of the recovery of that data. Further, it stressed the need for the employees with the expertise to support the cloud environment. Lastly, the research showed that costs associated with services, including integration and the provider support were key factors to consider when planning the transition to a cloud network. Consequently, without considering all these key factors, the plan to transition to cloud computing could be flawed.

Legacy systems. Additionally, Legacy systems can impact an organizations cloud computing plan considerably. The integration of companies' legacy systems with new cloud computing systems is a significant concern for most companies (Akar & Mardiyan, 2016). Therefore, many organizations are moving existing legacy systems to cloud platforms (Fahmideh, & Beydoun, 2018). In order to transition legacy systems successfully, it requires an understanding of the requirements and risks involved before starting the execution of the plan. Questions about the systems will help to create a clear planning strategy. It is essential to know what systems that will be apart of the migration, why they are moving, and what are the benefits of moving them. Cloud computing

provides cost-effective IT solutions (Ramzan, Akhtar, Farooq, IIyas, Zamir, & Khan, 2018). However, it is not always about cost. Adopting cloud computing is also about being able to adjust to the needs of the customer and improving customer service. Furthermore, cloud computing allows companies to expand their operations internationally and provide scalability and elasticity, which allows the business to adjust to the customer's needs (Ramzan et al., 2018).

Storage. Likewise, the consideration of storage is another aspect of cloud computing. Cloud computing provides significant amounts of data storage and computing services via the use of oversized data centers (Ramzan et al., 2018). When users transition their data to the cloud storage, private storage infrastructure is no longer needed, and the data on the storage is accessible from anywhere at a low cost and with greater dependability. As a result, the cost of maintaining data storage on-premise is no longer needed.

Training for the cloud. Moreover, the proper training for the cloud environment is essential for maintaining and expanding cloud services. Training all personnel before cloud implementation will assist with reducing the unfamiliarity of a cloud environment and allow employees to become more acquainted with the cloud concepts (Bildosola, Rio-Belver, Cilleruelo, & Garechana, 2015). A 2015 research study showed that 54.9% of microenterprises and SMEs do not understand what cloud computing represents or the benefits it provides (Bildosola et al., 2015). Yet, to combat this issue, Universities can be utilized to narrow the gap. Universities use cloud computing so they can assist with

creating cloud computing workshops and security training for local businesses and organizations (Kahle-Piasecki, Ritzman, & Ellingson, 2017).

Consequently, there has to be a clear understanding of the capabilities that are being offered by the cloud and how it will benefit the organization (Bildosola et al., 2015). Without education in support of the cloud, users may create their perception of the cloud. The training can go even further by performing the research to show future uses of the cloud to enhance the future of the businesses (Kahle-Piasecki et al., 2017). This all demonstrates the benefits of providing cloud training before the cloud implementation.

Conceptual Framework

TAM overview. Davis (1989) proposed the TAM, a widely accepted model for predicting and explaining user behavior and IT usage. The TAM theory is broken down more into two attributes known as PU and PEOU, which are considered two vital factors in understanding the reason why new technologies are adopted. Davis states that PU is whether the technology will enhance the users' job performance and PEOU relates to whether using the system will be free from effort (Davis, 1989). Factors of perceived usefulness are in categories under the social influence and system characteristics that they are in alignment with, which includes the user level of trust for the new IT system (Behrend, Wiebe, London, & Johnson, 2011). Variables of perceived ease of use include perceived enjoyment, which is the degree of enjoyment that the system provides and the degree of effort to use it (Behrend et al., 2011).

Davis (1989) built the TAM theory from the Fishbein and Ajzen's theory of reasoned action (TRA), TRA was for modeling the user's adoption of information

systems. TAM has been broadened and updated through several studies to include three additional variables referred to as perceived security (Dawson, 2015; Ross, 2010), perceived benefits (Dawson, 2015) and perceived accessibility (Djamasbi, 2007). TAM extension to forms such as the Technology Acceptance Model 2 (Venkatesh & Davis, 2000), the Unified Theory of Acceptance and Use of Technology (Venkatesh, Morris, Davis, & Davis, 2003) and Technology Acceptance Model 3 (Venkatesh & Bala, 2008). The extensions were evidence that TAM had perceived gaps in the theory.

Several studies (e.g., Akar & Mardiyan, 2016; Dawson, 2015; Gangwar, Date, & Ramaswamy, 2015; Habjan & Pucihar, 2017; Hosseini, Nordin, Mahdiani, & Rafiei, 2014; Ibrahim, 2014) include the impact of cloud computing adoption factors and research models based on different technology adoption theories, such as TAM, unified theory of acceptance and use of technology (UTUAT), task/technology fit theory (TTF) (Habjan & Pucihar, 2017). Therefore, a discussion of these theories is necessary to explain why TAM was selected, and the other theories were not acceptable for the study.

There are various research studies on TAM confirming the validity of the original Davis model. TAM is known as one of the most vital theories of user behavior towards technology acceptance in the workplace. Supporters of TAM claimed two constructs PU and PEOU were essential in understanding a person's technology adoption intentions (Bonera, 2011). For example, Ibrahim (2014) studied Assessing cloud computing Adoption by IT Professionals in Small Business Using the TAM. Ovčjak, Heričko and Polančič (2015) examined mobile data services and constructs that affect their adoption

and Sabi, Uzoka, Langmia, and Njeh (2016) investigated the adoption of cloud computing in education. The paragraphs below further explain the studies

The cloud computing adoption rate has moved slowly within many industries due to multiple factors. A research study showed that the slow adoption rate of cloud-computing for various organizations was due to not trusting services such as performance, security, compatibility, and adaptability (Ibrahim, 2014). TAM was used to evaluate the causes of cloud-computing adoption. This non-experimental quantitative predictive study used data via an online survey to collect responses from 153 participants who were from randomly selected IT organizations in the USA. The study found that performance and security affect a person's intent to use cloud computing when considering perceived usefulness and perceived ease of use due to the impact that it could have on the network tasks of the users and security of the data. Compatibility and adaptability both affected perceived usefulness based on how difficult it would be to integrate into the network environment. Therefore, include performance, security, compatibility, and adaptability when adopting cloud computing to create an appropriate plan.

Moreover, there are other examples in different industries that show various factors that impact behavior towards the acceptance of new technology. The perception of mobile data services and other constructs impact the adoption of mobile data services (Ovčjak et al., 2015). A study used the TAM theory to examine a pool of 80 studies on the acceptance of mobile data services (Ovčjak et al., 2015). The review focused on both a specific and broad field of mobile services to increase the validity of the results. It

further examined the relationships between significant factors and the extent of their usage. The results suggested implementing a generic model for each of the mobile service categories (Ovčjak et al., 2015). Therefore, understanding the offerings of mobile services helped with planning the strategies towards the adoption of mobile services.

Likewise, universities in developing countries face challenging socio-economic and political constraints that limit their ability to invest in expensive information systems to compete on the global stage (Sabi et al., 2016). A study used both the diffusion of innovation theory and the TAM to evaluate the data. It recommended a model that considered economic and technological influences in the perception and adoption of cloud computing at universities in sub-Saharan Africa. Consequently, suggesting that the resources of that society had an impact on the adoption of cloud computing.

Additionally, TAM can be used to show more perceptions that impact the adoption of new technology. TAM was used in a study to analyze the primary variables that persuaded the senior manager's persistent goal to make use of cloud computing in organizations (Tripathi & Nasina, 2017). The researchers distributed a questionnaire targeting various companies in IT, manufacturing, finance, pharmaceutical, and retail sectors in India to collect the data for the research. The data analysis included using the structural equation modeling technique. Perceived usefulness and perceived ubiquity were essential factors that impacted continuance intention to use cloud computing. Perceived ease of use also was found to have secondary influence through perceived usefulness. These concepts showed that the users could have their perception of the cloud environment that training can address, but the cloud environment also has to be

explained in a way to make the users perceive it as an easy technology to use. The study highlighted that the validated model could be used as a framework for managers to ensure the successful implementation of cloud computing. The study extended TAM by incorporating additional variables like perceived ubiquity, perceived costs, and perceived risks to explore the determinants of continued intention to use cloud computing. As a result, the study showed that the user's thoughts about the new technology, the technology value, the money to sustain it, and risks of the data could impact the rate of approval and adoption of the new technology.

Technology Acceptance Models 2 and 3. Continued research of the TAM extended it to TAM2 (Venkatesh & Davis, 2000), followed by TAM3 (Venkatesh & Bala, 2008), by recognizing and hypothesizing more factors of perceived usefulness and perceived ease of use. TAM2 examines the adoption of a new technology based on the behavior and intention to use from the end-user and PU and PEOU (Hadji & Degoulet, 2016; Hadji, Martin, Dupuis, Campoy, & Degoulet, 2016). The model keeps evolving, integrating newly discovered factors at the recommendation of various authors to clarify the predictors of TAM (Venkatesh et al., 2003; Venkatesh, 2008). TAM compares the factors perceived usefulness and perceived ease of use (Davis, 1989) with system features and the likelihood of system or application use. Perceived usefulness describes the possibility that people will use technology because it may enhance their opportunities for success at work. In perceived ease of use, the technology could be user-friendly, yet complicated to adapt to, so the benefits of using it are overshadowed by the increased learning curve to use it.

Analysis of rival theories. Although many researchers have found TAM to be a credible theory to explain cloud adoption further, other theories were initially considered as feasible to support the study, and they included task/technology fit theory, unified theory of acceptance and use of technology theory, theory of reasoned action theory, and diffusion of innovations theory. The Task-Technology Fit is the relationship between task requirements, individual capabilities, and the functionality of the technology (Goodhue & Thompson, 1995). According to Tripathi and Nasina (2017), Information technology within the TTF theory will favorably impact a person's performance if the characteristics of the IT system are in alignment with the goals of the task of the organization.

Unified theory of acceptance and use of technology (UTAUT). In 2003, Venkatesh established UTAUT, which identified eight main competing theoretical models (Venkatesh et al., 2003). This theory combined IT user acceptance models, which included the TRA, the theory of planned behavior (TPB), and TAM (Venkatesh et al., 2003). UTAUT describes the behavioral intentions to use an IS and to forecast the IS usage on a consecutive basis. Researchers also stressed to extend UTAUT to emphasize collaboration technology, which associated the concepts of acceptance for technology, individual, group, task, and situational characteristics (Brown, Dennis, & Venkatesh, 2010). The use of UTAUT continues in many different studies. It was not selected because TAM was more suitable for my study since it addressed both perceived usefulness and perceived ease of use.

Theory of Reasoned Action (TRA). The TRA proposed that behavioral intentions drive individual behavior. The TRA is a more generalized theory. Fishbein and

Ajzen (1975) also suggested that the individual attitude toward performing an action or behavior depends upon the positive or negative feelings of the individual performing a behavior. Within the TRA framework are three key concepts: BI, attitude (A), and subject norm (SN) (Fishbein & Ajzen, 1975, 1980). According to Wheelock (2013), TAM is an adaptation of the TRA for technology purposes. Therefore, I did not select TRA because of its narrowed viewpoint on the performance of an individual. TAM also focused more on the two technology acceptance factors, ease of use, and usefulness rather than attitudes.

Diffusion of Innovations theory. DOI describes the aspects that may impact a person's reasons for using an innovation. In the IT environment, consider the perspective on the eagerness and the choices made to use an innovation within a company (Rogers, 1995). Rogers (2003) defines innovation as 'a thought or suggestion and the application of that idea that is considered newly created or discovered by another person or group. Additionally, if a person does not know the idea exists, it is considered a new innovation. Many other studies have used this theory to provide a perspective on other innovation adoptions (Boushey, 2016; Byambaa, Janes, Takaro, & Corbett, 2015; Mohammed & Ibrahim, 2015). Yet, it was not selected because additional research could include a combination of the diffusion of innovation or theory of reasonable action to address the deficiencies related to a research design exclusively focused on TAM. Such additional research should examine the psychological barriers post-adoption to understand how information systems may improve feedback to overhaul, if necessary, the

postimplementation, maintenance, and subsequent upgrades to operating systems (Duncan, Rahim, & Burrell, 2018).

TAM usage in research. TAM observes user first introduction to adopting new information technology after brief system usage. The brief system usage is usually when it is a new technology replacing old technology. However, many researchers argue that the TAM model applies better to technology adoption studies when considering systems that users are not mandated to use (Lee, 2015). Additionally, TAM describes future user interactions and behavior towards systems (Tripathi, 2017). Therefore, TAM will be the theory to examine the new cloud technology. The studies showed that different types of technologies all had common concerns that impacted the adoption of the product. The following information examines the results of those studies.

Cloud computing adoption at the organizational level can be difficult. A past study that combined the TAM model and TOE framework presented the perspective of cloud computing adoption at the organizational level (Gangwar et al., 2015). The methodology included the use of a questionnaire and factors that represented technology and the organization of TOE framework and environmental factors to show the impact on cloud computing adoption. The test pool included 280 information technology, manufacturing, and finance companies in India. The modeling methods verified the proposed model, structural equation modeling. The results address the relative advantage, compatibility, complexity, organizational readiness, top management commitment, and training and education as significant factors that impacted cloud computing adoption. Those factors were directly related to PEOU and PU. In addition to

the other factors, competitive pressure and trading partner support were also contributing factors that impacted the goal of cloud computing adoption. Furthermore, In this study, I concluded that organization's readiness through top management buy-in and trader support was significant to the success of cloud computing because of the support that it would need to keep moving forward. Additionally, the staff competence level via their knowledge of the cloud computing environment and the level of the complexity of the environment were related because, without the expertise, the environment would fail. Finally, the degree of advantages the cloud environment would provide to the organization over their competition all impacted the speed of the adoption of cloud computing.

Work Performance can also be a challenge when dealing with new technology. TAM2 was used to investigate the specific person and their combined work performance using cloud-based modeling tools when developing software (Polancic et al., 2015). The study found that job relevance, perceived usefulness, output quality, and image were deciding factors determining which modeling tools software developers choose. The study is significant in that it established a relationship between collaboration tools in the cloud and software development. Consequently, showing how tools in the cloud environment can impact the way people perform their tasks.

Furthermore, mobile technology adoption has many challenges. The TAM and technology organization and environment (TOE) model was used in a study to examine a conceptual model (Gholami, Abdekhoda, & Gavgani, 2018). A researcher-distributed a questionnaire to capture 120 academic librarians' influence on mobile technology

adoption using seven factors from TAM and TOE (Gholami et al., 2018). The results of the study reported that the TAM and TOE model adequately presented the significant factors in mobile technology adoption in a library context (Gholami et al., 2018). Further analysis using regression analysis found that out of the seven factors, perceived ease of use, perceived usefulness, compatibility, relative advantage, and organizational competency are factors that impact adopting mobile technology-based library services among the participants in the study (Gholami et al., (2018). As a result, showing that the adoption of mobile technology requires an open-minded organization that perceives it as a useful service that provides an advantage to the organization.

TAM is also in use in the mobile phone cloud storage environment. This study used the TAM to present indicators that affect student's opinions and intent to use the cloud services available with mobile devices (Arpaci, 2016). Two hundred sixty-two undergraduate students participated in the study. The results showed that Perceived usefulness, subjective norm, and trust impacted the student's opinion in a positive way. The results then connected Perceived security and privacy as being directly related to how much the students would trust the cloud storage environment. Lastly, the perceived ubiquity and ease of use are tied back to perceived usefulness. Therefore, if the students felt that their data would remain confidential, readily available, and user-friendly in the cloud environment, they would trust storing their data in the cloud.

Criticism and limitations of TAM. The majority of adoption studies use TAM and apply causal-explanatory statistical analysis for understanding relationships (Behrend et al., 2011;). Yet, the concern with this is that the original TAM by Davis (1989) applies

only perceived usefulness and perceived ease of use, which have shortfalls when clarifying the intention to use (Venkatesh et al., 2003); consequently, researchers have proposed to extend TAM by supplementing the original TAM with additional factors that can clarify the intention to use.

Similarly, other limitations of the TAM is that it assumes that the end-user is free to choose or not choose to utilize the technology (Wheelock, 2013). However, once the decision to purchase specific hardware or software receives support, the user will then have to use the selected product. TAM does not thoroughly consider this situation.

Additionally, researchers continue to point out many limitations to TAM. Researchers argue that some other limitations of TAM are that it does not specify motives for positive or negative adoption of technology outside of showing the relationship with perceived usefulness and ease of use (Lee, 2015). It also falls short on connecting other external factors to the adoption of technology that includes the magnitude of the organizational, competitive advantage drivers, and system compatibility. Although TAM is typically quantitative, the previous examples of studies show that TAM can be successfully used in a qualitative environment to measure the perceived usefulness and perceived ease of use.

Adoption of cloud technologies

Overview of cloud technologies adoption. Many studies include the adoption of cloud computing. For example, Akar and Mardiyan (2016) studied analyzing factors affecting the adoption of cloud computing; Alkhater, Walters, and Wills (2018) researched the adoption of cloud computing in Saudi Arabia; Garrison, Wakefield, and

Kim (2015) examined the impact of social practices, supervisor decision making and IT technical expertise on cloud computing success; and Hamoodi (2016) studied how younger users had multiple factors that impacted the adoption of the cloud environment. These four authors have unique perspectives on cloud computing adoption and on how different obstacles can hinder the adoption and will I further examine them to show the perspectives of each author.

Akar and Mardiyan (2016) explained that cloud computing was a technology of the future for the field of information technologies. The study showed how different variables have an impact on the adoption of cloud computing and how the structural equation modeling technique assesses the different areas of the adoption. The study suggested that fifteen factors, including reliability, maintenance, virtualization, integration, performance, cost, on-demand service, legislation and regulations, security, supplier availability, adoption, need, customization, user-friendliness, and managerial support, contributed to the adoption of cloud computing.

The study included semistructured interviews to retrieve the data. They scheduled interviews with eight cloud computing SMEs who lived in Turkey. The experts were asked their perspectives on whether or not the 15 factors or any other related factors were significant and measurable for their organizations. The results of the interviews include categories separated into seven key reasons that impact the adoption of cloud computing in Turkey. The principal categories were security, need, supplier availability, on-demand service, cost, legislation, and regulations. Then they collected more data by using an online questionnaire targeting organizations that make use of cloud computing services.

The data categories included divisions of the organizations, years in service, company structure, usage of cloud computing services, and their service providers that offer cloud computing services.

As a result of the investigation, all factors excluding cost showed a direct impact on cloud computing adoption. Establishing acceptable technical requirements are vital to adopt cloud computing technology. Furthermore, most organizations prefer to separate themselves from the technical responsibilities and adapt to the business side of the industry. Additionally, funding is a factor when adopting cloud computing. Companies want low cost. The study forecasted that in the future, 11% of organizations budget, which in the past was for traditional infrastructure and services, would apply to a cloud computing service. Furthermore, when considering money, statistics showed that the organizations IT budget was reduced by 25% when they integrated cloud computing services.

The study also highlighted the need and security heightened organizations decision to adopt cloud computing. The need was centered around the companies' technological needs to stay competitive at a global level. While when considering security, if organizations are confident that their data is secure in the cloud, they quickly adopt the cloud concept. Similarly, the results revealed that legislation and regulations are significant factors to ensure the growth of data privacy and security in systems within the cloud computing environment. The results showed that many factors could impact the adoption of cloud computing, but the adoption can depend on the unique objectives of the organization that may vary between organizations.

An exploratory case study focused on the aspects that influenced moving to a cloud computing environment in the private sector using the Diffusion of Innovation Theory (Alkhater et al., 2018). An integrated model was proposed, along with other aspects that influence the adoption of cloud technology. The collection method involved retrieving data from 300 IT professionals in various private sector organizations in Saudi Arabia. Furthermore, 78% of the 300 IT professionals belonged to organizations that had not moved to cloud technology, while 22% of them had already transitioned over to a cloud infrastructure. They conducted tests on the cloud adoption model and different aspects that impacted cloud adoption positively or adversely. Factors that mostly persuaded the decision to adopt cloud technology were quality of service and trust. While security and privacy concerns still hinder organizations from transitioning to a cloud environment. This study also showed that the more substantial organizations were more skeptical about adoption than smaller organizations because of the misunderstanding of the benefits of the cloud environment. Therefore, buy-in from top management was required to ignite the adoption of cloud computing in Saudi Arabia, and they presented the benefits of the technology to the users. The research findings presented helpful guidelines to cloud providers, managers, and government officials on paths that they can take to promote moving to a cloud computing environment in Middle Eastern countries. Again, specific variables such as quality of service and trust can determine the speedy or delayed transition for an organization to move to a cloud environment.

Additionally, a case study examined the relationship between the three deployment models known as public, private, and hybrid and other IT capabilities using

the Resource-Based Theory (RBV) framework. The test population included 302 organizations (Garrison et al., 2015). The study found that IT capabilities with interrelationships significantly increased the success of cloud adoption over technical and supervisory capabilities. Additionally, the study further revealed that success within the public and hybrid cloud models depended on interrelationships of the IT capabilities that are available. Yet, there is more success with flexibility and agility of internal IT technical capabilities with the public cloud model. The study also showed that cloud services help companies to increase scalability, flexibility, and agility effectively as well as reduce costs and risks. Therefore, the deployment model that is selected could determine the success of the cloud-based on the variables that are important to the organization.

Cloud computing in the academic world is also expanding. Hamoodi (2016) case study found an increased number of cloud computing users in the academic world. Cloud computing provides students with the capability to access multiple applications. This study presented the acceptance level of the applications and the students' goals of interacting with cloud computing Applications applying the Unified Theory of Acceptance and Use of Technology Model (UTAUT). The pool of participants included approximately 110 students that represented various Jordanian universities. The results revealed that Performance and Effort Expectancy, Attitude toward using Technology, Social Influence, Self-Efficacy, Attention, and Relevance linked differently with Behavioral Intention in cloud computing applications. Yet, no relationships existed between Anxiety and Behavioral Intention in cloud computing Applications. Therefore,

the younger generations of perspectives can sway because of many different factors. The Ali et al. (2016) researchers also presented that the significant areas needing evaluation when adopting cloud computing in regional municipal governments are Internet connectivity, Internet speed, availability, reliability, data storage location, security, data sovereignty, cost, integration, data backup, provider dependability, employees' knowledge, and transportability.

Yet, the identification of processes is needed to be successful. A study addressed the lack of a standardized process to move to the cloud computing environment (Bildosola et al., 2015). The nonexistent standardization was due to organizations being unaware of the strategies and procedures to capture their correct requirements to transition to the cloud. Furthermore, the study indicated there should be a decision support tool used to help consider all requirements that are necessary to decide to migrate to the cloud. As a result, a decision support tool can significantly help with intelligent planning and implementation of transitioning to the cloud.

Concluding remarks. The review of strategies federal government IT project managers use to migrate IT Systems to the cloud was vital because the organizations strategic reasoning is different from commercial organizations, which may impact the adoption of cloud computing within the federal government. Furthermore, the study included how each aspect might affect the integration of systems and risks associated with strategies federal government IT project managers use to migrate IT Systems to the cloud, which was the goal of the review of the professional and academic literature.

Finally, the different aspects might provide a focus on how diverse adoption might occur depending on the industry.

While TTF, TOE, TRA, TPB, DOI, and UTUAT are feasible frameworks for studying technology, there are gaps in the theories to measure the different characteristics towards strategies federal government IT project managers use to migrate IT Systems to the cloud. Although the extension of the TAM theory has happened a few times, it meets the requirements to measure strategies federal government IT project managers use to migrate IT Systems to the cloud. Hence, TAM is the best fit to conduct this study. The conclusion from the literature review provides sufficient evidence that shortfalls are present with the strategies federal government IT project managers use to migrate IT Systems to the cloud, but the gap is the degree that the issue exists.

Transition and Summary

This section contained an overview of the adoption of cloud computing within organizations. Additionally, the purpose of the study was to explore the strategies used by federal government organizations IT project managers to select systems to migrate to the cloud. Applying TAM as the foundational theoretical framework for exploring the relationships provided a thorough understanding of how various factors have an impact on cloud adoption. Finally, the literature review focused on defining cloud computing, clouds in the federal government, defining the TAM, and how it applied to the study and arguments on the adoption of cloud technologies. Section 2 expounded on the study with sections such as the role of the researcher, the participants, the justification for the qualitative method and design, the population and sampling methods, ethical research,

data collection methods and techniques, data analysis method, and the validity of the study. Additionally, section 3 presented the findings and the examination of information, which included the application for professional practice, the implication for social change, and recommendations for future studies. Lastly, a reflection on conducting the study was presented.

Section 2: The Project

Section 2 includes a discussion of data related to the participants involved in the study, sampling procedures, and the research methodology and design that I used. In this section, I address the ethical boundaries for the protection of the participants in alignment with the Walden Institutional Review Board (IRB). Finally, I describe the method for data collection and data analysis, as well as how I upheld reliability and validity.

Purpose Statement

In this qualitative exploratory multiple case study, I explored the strategies used by federal government IT project managers to select systems to migrate to the cloud. The targeted population of this study was 10 federal government IT project managers in three federal government agencies in the Southeast of the United States who have strategies to select federal IT systems that migrate to the cloud. The implication for positive social change from the results of this study may lead to home and workplace reductions of the carbon footprint by consolidating data and allowing them to be stored, managed, and processed remotely instead of locally. This reduces the decentralized carbon footprint by placing the data at centralized data centers for multiple services such as software-as-a-service and platform-as-a-service.

Role of the Researcher

My role in this qualitative study was to, in an unbiased manner, collect, categorize, infer, and access data. The role of the researcher is to be knowledgeable about the research and without any biases, create well thought out interview questions, and pay close attention to the participants' answers (Roulston & Shelton, 2015). The integrity of a

study can be impacted by how the researcher identifies their personal views (Fusch & Ness, 2015). I have over 20 years of professional experience in the IT field within the federal government, working as an innovator of change with virtualization, but only the planning stages of transitioning computer systems to the cloud environment. The planning stage involved being a part of a team made up of individuals from multiple organizations within the United States Marine Corps (USMC) that had the task to identify USMC computer systems and applications that needed to transition to a cloud environment. However, I have no relationships with the participants of this study. My background related to the study topic was my motivation for selecting to present this study. My relationship details related to the study topic and participants above is so that the audience can comprehend the researcher's experience and so there are no outside biases. Vydiswaran, Zhai, Roth, and Pirolli (2015) stated that researchers should always assess supporting evidence or challenge a claim to ensure that biases are not present in a research topic. Therefore, I did not allow my personal experiences to interfere with the findings from the research.

Per the U.S. Department of Health and Human Services (1979), the Belmont Report defines research participants protected under the Belmont Report as human subjects that include individuals or groups that are protected by ethical practices and guidelines in research studies. I made sure to include all of the basic principles in the Belmont Report throughout my research process and methods. The Belmont Report identified respect for persons, beneficence, and justice as the basic principles of ethics:

- Respect for Persons – includes respecting and protecting individuals'

rights.

- Beneficence – includes respecting individuals' choices, ensuring they are not harmed and protecting their welfare.
- Justice – includes just and equal distribution of advantages and disadvantages of participation in a research study. (U.S. Department of Health and Human Services, 1979).

Without data integrity, in qualitative research, the credibility of the study is weakened even though it may be without the researchers' knowledge (Roulston & Shelton, 2015). Therefore, I asked non-leading questions that allowed definitive answers during the interview process. I did not interrupt or try to interject my opinion in any way to avoid any bias in the results. The purpose of my interviews was to seek the participants' viewpoint, expertise, and background experience on my research topic. A researcher's interview protocol is a tool to gather information when asking interview questions about the research topic (Patton, 2015). I used an interview protocol for my in-depth interviews for this study (see Appendix A).

Participants

For this qualitative case study, I selected participants from the population of IT project managers within the government on the east coast. I strategically selected the sample , as I will discuss in a later section. Vasileiou, Barnett, Thorpe, and Young (2018) suggested sample sizes used in qualitative research should be large enough to receive a detailed understanding, but small enough to get a full understanding without excluding any essential data. The participants' skill sets included knowledge and experience as well

as best practices regarding strategies federal government IT project managers use to migrate IT Systems to the cloud. A key attribute of qualitative research is the data collected from the knowledge and experience of the participants in the study (Arseven, 2018). If the participant did not have the required experience, they were not able to participate in the study. Rosenkranz (2015) suggested removing participants from the study with inadequate information.

The critical interviewees for the in-depth interviews consisted of IT project management personnel who work within the IT department or IT project management office. The participants for this study followed the government governance processes and procedures related to migrating IT systems to the cloud. Before I selected the participants, I used preinterview questions to determine their title, department, role, and level of expertise with migrating IT Systems to the cloud practices.

A gatekeeper coordinates all communications between the researcher and the participants (Peticca-Harris, DeGama, & Elias, 2016). My strategy was to use my senior points of contact at the organization of the study to contact the appropriate staff members that I wanted to interview once I commenced data collection. A letter of cooperation from the case study organization is included in Appendix C. Hays, Wood, Dahl, and Kirk-Jenkins (2016) recommended that a researcher should strategically support the research process using multiple resources. I contacted the participants by using the information that the gatekeeper provided to me and then used their e-mail addresses to send them emails (see Appendix D) introducing myself, provided the purpose of the study, and respectfully asked them to be a part of my study. I then followed up with another e-mail

(see Appendix E) requesting a convenient time to interview them if they agreed to participate. I also provided them my interview questions beforehand so that they would be better prepared to answer the questions. Alase (2017) found that building relationships with participants allows for the effortless collection of data. Therefore, to make the interview process more friendly and inviting, I set up Zoom meetings to conduct interviews via audio and video so that I could observe the body language while I recorded the responses. However, some participants were not able to use Zoom, so I scheduled over the phone interviews to remain flexible with accommodating the participant. I also ensured that I adjusted the time slots so that I allowed myself enough time to collect the data during the interviews and attend the online meeting on time.

The email that I created to inform the participants (see Appendix E) included a brief introduction to the study, the purpose of the study, potential benefits of the study and their right of confidentiality to ensure I gained their trust and respect. Peticca-Harris et al. (2016) developed a process for reaching out to participants during data collection that includes study design and forecasting, identifying informants, communicating with informants, and intermingling with informants. Rattani and Johns (2017) also suggested using well-known individuals to reach out to participants. In compliance with the guidance from the IRB for informed consent, I obtained the informed consent for each of the participants in my study. I saved all of the participants' personal identifiable information in a secured document to ensure the confidentiality of all participants. Ensuring participants remain anonymous protects them when involved in ethical research (Angiuli, Blitzstein, & Waldo, 2015).

The in-depth interviews (see Appendix A and B) captured detailed practices that reveal the strategies on how each IT project manager migrates IT Systems to the cloud. I interviewed IT project managers that met the requirements to be in the population. Haegele and Hodge (2015) recommended that detailed information about the participants should be included in the research. Ardagna, Asal, Damiani, and Vu (2015) also argued that the participants should have the level of knowledge required to address the questions that are asked in the interview.

Qualitative methodology allows researchers to use their interpersonal skills to evaluate a research topic (Alase, 2017). Therefore, I used my personal experience with interacting with different levels of personnel within my career, to interview the interviewees and make them feel comfortable with answering the questions. Guest, Namey, Taylor, Eley, and McKenna (2017) argued that interviews provide more insight into individual viewpoints. While Brinkmann (2016) explained that a vast amount of data could be captured when using qualitative research interviews.

Research Method and Design

Qualitative case study design strives to focus on meanings that shape people's perspectives based on their experiences (Taylor, Blount, & Bloom, 2017). This research method and design provide the participants with a descriptive account of events and experiences (Louch, Mohammed, Hughes, & O'Hara, 2019). In this qualitative case study, I explored the strategies used by federal government IT project managers to select systems to migrate to the cloud. A qualitative case study presents thorough and vivid depictions of the participants' events that have occurred in their life (Maphalala &

Mpofu, 2018). I explored strategies to migrate systems to the cloud to improve my acumen in this area, which will allow me to provide insights for IT project managers in the federal government.

Method

I utilized the qualitative method to collect data for my study; however, I also considered quantitative and mixed-methods approaches as feasible research methods for conducting my research study. In a qualitative study, the data collection methods include observation, interviews, and assessing documentation (Vezne & Gunbayi, 2018). Qualitative research utilizing case studies focus on data to be collected and then it is examined by decomposing data into themes (Sahito & Vaisanen, 2018). Qualitative research provides a thorough background of information that gives meaning to a specific phenomenon rather than generalized information (Karakas & Yavuz, 2018). I selected the qualitative research method as the best method for conducting a detailed study for my topic of strategies used by federal government IT project managers to select systems to migrate to the cloud. I selected the qualitative research method to analytically evaluate current and previous data and references on the topic (Neto, Alfama, Gonçalves, & Borges, 2018). Qualitative researchers record their notes as they go through each step of their research, which reveals the reasons for the decisions that they make (Connelly, 2016). I recorded my notes in a journal to ensure I provide the background meanings to the decisions that I make about the data and results. Data collection can be administered from multiple sources such as interviews, reflexive journal, and writings (Cope, 2015). Reaching data saturation and deciding on the appropriate population and sample size

includes the following considerations: (a) the goal of the study, (b) the environment of the study population, (c) the categories of coding, and the difficulty and strength of the journal used by the researcher (Hennink, Kaiser, & Marconi, 2016). In the qualitative research study, I recorded data in my journal from experienced professionals that are subject matter experts in the cloud computing field.

For this research study, I decided that the quantitative and mixed-methods approaches were not the best fit for gathering the data to answer the research question of my study. Qualitative research usually produces more contextual results, while quantitative research offers numerical and statistical data (Quick & Hall, 2015). Researchers use qualitative methods to describe an event related to their study (Percy, Kostere, & Kostere, 2015). Categorizing data in an orderly pattern from various sources is essential to the success of qualitative research (Houghton, Murphy, Shaw, & Casey, 2015). The quantitative method includes gathering statistical information and using measurements; for my study, I wanted to collect data by conducting interviews to ask more detailed questions and understand the perspectives of the participants, so I selected the qualitative method. Qualitative research requires all participants to have a level of understanding of the research (Boddy, 2016). Haegele and Hodge (2015) explained that the quantitative methodology should be unbiased data captured anonymously using a survey. McCusker and Gunaydin (2015) explained that the quantitative research method should have a proposed theory that has supportive details on the meaning of the data and what is considered in support of or against the theory.

Mixed methods incorporate both quantitative and qualitative methods to collect data for a research study (Kamalodeen & Jameson-Charles, 2016). Almamy, Taina, Airi, Erkki, and Yue (2015) also argued that consolidating methods can provide more support for the research than a single methodology. Touray, Savolainen, Salminen, Sutinen, and Dai (2015) argued that utilizing the mix methods approach by consolidating the qualitative and quantitative methods is a more complicated process than just selecting one method. I found that the mixed-methods approach was ill suited for my study due to its inclusion of using quantitative concepts, so it is not relevant to answer my research question for my study. Independently using a qualitative approach allowed me to provide more depth to my conversations with the participants and a full synopsis of the topics related to the research question.

Research design

There are multiple types of qualitative research. The qualitative research design types include ethnography, phenomenology, historical research, and case studies (Nimehchisalem, 2018). Lewis (2015) reported that the critical research designs that fall under the qualitative method are narrative, case study, phenomenological, and ethnographic. The use of case studies provides a description of findings related to a specific event (Ikhwanudin & Suryadi, 2018). I selected a case study design to ensure I performed an in-depth review of the strategies that federal government IT project managers use to select systems to transition to the cloud. In a case study design, I performed a detailed review of the strategies to transition systems into the cloud. The case study provides an in-depth description that provides an understanding of the context

and the decision of whether or not the findings can be applied in another environment (Alpi & Evans, 2019). I selected a case study design to understand choices made by IT project managers to use strategies, deployment of the strategies, and the impact of the strategies on transitioning systems to the cloud. I chose a case study design to examine a specific case of project managers using strategies to migrate IT systems to the cloud within a federal government environment.

Ethnographical research includes the researcher's observation of the behaviors of the participants (Gruenefeld et al., 2018). Ethnographic research design also applies when the study is about a group of people in a common environment and the researcher wants to describe and observe behaviors, beliefs, and collaboration amongst the group (Percy et al., 2015). In ethnographic design, the researcher examines cultural groups in a typical setting over a specific period of time (Mannay & Morgan, 2015). I did not select an ethnographical study because it highlights the observation of cultures and behaviors within a group of people. Observing cultures and groups did not help me gain a better-detailed understanding of strategies to transition systems to the cloud so I did not consider it. An ethnographical study does not involve asking detail questions; instead, it involves observations which would not provide me the detailed information that is needed to answer my research question, so I did not select it.

A phenomenological research design includes how people experience events that occur in their lives and how they create meaning and different perspectives from those experiences (Picton, Moxham, & Patterson, 2017). Researchers using the

phenomenological design explores the stories behind the events or experiences of the participants in the study (Corley, 2015). Researchers use phenomenological designs to study how participants understand and perceive events and experiences (Rosenthal, 2016). I did not consider the perspectives of the participants social, cultural, and political views in this study, so I did not select the phenomenological design because it was not appropriate for this study. The participants view on specifically the strategies to transition systems to the cloud were the only perspectives that I was interested in to answer my research question, so I selected the case study design.

Case study research is a qualitative approach in which the researcher examines a real-life phenomenon or phenomena for a specific period to gather in-depth data and then describe the phenomena (Alpi & Evans, 2019). Case study research is appropriate for the researcher examining new technology implementation projects (Swanier, 2016). Rule and John (2015) inferred, there are multiple ways of approaching case study research. I used this approach by using interviews, asking detailed questions to query the minds of my participants.

Data saturation is reached when there is no additional data to support the study and enough information to duplicate the study (Fusch & Ness, 2015). If data saturation is not reached it can affect the perception of the quality of the data and content validity (Fusch & Ness, 2015). In qualitative research methods, researchers consider data saturation to be directly related to the value of a study and the strength of the supporting details (Fusch & Ness, 2015). It is essential to have a level of understanding of the study, participants responses, and the point of data saturation in the research. As a

reccommendation, data collection from interviews should continue until saturation is met (Weller, Blackburn, Borgatti, Gravlee, & Johnson, 2018). I ensured that I met data saturation by interviewing all participants in the study and asking them clear and concise questions that limited the need to conduct any follow-up interviews. I also interviewed participants who are considered subject matter experts with experience using strategies to transition systems to the cloud. Interviews are performed to ask probing questions and to produce more detailed data collection as well as to simplify responses (Resnik, Acluche, & Lieberman Klinger, 2018). Interviews allow more flexibility to ask probing questions and at the same time, provide control and focus that can be steered by the interviewer (Singh & Ruggunan, 2016). I asked all participants the same detailed questions to ensure I did not receive erroneous results and to ensure I reached data saturation.

Data triangulation and data saturation complement each other since data triangulation is a means to get to data saturation (Fusch & Ness, 2017). Data triangulation involves using multiple sources of information to support the validity of the study (McCusker & Gunaydin, 2015). Fusch and Ness (2015) also found that data triangulation is the use of various sources of data collection and evaluation. I collected various data that is for public distribution during my research. The data collection included project management documentation, selection documents, contract documents, standard operating procedures, policies, instructions, other related documentation, interview questions and observing the behavior of my participants during the interviews.

I documented all answers to my interview questions with all participants in my study targeted population. Additionally, I made a note of all mannerisms from

participants during the interviews. Furthermore, I documented data from related articles and documentation about cloud migration strategies, best practices, collaboration, and processes from the organization in support of my research. I reached data triangulation when I consolidated the data that I collected from these various sources of information to determine when I reached data saturation. I continuously gathered data until I identified all current data to reach data saturation.

I ensured that I collected various sources of data to support my study. To achieve data triangulation, I reviewed secondary documentation from the organization's internal documents, public documentation, interview questions, and any observations of the participants during the interviews. Hussein (2015) argued that data triangulation is a technique researchers' use to verify the correctness of the data collection process. Triangulation improves the findings of the study by validating the findings utilizing data from distinctly different sources of information (Abro, Khurshid, & Aamir, 2015). I utilized both the gatekeeper and the participants to get copies of additional information about the organizations so that I could gain more insight about the organization which was helpful with identifying organizational documents that were advantageous to supporting my study. Supporting documentation includes policies, standard operating procedures, desk guides, organization charts, and any other documents supportive of my study. I also used the Internet to research public records about the organizations involved in my study.

Population and Sampling

The population of my study included 10 seasoned IT project managers from three federal government organizations in the state of Virginia as well as Washington D.C. All participants in the population of my study had experience using strategies to migrate systems to the cloud. Sampling is an essential piece of the research process because if the sampling is inappropriate, then the credibility is weakened (Onwuegbuzie & Collins, 2017). Malterud, Siersma, and Guassora (2016) argued that the amount of information the participant has related to the study decreases the number of participants that are needed for the study. Additionally, Dasgupta (2015) further found that there is not a mandatory sample size that is a requirement for qualitative studies. The study population included IT project managers with at least seven years of experience in transitioning systems to different network environments, managers with specific roles in the cloud migration process and a key stakeholder in the development of strategies to migrate systems to the cloud.

I held the interviews at my home office to conduct the interviews. I posted a sign that said interview in progress on my home office door, turned my cell phone to silent and turned off my alarm clocks so the participant was not interrupted throughout the interview. Background noises should be kept at a minimum during interviews to eliminate capturing unwanted audio and distracting participants (Dikko, 2016). I selected my home office because it was away from common areas of my home where my family gathered to avoid background noises and to eliminate interrupting my participants' responses. I was sensitive of the participants time by proposing any time that was

convenient for them since the Coronavirus Disease (COVID) 19 pandemic changed some of the participants working environments and availability. The change to the working environment eliminated travel time and allowed the complete planned time for the interview.

Sampling from a population is performed in multiple ways. Probability sampling is the idea that every participant has the same probability of being selected from the population (Etikan, Musa, & Alkassim, 2016). While nonprobability sampling does not give all the participants the same probability of being included in the study (Etikan et al., 2016). I used the purposive sampling strategy for my study. Researchers use purposive sampling method to select a sample of participants that are subject matter experts in a particular field (Bernard, 2017). I used a purposive sampling strategy to interview and capture the perspectives of at least four subjects or until data saturation within the case or organization, in my study targeted population from three federal government organizations that qualify using the eligibility criteria. The eligibility criteria included 10 seasoned IT project managers from three federal government organizations who have used strategies to transition systems to the cloud environment. Purposive sampling was appropriate because the small population size meets the structure of this study, and it provided targeted participants. Most organizations have small groups of IT project managers, so the assumption was that the population would include a small number of IT project managers with the specific skills in the targeted population. In qualitative research, a well-known method for defining the sample sizes is to determine if data

saturation is reached (Astroth & Chung, 2018). So, I ensured that I used this method when asking questions to reach data saturation.

My study population included 10 IT project managers from three federal government organizations who met all the eligibility criteria, that handle migrating systems to the cloud. I invited the entire targeted study population to participate in my study. Sampling is done to ensure it supports the findings of the study by collecting data that represents the population of the study (Etikan et al., 2016). My sample size included all participants in the study targeted population, so my results represent an actual perspective of all participants. I notated all of the interviews in a journal to ensure I kept them in a centralized location and that I interviewed all participants in the study targeted population. For additional information that the participants wanted to provide to me after the interview, I used my journal to keep track of any additional information and all pending actions. I ensured that the interviews remained private to protect the participants' identity by using numerical and alphabetic characters that represent each participant and organization to hide the identity of the participants.

Malterud et al. (2016) insist that sample size necessary for data saturation includes the study, the unique sample, the theory used, the quality of the conversation with the participant and the strategy used to evaluate the study. I collected data from other related sources of information to ensure that I captured an accurate perspective that supported the results from the interviews. I also used additional sources of information to create data triangulation, which helped me prove that I have achieved data saturation. I

collected data until no other data exist outside of the data collected, which indicated I had reached data saturation.

Ethical Research

Ethical research utilizes applicable scientific methods that support a specific field of study (Stang, 2015). I ensured that I reviewed the definition of ethical research again to guarantee that all my practices and processes were ethical within my study. Furthermore, I completed the online course on protecting human research participants with the National Institutes of Health and received a certificate of completion (Certification Number: 2832294, see Appendix F).

Once I received approval from the Walden University Institutional Review Board (IRB) (number 10-16-19-0394296), I then contacted the participants organizations to obtain the letters of cooperation from each organization. I ensured that all of my participants received, read and consented to the consent form to document their approval to participate in my study. Institutional Review Boards (IRBs) main concerns are informed consent forms, privacy, discretion, bodily/emotional harm to participants, conflict of interests, and rational scientific analysis (Cannon & Buttell, 2015).

The consent forms ensured that I was compliant with the IRB guidelines. I used the informed consent form to ensure all participants were aware of the purpose of the study, opportunities, risks, confidentiality of their information, and the right for them to withdraw from the study at any time (Barnard, 2016). I took the extra time to ensure participants fully understood the purpose of the research. Additionally, I answered all questions if clarification was needed before consent.

At no point in the study did I allow the participants to feel that they were unable to withdraw from the study, feel threatened or feel that their privacy or confidentially could be compromised. If for any reason a participant wanted to withdraw from the study, I would have promptly deleted their data. Yet, since I used purposive sampling to interview everyone in my study targeted population, removing participants did not apply in this study. I did not pay any funds to participants to solicit their participation in this study.

I secured all of the data for this study in appropriate areas to ensure confidentiality of the names of the participants and organizations. All emails with data related to the study was encrypted and signed. I used an external hard drive, so it also was encrypted. All printed documentation was stored in a security container with a lock on it and will be retained for at least five years to protect the participants' confidentiality. After the five-year period ends, I will delete the data and I will shred the printed documents using the appropriate shredder for sensitive data. After five years, any documentation from the research is irrelevant and can be destroyed (Batista et al., 2015).

Data Collection

Data collection instruments

I was the primary data collection instrument as the researcher of the study. The researcher is the main collection mechanism to interact with participants to record information related to the research (Santiago-Delefosse, Gavin, Bruchez, Roux, & Stephen, 2016). This section discusses data collection tools, how data was collected and utilized during the study. Semistructured interviews were used as a data collection

method so I could observe body language and ask open-ended questions, which were showed in the interview protocol document (see Appendix A). I conducted the interviews appropriately to collect the data from the participants. I followed all rules of conduct related to the semistructured interviews to answer the research question of what strategies do federal government IT project managers use to select systems to migrate systems to the cloud. The principal instrument that I used is the semistructured interview along with a journal to record the responses. During the interview process, I asked all the participants the same questions, and I only provided an example if they asked for one. I provided an example to help clarify questions for them if they did not understand the question. Using this approach helped me stay in alignment with the interview protocol, so the semistructured interviews were more reliable. Questions asked after the initial interview are used to clarify responses and to ensure that participants conveyed their responses correctly to the researcher (Kallio, Pietilä, Johnson, & Kangasniemi, 2016). Consequently, once I completed the interviews I member checked the data that I transcribed by calling the participants and emailing the transcript to the participant to ensure their statements were accurate. Additionally, for accountability purposes, it is best to confirm research results with participants by continuously using member checking (Naidu & Prose, 2018). I performed the member checking steps to guarantee the reliability and validity issues of the data collection process.

Data collection technique

I utilized interviews and analyzed documents as the main methods of data collection in my study. My data collection technique involved reaching out to

participants, explaining what the research was about, asking the participant to conduct the interview, ensuring that I received informed consent from participants, coordinating a convenient interview time with the participant, scheduling interviews, following an interview protocol, and conducting member-checking activities. All of these activities were the primary data collection tools I used to collect the data in support of my study.

It is vital to have a consistent interview protocol to acquire high-quality data from interviews (Yeong, Ismail, Ismail, & Hamzah, 2018). I used the interview protocol to ensure I was organized and meticulous with all task in preparation for data collection and during data collection. The interview protocol allows you to ask questions outside of the interview questions (Fletcher, DeMassis, & Nordqvist, 2016). Castillo-Montoya suggested that an interview protocol starts the engagement of conversation (2016). Data collection during interviews paired with an interview protocol improves the value of the data (Castillo-Montoya, 2016). I used the interview protocol to guide the plan for the interview process. I used my Apple iPhone to record the interview, and I ensured that I set the do not disturb and airplane mode settings on my phone so the recording would not be interrupted during the interview process.

Member checking supports the integrity of the data by ensuring the researcher interpreted the participants' responses accurately (Morse, 2015). Member checking examines the value of the results from the participants (Birt, Scott, Cavers, Campbell, & Walter, 2016). Thomas (2017) argued that member checking is helpful when requesting approval to use direct quotes from participants.

I used member checking and data triangulation to check the accuracy and legitimacy of all my data, which supported the integrity of my study. After reviewing all the current and new data, I was able to with certainty show that I have met data saturation, which again was supported by the member checking process. Member checking showed that I met data saturation and that the data was valid and understood appropriately. Member checking involves members potentially reviewing recordings or transcribed data from their interview for correctness (Harvey, 2015).

I used member checking to validate the accuracy of the phone interviews by carefully reviewing all the data that was collected. Member checking is a review with the participants to ensure recorded data was what the participant truly wanted to convey (Kornbluh, 2015). I used the member checking technique after speaking with each participant and I followed up with the participants additional times as needed.

I utilized the gatekeeper for each organization to provide me with the participant email addresses. After getting a response back from the participant that they were interested in being a part of the study, I communicated with the participants via email and phone. I explained the use of the consent form to the participants and requested that they email their consent back to me. Once the consent from the participants was received, I coordinated with the participants to schedule interviews.

I ensured that the participants understood I recorded all interviews and phone discussions. I also sent the interview questions to the participants before the interview for their review. Once I completed the interviews, I performed member checking to ensure I recorded all responses correctly.

The recording was then transferred to an external encrypted hard drive and then deleted from the iPhone. The telephone was the alternative method for capturing the participants' responses due to COVID 19 health safety guidance to avoid unnecessary face to face interactions if possible. All recordings were transcribed into a word document and protected via password, and then saved to the external encrypted hard drive. The hard drive is now in my personal safe at home.

Additionally, I obtained IRB approval before beginning any coordination or data collection. Gatekeepers can initiate an introduction to participants by using their already established relationship with participants while simultaneously giving a brief overview of the benefits of the study (Peticca-Harris et al., 2016). I emailed the gatekeepers a short description of my study and allowed them to recommend participants that would meet the criteria for my study. I also used a journal to record specific answers to the research questions and to make a note of observations.

I ensured that the participants were comfortable with speaking to me by giving a short introduction of who I was and what the goals of the study were overall. During the interview process, I ensured that I referred to the questions so that I clearly and concisely asked the questions and then listened for the answers. During the interview, I also allowed the participant to elaborate on their answers without interruption so they could convey their thoughts. Similarly, if the participant wanted to go back to a question, I allowed that flexibility. After the completion of the interviews, I kept in contact with the participants until the conclusion of the study so that I could keep them informed of the status of the study.

Data organization techniques

I kept track of data in various ways to ensure that I had enough primary and supporting data. The semistructured interviews included typed questions with adequate space to record responses. I used a recorder to record and document the audio of the interview. I conducted some of the interviews online, so I used Zoom for the participants that preferred to use Zoom. The use of a journal allows the researcher to have more valid data (Vicary, Young, & Hicks, 2016). Therefore, I used a journal to record my notes and observations of the strategies used by IT project managers to migrate systems to the cloud. I scanned my notes from my journal to create a digital record of the notes. I then transferred the notes to my encrypted hard drive for safekeeping. Putting the data in categories assisted with grouping similar data (Plamondon, Bottorff, & Cole, 2015). After I scanned the data, it was converted to .pdf format to avoid mistakenly modifying the document. I also used Microsoft Excel to consolidate and view my data. I kept track of all my participants information by categorizing them as Participant 1 through 10. I categorized each organization as Organization A, Organization B, and Organization C. I created a naming standard that would include the following format, Participant 1 Month Year, to ensure all data was easily searchable.

I ensured that all collected data remained confidential by storing it in password-locked software on an encrypted hard drive, and I secured the drive in a locked, secure container when it was not in use. Data will remain stored on the hard drive for five years, and then after five years, I will permanently delete all electronic media and shred any

hard copy documents. I will maintain the hard copy documents in my safe with the encrypted hard drive.

Data Analysis Technique

During the data analysis, I thoroughly reviewed all data to ensure I had relevant information to answer my research question on strategies used by federal government IT project managers to select systems to migrate to the cloud. I choose to use the within-method type of methodological triangulation to perform my analysis of the data that I collected via documents, interviews, and observations for strategies used by federal government IT project managers to select systems to migrate to the cloud. Methodological triangulation provides in-depth data collection and provides validity to the research (Fusch & Ness, 2015). When I started my data analysis, I ensured that I did a thorough inventory of the data that I had received. I then did a thorough review of the data to look for similarities, trends, patterns, relationships, and inconsistencies. I grouped like responses together into themes, lessons learned, and best practices. I kept a binder of all the documentation and kept a journal available to record all notes in it. I used specific numerical and alphabetical characters to represent participants and different types of data. I went back through the data once again to ensure all data was captured and interpreted correctly to ensure I could clearly and concisely answer my research question. My data analysis included data from my literature review that supported my research question, the conceptual framework, and data I collected from documentation interviews and observations. Additionally, the data that I gathered was from the most current references available.

Atlas.ti is a qualitative data analysis software that I used for evaluating data in research (Paulus & Bennett, 2017). I used the Atlas.ti software to organize and analyze the data that I collected from documentation, interviews, and observations by using the software to code and group my data and assist me with extracting meaning from the data throughout the rest of my data collection and analysis. Computer software help to simplify and consolidate all of the raw data (Vezne & Gunbayi, 2018). I also used Atlas.ti to assist with displaying a pictorial representation of my data, which assisted me with categorizing the data into themes in alignment with my research question. There are advantages to using software programs to gather data in research because it can quickly manage large amounts of data for evaluation. (Iovu, Goian, & Runcan, 2015). I also evaluated the data to see the interrelationships between migrating systems to the cloud, strategies, and characteristics of the TAM. Additionally, during research it is recommended to organize data using codes and themes (Hennink et al., 2016).

Reliability and Validity

It is critically important that when researchers perform a study that they have rules and regulations to protect the participants and produce a reliable and valid study. To demonstrate that validity and reliability exist in research data, the researcher should use the rules of validity and reliability when performing qualitative research (Ikhwanudin & Suryadi, 2018). The quality of the research value comes through the validity and reliability of the research and findings (Hayashi, Abib, & Hoppen, 2019). Pilcher and Cortazzi (2016) asserted that researchers must ensure that reliability and validity a part of

their research findings. In qualitative research, reliability-focused on being able to repeat the study and obtaining the same findings while validity

addressed the confidence level and the strength of the argument the research is providing (Olson, McAllister, Grinnell, Walters, & Appunn, 2016). Without reliability and validity, the research may be considered untrustworthy. Therefore, when performing the research, it is pertinent that data collection and results are not erroneous and unclear. In qualitative research, validity refers to the level of appropriateness the research and findings of the study are in relation to the main research question (Leung, 2015).

Credibility

In a qualitative study, researchers use member checking to assess the credibility of the findings by seeking feedback from the participants to confirm or refute the truthfulness of the findings (Birt et al., 2016). I ensured that I reached data saturation by organizing the data so that I could see that the data is no longer presenting any new viewpoints and justifications. Therefore, I used a data saturation grid to track correlations and themes from the interviews to determine when I had reached the level of data saturation. Additionally, I used member checking as a technique to ensure my data was credible by asking participants if I interpreted their narratives, words, and perspectives correctly.

Transferability

Transferability is the consideration of how the results of a study are applicable in other settings (Cruz & Tantia, 2017). A researcher ensures the transferability of a study by thoroughly describing the research so future researchers can determine if the research

findings are transferable to another setting (Guba & Lincoln, 1985). I ensured that this study was transferable by providing an in-depth narrative, background of the study, the participant criteria, the sampling methodology, and the population size, so the transferability would allow it to go beyond the bounds of this research.

Dependability and Confirmability

Confirmability is when data is in alignment with what was truly provided by the participants (McInnes, Peters, Bonney, & Halcomb, 2017). The confirmability of a study also includes journals, which gives meaning to the decisions that were made and may also be used to establish confirmability (Guba & Lincoln, 1982; Lincoln & Guba, 1985). In confirmability, the process must eliminate the question of whether or not the results from the research are indeed the experiences of the participant and not the biases of the researcher (Abdalla, Oliveira, Azevedo, & Gonzalez, 2018). Data analysis reveals confirmability. Therefore, I ensured confirmability by revealing any personal biases towards the research question.

Additionally, I ensured that all my correlations and themes strongly support what was stated by the participants of the study. Methodological triangulation allows researchers to enhance the accuracy, dependability, and validity of the study (Wilson, 2016). Dependability verifies that results from a research study could be repeated (Amankwaa, 2016). Methodological triangulation also allows researchers' use of multiple data sources to support data saturation (Baillie, 2015). I documented all of the steps that I perform to check and recheck my data as the research moved forward. All of the participants' responses were carefully written and recorded. I used various methods

such as note-taking, audio recording, and analyzing documents to collect the most enriched data and to avoid erroneous data. If there are erroneous data in one method, the other methods will act as the backup method to retrieve the most accurate data.

A common technique that researchers use is member checking to increase the validity and legitimacy of the study by encouraging feedback from the informants after data collection (Iivari, 2018). The Informants may validate the researchers' explanations as well as point out incorrect statements or reevaluate their perspectives (Iivari, 2018). I requested that all my participants confirm my narrative of their interview responses to solidify the confirmability and reliability of my research.

Transition and Summary

In this section, I reviewed the specific tasks that I performed for my research study. This section includes a description of the role of the researcher, participants involved, research method and design, population and sampling, ethical research data collection, data analysis techniques, and reliability and validity. The next section includes the results of my research, applications to professional practice, implications for social change, and recommendations for further research.

Section 3: Application to Professional Practice and Implications for Change

This study's purpose was to explore the strategies used by federal government IT project managers to select systems to migrate to the cloud. This section includes the presentation of findings from this qualitative multiple case study. It includes a description of how this study may contribute to the information technology community, implications for social change, and recommendations for future research. The section also includes a final reflection from conducting the study.

Overview of Study

The purpose of this qualitative exploratory multiple case study was to explore the strategies used by federal government IT project managers to select systems to migrate to the cloud. The study incorporated semistructured, phone and video teleconference interviews with 10 participants located in federal organizations in Virginia and Washington, D.C area. I collected data from 10 IT project managers from three separate organizations that were trailblazers for migrating federal government systems to the cloud. I also analyzed documentation from publicly available sources on federal government cloud computing and directly from the participants or from websites that the participants referred me to. All the participants had at least 7 years of cloud related experience and up to 28 years of IT experience. I utilized member checking and data triangulation to increase the validity of my findings from the data collection and analysis. The conclusions of the data analysis revealed four major themes that are considered strategies for migrating systems to the cloud.

Presentation of the Findings

The main research question of this study was: What strategies are used by federal government IT project managers to select systems to migrate to the cloud? This section includes the findings from my research study and highlights four major themes that I identified after conducting the study. I explored three cases, totaling 10 participants. The four themes represented strategies that federal government IT project managers could use to select systems to migrate to the cloud. The four major themes that emerged from data analysis included: Mission Owner Readiness, Planned Funding, Leveraging Industry Expertise, and Application Categorization/Rationalization.

Theme 1: Mission Owner Readiness

Theme 1 was mission owner readiness. This theme is vital because mission owners are the application owners and have to consume and fund the cloud services that they require. Therefore, the mission owner has to be willing to contemplate and accept the needed changes to the application to absorb all of the benefits from the cloud environment. Without the perspective of allowing changes to the application in the cloud environment, the cloud would not be as beneficial to the mission owner. The selection and changes to the application in the cloud should include evaluating multiple factors; however, Theme 1 focuses on the necessity of the mission owner readiness.

Theme 1 was supported by all interview participants when they stressed the criticality of the mission owner readiness to select systems to move to the cloud (see Table 1).

Table 1

Frequency of Occurrence: Theme 1

Data Source	Total number	Frequency of occurrence
Interviewees	10	10
Documents	37	11

Interviewee OCP1 stated that "if we do not have a motivated application owner or mission owner to bring their applications into those platforms, it can create delays." OCP1 further stated that,

> We did see delays in the past, but now with the ability to move into the cloud and to different cloud environments, we have seen a lot of mission owners being more collaborative and wanting to move to the cloud faster. OCP1 also explained that, We have seen a lot of championing at the leadership level to champion those systems that are moving faster and to really highlight and celebrate their successes." This shows that senior leadership influence can push along the cloud migration initiative exponentially.

Similarly, OBP3 stated that,

> The key to their successful transition was the involvement of an executive champion in the form of a resource sponsor. Additionally, having direct access to the director of all the organizations that are major stakeholders in the migration of the applications to the cloud is beneficial to the success of the project. This allows issues to be resolved and escalated quickly to the executive level. OCP3

> explained that our recommended approach is to refactor to take advantage of all that the cloud offers, but this is often difficult due to resource constraints on the application owner. The term "refactor" is used to describe how the application is architected and developed in the cloud.

OCP2 explained,

> Direction for applications and systems to migrate to the cloud really comes from a higher level and is the responsibility of the individual mission owners, and then they go to the appropriate point of contact for assistance in making that happen.

OCP 1, 2, and 3 insisted that selection of which mission owner applications to move to the cloud is primarily a mission owner or larger federal government organization driven activity. Therefore, the direction to move to the cloud is at a higher level. However, the selected systems could be senior leadership directed and a recommendation from the mission owner to senior leadership. For this purpose, the readiness of the mission owner is essential.

Additionally, OAP2 asserted, "A cloud environment is a key component in creating or moving to a more centralized architecture, which is the direction that the federal government wants the mission owners to move to." OBP1 emphasized, "Mission owner success is when at the end of the transition, the users of the system do not really notice any performance degradations, the system still operates and functions properly." Similarly, OBP1 also noted, "The performance of the system in the cloud after you have achieved that migration is a critical success factor for a mission owner." Therefore, the cloud environment should provide the user with a user friendly, highly available, and

highly productive experience. OCP 1, 2, and 3 agreed that another critical success factor to be used by the mission owner when migrating systems to the cloud is moving an application at the appropriate time within its lifecycle to see the highest return on investment. OCP 1, 2, and 3 further insisted that timing system migrations with application lifecycle refreshes make applications high candidates to move to the cloud and this will see the most success since redesign of the system is often already planned for by the application developers and enables for optimal interjection of cloud services for transformation to a native cloud application. OBP4 warned that, "Making sure that you empower the mission owner to understand that it is not just a rush to the cloud, but rather how does it benefit the end-user."

Additionally, OBP4 stressed that,

> Making sure that as part of their strategy, they understand the impacts that are associated with moving their application, whether it be cost, whether it be the end-user performance, but there would be certain things that happen that cannot be overcome.

Additionally, OBP3 explained the importance of the mission owner, providing the cloud service provider CSP with all requirements and baselining all of those requirements. This helps the CSP understand the appropriate cloud environment for the applications and systems. Furthermore, OBP3 expressed that doing functional, volume, and stress testing prior to the network going live, when transitioning to a whole new network, is optimal to ensure the user experience would be better. This is helpful to involve the user and allow the user to provide feedback on whether or not the cloud services meet the requirements.

As I collected documentation from the interviews with the participants, I was able to meet methodological triangulation by finding that 11 of 37 organizational documents additionally supported the mission owner readiness theme. The documents revealed that many decisions needed to be made by the mission owner. Therefore, deciding to move to the cloud is a significant commitment for the mission owner for the transition to be successful. The *Office of the Federal Chief Information Officer Strategy | Federal Cloud Computing Strategy* document stressed that successfully managing cloud adoption risks requires collaboration between agency leadership, mission owners, technology practitioners, and governance bodies. This document is in alignment with the 10 participants who spoke about critical success factors that involved the mission owner readiness and the understanding of the stage of the life cycle of the application prior to transition, importance of the mission owner going through the application categorization process, monitoring the performance of the application prior to the transition and after the transition to the cloud, planning the funding and resources needed and lastly having an understanding of the capabilities needed for today and in the future.

Additional documents analyzed supported Theme 1. The *DISA Department of Defense (DoD) Cloud Connection Process Guide* document stated that

> Mission owners are entities such as IT system/application owner/operators or program managers within the DoD Components/Agencies responsible for instantiating and operating one or more information systems and applications which may leverage a CSP's Cloud Service Offering
> (CSO) in fulfilment of IT missions.

Additionally, the *Defense Acquisition University DoD Cloud Computing Acquisition Guidebook* suggested that mission owners should analyze applications that will be moved into the cloud to determine if any need to be refactored, modernized, or certified to run in a cloud.

Current scholarly literature indicates that complexity, compatibility, relative advantage, top management support, firm size, technical readiness, competitive pressure, and trading partner pressure, are the eight critical success factors that influence cloud computing adoption (AL-Shura, Zabadi, Abughazaleh & Alhadi, 2018). Amron et al. (2017) found that the most contributing factors for use of cloud computing are technology readiness, human readiness, organization support, environment and security, and privacy. Mission owner readiness continues to be a large contributing factor to success. Naveed and Ahmad (2019) stated that critical success factors for migrating to cloud-based eLearning were four dimensions, namely cloud service resilience, university technological maturity, university organizational readiness, and cloud-based e-learning imperatives. All these articles pointed to the readiness of the organization or human as a contributing factor to the success of the cloud migration.

Additionally, many SME leaders have difficulties in establishing an optimized and coherent strategy due to lack of time, methodology or know-how (Vasnier, Maranzana, Messaadia, & Aoussat, 2020) Therefore, mission owners have to come up with a strategy either on their own or with the assistance of an expert to keep moving the transition to the cloud forward. The strategy should be clear and concise to everyone involved in the transition. Many of the participants mentioned the importance of daily

meetings to keep the project team informed at all times. Likewise, the participants stated that they had daily meetings with the senior leadership to inform them of the status of the project as well. Therefore, the strategy, vision, goals, and even obstacles were made known to all stakeholders. The literature further supports the importance of the mission owner readiness of an organization as a critical first step in the strategy to move systems to the cloud.

The mission owners and project managers' readiness and perception of the benefits of selecting systems to migrate to the cloud impacts the success of selecting systems to move to the cloud, which is in direct alignment with the perceived use concept of the TAM theory used in this study. TAM is built on the Theory of Reasoned Action, positioning PU and PEOU as the main determinants of BI (Vasnier, Maranzana, Messaadia, & Aoussat, 2020). The mission Owner and project managers have to consider the cloud environment as something of value to them and something that is not too complex for their users. The information from the interviews included details about the importance of mission owners' readiness to transition to the cloud, the value of championing from leadership, and the hands-on involvement of all stakeholders. The TAM model provides insight to predict systematic characteristics that affect the attitude and behavior of using information systems (Bui, Nguyen, Tran, & Nguyen, 2020). The participants stated how the senior leadership celebrated their successes along the way, which had an impact on their attitudes and behavior towards the new cloud environment.

Gkika, Anagnostopoulos, Ntanos, and Kyriakopoulos (2020) explained that the use of the TAM could help understand the factors that influence end user’s technology

adoption. Many participants spoke about how they met with their users to capture detailed information about the systems and applications that needed to move to the cloud. The meeting with the users helped them record the correct requirements and understand the limitations of the applications and systems. Those upfront interactions help influence the end user's adoption of new technology. Additionally, the TAM model assumes that when someone learns a new technology, several factors will influence his or her decision to use it (Binyamin, Rutter, & Smith, 2019). Participants mentioned several factors that impacted the user's willingness to use the cloud environment; they included upfront interactions with the user, constant engagement, resolving issues quickly, championing at all levels of leadership, and expertise in getting the job done effectively with minor impacts to the user.

The documentation, participants, and scholarly literature support Theme 1 by showing the mission owner's readiness and includes multiple other factors. Understanding what the application or system does, its use, its life cycle stage, and security posture is key to first selecting what application should be selected to move to the cloud. Additionally, understanding the requirements of the users and capabilities that the cloud service provider offers is key to selecting the right CSP model. Furthermore, ensuring the user has an understanding that changes may have to occur to the application or system before the transition to the cloud helps with expectations and the user's attitude towards the migration to the cloud. Furthermore, knowing the application service levels that an organization has and service level goals that the organization wants to meet in the cloud is instrumental to an organization's success. The final recommendation from

participants was to make sure a meeting included lessons learned at the end of the project to capture the successes and failures so that processes can be continuously improved.

Theme 2: Industry Expertise

The second theme discovered during data analysis was industry expertise. Industry expertise is significant because the industry is much more familiar with the cloud services offerings, so it is best to seek their expertise.

OAP2 stated that,

> The overarching strategy to make the decisions to determine the processes that are needed to place specific systems in the cloud boils down to commercial best practices and acknowledging that the federal government is not really the leaders in the cloud and are really riding the coattails of the industry.

OAP2 explained that in terms of an overall strategy, they look at what industry is doing and what's out there, but both from a process and procedure perspective and then leading to the actual tools that are in use.

OAP2 further stated that,

> To improve on the strategy that is in used for transitioning to the cloud, a mission owner should leverage industry best practices by maintaining the engagement with industry via meetings on what the latest best practices are and a continuous model for maintaining an awareness. This theme was shown by all interview participants highlighting the importance of industry expertise (see Table 2).

Table 2

Frequency of Occurrence: Theme 2

Data Source	Total number	Frequency of occurrence
Interviewees	10	10
Documents	37	10

Likewise, OAP3 recommended, “Mission owners should use programs that allow you to hire industry experts into the government to help understand the requirements associated with moving a system to the cloud.” OAP3 also asserted, “We leveraged consulting services like Gartner and those types of engagements for mission owners to learn how to transition to the cloud.” OAP3 stated that, “The consulting services will help the mission owner understand what it takes to get to the cloud, how the industry does it, and how you select the system that is best fit for the cloud.” Similarly, OBP4 indicated to use risk-based analysis automated toolsets, and it is best to bring in the commercial industry to automate the process and to quantify better how those applications are. OBP4 also stated the commercial industry could recommend what the benefits are for those applications or what the risk to those applications would be in a commercial cloud environment if they do not modernize or if they maintain their current state. OBP4 further highlighted that mission owners bring in the industry to ask them about their recommended approach and to study with Gartner and different consulting expertise to look at how the commercial industry is training their workforce. Additionally, OBP4 explained, “Most industry trends are on a strong centralized managed CIO and CTO

platform, yet the federal government specifically took a while to adopt that and their responsibilities of that centralized management."

OAP1 expressed that,

> Probably the most important functions though are not the technical functions, one is finding the right people with the right skills to do the planning, design, development, and implementation which involves updating some of the position descriptions working with the HR team to include new technologies such as the cloud.

Additionally, OAP1 explained that they have gone to Amazon and Microsoft and Oracle, but mostly Amazon and Microsoft, to have some of their cloud training. Therefore, the benefit of using industry expertise comes along with the automated tools and training when moving applications to the cloud.

The federal government procured the SAP NS2 Secure HANA Cloud (SHC), an offering for customers to move their applications and infrastructure workloads to the cloud securely. AWS GovCloud (U.S.) is available through the SHC offering (Amazon Web Services, 2020). OBP3 stated that they sought out highly motivated small businesses that could lead the work for them and that had expertise and access to SAP NS2, everything else went to the back burner, they threw all of their resources at it to make the business impact. OAP3 stated that there are federal government program offices that are responsible for executing the federal government cloud policy and ensuring oversight of the total cloud implementation for the entire Program Office (PO). They are making training available to everyone. Similarly, OBP4 declared that there is

goodness in doing a cloud smart strategy to support understanding and getting organizations trained. OBP4 stated that the federal government project offices are responsible for the enablement of commercial cloud services and helping with the enterprise training and education and opportunities for mission owners, CIOs, and different participants to move their applications and look for the benefits of using the commercial cloud.

The organizational documents that were analyzed also supported Theme 2 and allowed for methodological triangulation of this theme as well. Out of the 37 documents, 10 specifically stated the benefits of involving the industry in the migration process. The agency's *Commercial Cloud Services BPA – Efficient, Easy to Use, Saves Money* document states while the government commonly modifies IT solutions, cloud computing works best if it is bought as is, as the industry would use it. This new approach to procuring cloud solutions is a cultural change for the department. The *Cloud Joint Enterprise Defense Infrastructure (JEDI)* document states that DoD will implement the Joint Enterprise Defense Infrastructure (JEDI) as a commercial General-Purpose enterprise-wide cloud solution for the majority of systems and applications. An industry partner also will be required to implement the General-Purpose cloud due to complexity and DoD's lack of large-scale, enterprise, commercial cloud experience. The agency's *Achieves Historic Milestone in ERP Cloud Migration Delivering IT Modernization Results that Matter* document emphasized how the ERP team cut the projected timeline to migrate ERP to the cloud nearly in half through innovative approaches to problem

solving. It also stated that close collaboration with integration teams, network engineers, and industry partners created a quicker timeline.

The *Cloud JEDI* document warned to leverage commercial industry best practices to avoid vendor lock-in, leverage commercial technology, and capability whenever possible, maximize competition. These practices helped the DoD get the best value possible, leverage industry open standards, provide maximum flexibility for future innovation, and independently assess the delivered services to ensure data security. Furthermore, the *Cloud JEDI* document stated that the cloud pay-for-use cost model provides greater agility in adapting to changing priorities, budgetary conditions, and industry developments. The *Strategy | Federal Cloud Computing Strategy* document mentioned that agencies should also feel comfortable leveraging vendors involved in cloud migration activities to provide or support training for current employees. Additionally, the *DoD Cloud Computing Acquisition Guidebook* is a great reference for executive sponsors, project managers (PMs), contracting officers (COs), and their staffs to comprehend cloud acquisitions and related deployments. It also provides a snapshot of a list of various cloud computing services, platforms, and technologies training.

Industry expertise provides consulting services to help the federal government easily transition to the cloud with minor setbacks. Current scholarly literature shows the U.S. federal government CIO set up a working group of cloud computing and appointed a cloud computing CTO to coordinate the cloud computing industry and the government's IT services (Lv, Li, Wang, Zhang, Hu & Feng, 2018). Therefore, working groups within the government, including federal government employees and industry experts, play a

major part in the preparation, collaboration, design, implementation, and sustainment of the application or system in the cloud. These working groups allow the working group members to receive various perspectives, so the combined perspectives of others can select the best path forward. The rise of cloud computing has created an environment where small companies are better able to build products that can work for public agencies big and small (Miller, 2018). As a result, it is essential to allow industry experts to assist with preparing the federal government for the continuous transition to the cloud environment.

Government organizations very commonly lack trust in technology, enthusiasm to fund the new technology, in-house expertise, and the absence of regulatory authority (Sharma et al., 2016). Consistent with many of the perspectives of the participants. Although the government has very talented IT staffs, the specialized experience to migrate systems to the cloud with the federal government just does not exist at the level that it exists in the commercial industry. Therefore, the collaboration with industry expertise is critical to the success of selecting applications and systems to move to the cloud. Nieuwenhuis, Ehrenhard, and Prause (2018) insist that technical consulting regarding IT security, interface development, customizing, and data migration is still demanding by clients. Therefore, the expertise of customers' workflow and industry-specific business processes is indispensable (Nieuwenhuis, Ehrenhard, & Prause, 2018).

Kalogiannakis and Papadakis (2019) argued that TAM is one of the most popular theories that are applied extensively to explain the factors responsible for the adoption of technology, which is why it continues to explain the selection of this theory for this

study. Many works of research have demonstrated that perceived usefulness and ease of use influence the ways users accept a new innovation or system. This theory suggests that computer usage is decided by a behavioral intention to use a system, which is jointly determined by perceived ease of use and perceived usefulness (Hussein & Hilmi, 2020). Without the expertise of the industry outside of the federal government, the participants mentioned how the transition was very slow, and there were many unknowns on how to meet the cloud migration goals. Additionally, many organizations rely on industry expertise due to their use of automation and numerous tools to make the migration to the cloud process easier. Many participants mentioned at least one automation tool that was used by industry experts to move their applications and systems to the cloud. Moreover, this literature supports the necessary presence of the commercial industry expert's involvement with effectively selecting systems to move to the cloud to ensure that there is a positive perception of the use of the applications and systems in the cloud.

Previous TAM studies indicate that if an individual perceives a system to be easy to use, he or she is more likely to perceive the system to be useful as well (Adams, Nelson & Todd, 1992). Furthermore, the larger number of adoption studies used TAM and is broadly used amongst numerous models and theories in the context of information system (IS) research because of its simplicity and comprehensiveness (Asadi, Nilashi, Abd Razak, & Yadegaridehkordi, 2017). Consequently, this is why the factors that contribute to the ease of selecting systems to move to the cloud ties into ensuring that organizations have the industry expertise to minimize the problems that may occur and the complexity with moving to the cloud. Industry expertise also comes with automated

solutions and certifications that include training. The participants also mentioned that they were able to embed the industry experts into their teams for even more hands-on experience and on the job training.

The data, perspectives of the participants, and scholarly literature support Theme 2 by arguing that industry expertise is not an option; it is a recommended requirement. The industries already have an understanding of the cloud and understand the benefits of the cloud, so allowing them to lead the implementation is a best practice that should be adopted by the government agencies that are considering moving applications to the cloud. Having industry experts also embedded in the government team is monumental to continued support and training. Industry expertise is not a nice to have decision it is considered a requirement for success.

Theme 3: Planned Funding

The third theme discovered during data analysis was the planned funding that needs to occur to implement the application in the cloud environment. Planned funding is vital because the funding must include the cloud services, experienced staff, technology refresh to hardware, and training for the systems to be selected to move to the cloud successfully. OBP2 stated, “You have to have an upfront investment cost that's really called transformation because you have to put money ahead to be able to get cost savings later on down the road.” OBP2 additionally advised that the strategy always comes down to cost and being able to meet with the policies associated with IT and the actual IT technical strategy. OAP1 expressed the use of the data, how much of the data,

the volume that is in the data is important, especially to the cost and sustainment costs of cloud usage.

OAP1 also cautioned,

> You have to work with the right people to find the right tools then you will be able to get access to those tools to do that work, and then you have got to be able to obtain the funding to do the work and secure the funding to do the work in the out years.

Lastly, OAP1 indicated, “If you know if the system owners, the stakeholders are not fully on board, and if you do not have the money, then you are not going to be able to get the people the tools they need to get the work done.” This theme is shown by all interview participants' agreement that planned funding is essential for success (see Table 3).

Table 3

Frequency of Occurrence: Theme 3

Data Source	Total number	Frequency of occurrence
Interviewees	10	10
Documents	37	4

OBP2 emphasized,

> Success factors include the cost, and it is the things that people normally do not think about, and it is the costs associated with not just the operation on a yearly basis, but planning for technical refreshes since the federal government at large does not like spikes in budgets. Technical refreshes are spikes in the budget to the

> federal government, so they do not like seeing that, they like seeing the budget smooth, and so it always was a fight to address technical refreshes, but now we do not have to really deal with that from a cost perspective."

Additionally, OBP1 emphasizes, "Cost benefits are associated with not just the operation on a yearly basis but planning for technical refreshes, which are handled by the CSP, avoiding budgetary spikes in your IT budgets." OAP3 explained, "We have individual systems all within the same program under the same portfolio umbrella funding source, resources that distributed amongst the different systems and program managers." OAP3 further explained,

> So now we need to look at our capacity, our usage and consolidate, remove duplication, those sorts of things and consolidate the solution and come up with a shared service construct either within the PO level or within portfolio level as a part of this entire digital transformation effort.

OBP1 noted, "The first programs that moved to the cloud took a long time because there were a lot of firsts, and as the federal government has done more, they have gotten better with streamlining and reducing the time actually to get a system into the cloud." OBP1 further stated, "So if it does not take too long to do, it does not cost too much." OBP3 stated, "The key to understanding systems, for example, … ERP is the complexity cost it would take to undo the customizations and as well as what return would it give you." OCP 1, 2, and 3 stated, "Both industry and government managers are working together to operate within the contract bounds to solve the consumption model for how to handle IT procurements in the future." OCP 1, 2, and 3 further agreed,

"Selection of our systems and services for migration to the cloud is primarily business case driven." OCP 1, 2, and 3 stated that they ask, "Can we provide more value at the same cost, or can we provide the same service at a lower cost?" Lastly, OCP 1, 2, and 3 warned that external factors of funding and authorizations play a large role as an external factor to moving systems to the cloud, but they are not unique to the cloud. OBP4 found that there is a need to get away from program managers making decisions about IT-based on insufficient data and insufficient understanding of what a commercial cloud environment is. OBP4 further stated that there is a need to work on contract officers and legal representation to make sure that they understand how commercial cloud companies are selling units of IT or how using the costing and billing model is working from specific IT companies. OBP4 recommends working with the Defense Acquisition Workforce Development Fund (DAWDF) funding staff and identify funding streams to create more opportunities, not just for a single commercial service provider, but really to focus on the domain expertise of commercial cloud as a business for the federal government. Additionally, focusing on folks that would not necessarily be viewed as training candidates from an engineering standpoint to support commercial cloud. Likewise, OAP3 stated that the federal government, as a whole, has invested a lot of money in terms of cloud training.

As I collected documentation from the interviews with the participants, I was able to meet methodological triangulation by finding that four of 37 organizational documents additionally supported the Planned Funding theme, which represented all organizations. The documents revealed that advanced strategically planning for funding the transition to

the cloud environment is necessary. Successful IT migration strategies require buy-in from senior leadership, the CIO, and the CFO to provide funds and backing for the migration effort; A communications strategy to inform and continually engage stakeholders and a vendor management plan to ensure contracts align to migration strategy (CIO Council, 2019). The *Application Rationalization Playbook* stated that a full technology business management (TBM) implementation of all IT expenditures would provide a baseline of application portfolios aligned to business value, detailing the Total Cost of Ownership (TCO), and a breakdown of the infrastructure components and IT services. The *Application Rationalization Playbook* further states that if agencies do not account for the non-IT costs relevant to their applications in determining TCO, they may struggle to capture the true cost of their applications in any future-state scenario. The *DoD Cloud Strategy Overview* documented stated that systems and applications that are not "cloud-ready" will likely use excessive cloud resources and be more expensive to operate. The *Department of Defense Use of Commercial Cloud Computing Capabilities Services* document recommended the metric, Value through Cost Savings/Cost Avoidance, which will provide a measure of the financial value of transitioning data and applications to a commercial cloud environment. The data results can then provide a true assessment of the total cost of selecting systems and moving them to the cloud. Additionally, the participants in the research named a system requirements specification (SRS) document as the recommended document to capture the baseline system requirements, business goals, and other requirements, so it should be a document to refer to for the total cost of moving to the cloud.

Current scholarly literature indicated that in the past several years, the ecosystem of government-serving technology companies has seen an undeniable rise in financing activity, and it has been taking many forms: bigger deals, more investors, more companies, new ideas (Miller, 2018). Acceptance of cloud computing is shaped by viability, which in turn, formulates perceived technological appropriateness, organizational inertia, and cost (Mohammed, Alzahrani, Alfarraj, & Ibrahim, 2018). The understanding of cost associated with cloud computing are not that common in the government environment. As Kauffman, Ma, and Yu (2018) warned, cost-benefit estimation in cloud computing is likely to be complicated. Government organizations have been shifting to cloud-based services to reduce their total investments in IT infrastructures and resources (e.g. data centers), as well as capitalize on cloud computing's numerous rewards **(**Jones, Irani, Sivarajah, & Love, 2019**).** Therefore, Jones et al. (2019) recommend a properly conducted cost-benefit analysis study, which robustly identifies costs, value, and benefits from the implementation of new technology. The cost benefit analysis study enables organizations to understand the full cost impact and any cost savings of the system.

Cloud computing includes various hidden costs, such as support, application modifications, disaster recovery, and data loss insurance (Avram, 2014). So, when planning the funding for selecting applications to move to the cloud, there should be a detailed overview of all costs that are related to the cloud, which includes continuity of operations when a disaster occurs. Researchers have used various factors to calculate the cost of cloud computing, including the base cost of computing resources, the cloud

implementation cost, the usage cost, and the cost of keeping the current infrastructure as is (Ray, 2016). OAP1 stated, "The mission owners or applications that have a large volume of historical data, costs involved with the cloud could start creeping up there if you get into several terabytes of data." Therefore, many of the participants urged that planning the funding can at least prepare all stakeholders for possibly higher upfront cost and then cost leveling out as more data on cloud services usage is revealed.

The TAM aims at tracing the impact of external factors on internal beliefs of the end-user and their attitudes (Gkika et al., 2020). TAM is in alignment with the planned funding theme because if the funding is too difficult to obtain or understand, the mission owner or project manager could lose hope with trying to fund the cloud migration initiative, and other stakeholders would lose hope as well. Similarly, many research studies have proved that perceived usefulness and ease of use influence the ways users accept a new innovation or system which suggests that computer usage is decided by a behavioral intention to use a system, which is equally decided by perceived ease of use and perceived usefulness (Hussein & Hilmi, 2020). Many participants mentioned, they strategically planned their funding, and their migration was championed by leadership and stakeholders once the ease of use and usefulness of the cloud was understood. Therefore, their perspective towards the transition of moving systems to the cloud outweighed the true reality of the changes that may have impacted the application or system.

Cloud technologies were designed specifically to be easy to use and useful, so these classic TAM factors, perceived usefulness and perceived ease of use are constant

(Ho, Ocasio-Velázquez, & Booth, 2017). The participants stated that there will be times that the funding may include other funding sources for potential training and other cost, however, as long as other resources are in the planning, the funding will still be simple to identify and execute. The TAM is devoted to identifying barriers and enablers to the adoption of new technologies in a particular setting (Rodrigues et al., 2016). Funding can sometimes be a barrier within the federal government due to the many approvals that have to occur before the final approval. So, planned funding when pursuing any large project is best to keep stakeholders moving forward without worrying about whether they have funding.

Planned funding may appear to be an obvious area of consideration to ponder when selecting systems to move to the cloud, but an organization can easily underestimate cost. Many of the participants stated that it is best to set the expectation that the cloud costs could actually increase initially depending on what the supporting infrastructure is, network devices in place, and other hardware and software upgrades that may need to happen. Industry partners, interagency working groups, and individual agencies have provided the federal IT and acquisition communities with a wide selection of recommended actions to accelerate the adoption of cloud solutions (Office of the Federal Chief Information Officer, 2019). So, utilizing published documentation is recommended to capture the total cost of ownership. This literature further connects the data that argues the significance of planned funding in the selection of migrating systems to move to the cloud. The documentation, participants, and scholarly literature support Theme 3 by presenting the tasks and training in the planned funding and the stakeholders

that should be involved in the funding process. Considering the funding needed upfront will ensure that the mission owner or project manager will have adequate funding for all aspects of funding the transition to the cloud.

Theme 4: Application Categorization

The fourth theme found during data analysis was the application categorization process. This process is also known as application rationalization and is essential for current and legacy systems to migrate to the cloud because of the detailed evaluation process. Without the detailed evaluation of the application, there can be unknowns about the application or system that could have an impact on the success of the transition. Therefore, the upfront investigation is vital to meeting cloud migration goals. Theme 4 shows all interview participants highlighting the benefits of understanding all the characteristics of the application for the mission owner and project manager to plan the path that should be taken for the applications or systems to move to the cloud (see Table 4).

Table 4

Frequency of Occurrence: Theme 4

Data Source	Total number	Frequency of occurrence
Interviewees	10	10
Documents	37	10

OAP3 states that some of these federal government legacy systems are mainframe systems with Cobol. OAP3 further stated that some of them require an actual dedicated

machine, but that has to be understood, so there's a process called the application rationalization process that helps evaluate each application. Likewise, OCP 1, 2, and 3 stated that "Application Categorization is a useful exercise we have utilized to categorize an application into one of the following buckets: Retain, Retire, Re-Hosting, Re-Platforming, Refactor, Re-Purchase." Categories outside of Retain and Retire identify the applications that are candidates for migration. Categorizing ideally also is done by both systematic data gathering and mission owner interviews. OCP 1, 2, and 3 further agreed that timing and application categorization are two of the most critical factors to migrating systems to the cloud.

While OBP4 recommended to,

> Empower the mission owners that are responsible for making decisions to migrate systems to the cloud by providing certain activities of just risk-based analysis to say here's where you could make the decision or here's where it would work to support in a commercial cloud environment.

OAP2 stated that, "Related to legacy systems, we have identified what systems to move, and in our case, our preferences are to buy new, cloud-ready applications, but there are certainly cases where we will shift applications or systems into the cloud." Many of the applicants explained that it depends on the current state of the applications as to whether or not they are cloud hostable or if they have to encapsulate the application to make them cloud-ready or virtualizable. Additionally, OAP2 recommended that one possible strategy for moving legacy systems to the cloud includes following the lift and shift

process, but it is not immediate. It's best to stand up an instance and then connect to that cloud-hosted system and gracefully close down access to the Legacy system or systems. OAP1 stated that,

> What we are finding that's really driving everything right now, is cybersecurity, so the first targets that we go look to do these kinds of improvements or migrations on are the systems that we have difficulty maintaining good cybersecurity over." Those are and have been the initial targets to select to perform a migration.

Applicants mentioned that the analysis involved looking at systems without a large volume of historical data. The systems with a large volume of historical data required more analysis and engineering work with some of the cloud providers prior to transitioning them to the cloud. The applicants explained that many of the systems where people know what the system does, but they do not know why it does it. So, it's important just to understand what the system does today, and really understand why it does it and taking that and doing that capability of the system in a new and better way, in a new system in the cloud is the goal. Furthermore, they emphasized that a major piece of a successful migration is understanding the data is there, the usage of the data, and where to clean the data before it gets migrated. Lastly, OAP1 stated, "Understanding places where we do not really know the authoritative source of the data is a piece of a successful migration as well."

OAP3 explained that,

> Their program hired a system integrator. System integrators are contractors that

> do the detailed work and administration of the actual work. They perform the analysis, and they present all the findings and all that information to the federal government. When you have a whole slew of legacy systems and those legacy systems comprise multiple applications, you do not know if those applications are either current with current support, patched or if it is a customized application or if it is a commercial off the shelf application that you can just plug and play with minor configuration.

Many of the participants explained the importance of understanding what type of operating system the applications operate under because of the impact it has on how you choose the cloud provider." Additionally, the participants stated that some cloud providers are stronger than others, so you have to consider, for example, a Microsoft type environment versus a Linux type of environment, and they are all pretty much equal, but some are stronger. Therefore, it is important to understand the state of the application before migration and if it is hostable in the cloud.

> OAP3 further stated, "A whole lot of tools are now available in the market from certain vendors that are deployable on legacy systems." OAP3 explained that, "What it does is it performs an analysis on the state of the application, and it gives you feedback on the state of that application whether it can be easily lifted and shifted or refactored." OAP3 expressed, "Migration tools will give you an idea on the way to migrate, provides you an analysis, and the best way to migrate the systems." So, it does make it easier now to migrate than it was before.

OCP2 stated, “25% of our data centers have unique operating systems, so they are the heaviest lift, so those would be the last people we would worry about moving to the cloud.” However, they use Splunk and some other tools to report on the characteristics of systems to make migration decisions. OCP1 suggested that, “AWS has made Cloud Endure available because they recognize that we cannot migrate these legacy applications into their environment without the assistance of different tools and automation based on the size.” OCP1 continued, “So they are making these tools available to us.”

OBP1 stated that,

> They migrated systems by using a phased approach. They did not do all of their programs at once. They prioritized them in a phased approach, program by program. OBP1 explained, “We tried not to do a lift and shift to actually take advantage of what the cloud has to offer.” OBP1 further emphasized, “Really old systems that do not lend themselves well to the cloud environment, we have done some modernization to their architectures before bringing them into the cloud, so they are in a better position at taking advantage of the cloud and the core cloud services available.

OCP 1, 2, and 3 recommended approach was to refactor to take advantage of all the cloud offers, but this is often difficult due to resource constraints on the application owner. Asking them to maintain an existing system, while refactoring for the cloud is not always possible. OCP 1, 2, and 3 recommended, “When systems must come over as-is, we recommend a fresh build in the cloud for the cleanest configuration.” This approach supports migrations to serverless computing and managed database offerings. OCP 1, 2,

and 3 further recommended once the system and applications are available in the cloud, data migration from the legacy site includes tools such as Snowball for large amounts of data or direct file transfers over the wire. OCP 1, 2, and 3 stated, “Bulk transfer system data via Snowball and then follow up with synchronization over the wire.”

OCP3 recommended a fresh build in the cloud from the operating system up and then just move the data over. OCP1 highlighted to utilize a cloud-ready checklist and meet with the mission owner and just review the architecture of the system and the network requirements to talk through where they should transition.OBP3 stated,

> We did a lift and shift to migrate applications.” OBP3 explained, “We took everything off of the on-premise, and we moved it all into the cloud all at once because we could not break apart our system into functionalities because it was an integrated environment. We did a complete lift and shift, referred to as a technical refresh, because we leveraged new platforms, for example, like Suite on Hana, new technologies going from a relational database to columnar.

In every organization, the solution that was selected was unique to the organization, so it is important to know what matters to the organization and how success looks.

As I collected documentation from the interviews with the participants, I was able to meet methodological triangulation by finding that 10 of 37 organizational documents additionally supported the application categorization theme. The documents revealed that application categorization was essential to evaluate each application and system that are potential candidates to transition to the cloud. Documents that were analyzed that supported Theme 4 highlighted the upfront assessment of applications and systems. The

Application Rationalization: A Strategic Approach to Agency Cloud Migration document states there is no one-size-fits-all process for application rationalization, so agencies must tailor their approach to fit their unique mission, business, technology, and security needs. The *Application Rationalization Playbook an Agency Guide to Portfolio Management,* stated to achieve the benefits of application rationalization, agencies require cultural buy-in from across the organization. The *Application Rationalization Playbook* stated that it is a practical guide for application rationalization and IT portfolio management under cloud smart. It intends to help Portfolio Managers think through their agency's approach to IT modernization. The CHIPS Articles: *Application rationalization key to cloud migration success* included the statement that application rationalization is the most important factor in migrating a legacy application to the cloud, and application rationalization also provides leadership with insight on how migration impacts manpower requirements. *6 Strategies for Migrating Applications to the Cloud* document explained that enterprises typically begin to contemplate how to migrate an application during the second phase of the "Migration Process"—Portfolio Discovery and Planning. The Discovery and Planning are when they determine what's in their environment, what are the interdependencies, what's going to be easy to migrate and what's going to be hard to migrate, and how they'll migrate each application. The *6 Strategies for Migrating Applications to the Cloud* document further explained that the six most common migration strategies are Retain, Retire, Re-Hosting, Re-Platforming, Refactor, Re-Purchase. The *DISA Migrating Applications to the Cloud* document states that

application rationalization data should help to decide which apps get funding for modernization.

Current scholarly literature researchers recommend cloud education, support, and training, which is orientated both to the cloud application and to its use within a business context (Jones et al., 2019). Cloud service providers like Amazon web services, rack space hosting, windows Azure will provide a lot of services like Computing, Database, Storage and Content, Delivery, Management Tools, Security and Identity, Analytics, Application Services, etc. (Febin, Jacob, & Vijila, 2017). So, utilizing the services that the provider has is best when categorizing applications. Additionally, cloud risks vary with deployment, and the effect of risk on an organization is dependent on factors such as data sensitivity, cloud architecture, and implemented security controls (Akinrolabu, Nurse, Martin, & New, 2019). Therefore, taking the time to evaluate the application or system prior to selecting it to migrate to the cloud is a vital task.

During the review of applications and systems, the result may be that a Hybrid cloud solution is better suited for the applications or systems in the cloud. Hybrid clouds allow IT leaders to govern their mission-critical data and applications while leveraging the scalability and flexibility of internal and external cloud computing resources (Chandrashekhar, Gupta, & Shivaraj, 2015). Likewise, OAP1 also stated that some systems data are there for historical purposes and not used very frequently, so possibly a hybrid cloud can be used where some of that seldom-used, but necessary historical data actually will not reside in the cloud, but the user community will have access to it. Applications of cloud computing vary from industry to industry as well as from workload

to workload (Mohlameane & Ruxwana, 2014). Similarly, hosting complex applications in the cloud may surge support and network redundancy problems (Ray, 2016). Therefore, the application categorization can reveal unique results according to the application or system and how the application or system is used and will perform in the cloud. This detailed information is just more reason why the application categorization process is so important.

The use of information technology depends on the user‘s willingness to use it, which is relevant to his or her attitude and perceived usefulness. Attitude is a combination of perceived usefulness and perceived ease-of-use. The user's perceived usefulness is affected relatively by his or her perceived ease-of-use, along with other extrinsic stimuli (Jou & Wang, 2013). TAM has indeed provided the fundamentals to the extended theories that have enabled a clearer understanding of the beliefs, attitudes, and intentions of the users (Legris & Ingham, 2003). Therefore, in this research, the application categorization process was a variable influencing perceived ease of use.

TAM by Davis is extensively studied and adopted for its simplicity and predictive accuracy in the field of technology acceptance (Wang, Lew, Lau, & Leow, 2019). Researchers throughout the years tested the TAM model extensively and effectively, and many of the results support the main claims of the theory. The application categorization process can quickly impact the user's attitudes about moving to the cloud if the process is not governed well

and does not include the requirements of the users. So, taking the time to allow the users

to answer questions about the application or system that they will use in the cloud is significant for their acceptance of the transition and the mission owner or project managers' understanding of the application. Additionally, it is best to ensure that all stakeholders are comfortable with the transition and recognizes that it will be an easy transition if proper planning takes place. The documentation, participants, and scholarly literature support Theme 4 by showing the significance of going through the application categorization process. It saves valuable time and avoids rework. Application categorization also helps to eliminate the applications that should not be considered for the cloud and possibly retired, refactored, or repurchased. Furthermore, understanding the resources and funding needed for the application will assist the project manager in planning the proper timeline for the transition.

The findings show that many of the study's participants agree on various factors of selecting IT systems to move to the cloud, which includes ensuring that all stakeholders are ready to move to the cloud, senior leadership championing the cloud projects and praising successes, understanding the total cost, and clearly explaining expectations to the stakeholders. Additionally, other factors include training and lessons learned after and during the implementation phase, bringing in outside industry expertise, an in-depth application categorization process, and continuously collaborating with all stakeholders that are involved in the process to promote the value of the cloud. After the successful implementation of the ERP presence in the cloud, many federal government organizations are planning to move to the cloud, so the strategies to be successful at selecting systems to move to the cloud are warranted. IT project managers' task to move

to the cloud was mandated in the cloud first and cloud smart guidance to the federal government. Consequently, IT project managers need to consider how they can provide more continuous uninterrupted IT cloud services such as finances, human resource management, supplies, contracting, maintenance, and much more to organizations and other users.

Applications to Professional Practice

This study intends to address the specific IT problem identified in the problem statement, that some federal government IT project managers lack strategies to select systems to migrate to a cloud environment. The participants in the study provided their strategies and best practices that IT project managers could utilize to make swift and effective decisions to select systems to move to the cloud environment. The application to professional IT practice from this study may benefit federal government IT project managers and mission owners by highlighting the awareness of strategies for migrating IT systems to a cloud environment. The results from this study showed that deciding to move systems to the cloud requires the full support of senior leadership and the project managers' commitment to moving to the cloud.

Although the interviews consisted of participants in three different organizations, they all agreed that funding was also the main resource that had to be accounted for well in advance to plan, design, implement and maintain an application or system in the cloud. Likewise, they all exclaimed that the cloud environment is not the business that the government has expertise in, so utilizing a system integrator or industry expert is the best practice.

Furthermore, the findings revealed that the application categorization or application rationalization process is vital to evaluate each application and system that is selected to move to the cloud. They all agreed that an understanding of the application helps with planning the who, what, where, when, why, and how questions about the application or systems. The application categorization eliminates wasting time on trying to host legacy applications in the cloud when they should just be refactored or replaced. Categorizing the applications before selecting them to move to the cloud also helps identify the applications with the intricacies that are not quite like other applications. Likewise, the process allows learned lessons about how applications best fit in the cloud environment. The use of clear-cut strategies will allow organizations to improve the processes, procedures, and resources needed to move to the cloud. Proper planning can increase the transition rates of moving systems to the cloud, and documented policies and instructions can provide better cloud and data management governance. Therefore, the strategies presented by the findings from this study may improve professional IT practice by expanding the knowledge of what strategies should be used to select applications and systems to move to the cloud.

The noteworthy findings from the study revealed strategies that are currently used by federal government organizations that have implemented applications and systems to the cloud environment. IT project managers and mission owners who are responsible for transitioning their applications and systems to the cloud require the proper detailed strategies and knowledge on how to transition systems to the cloud in a more conducive way. Sharing these transition strategies from a federal government organization that has

successfully transitioned applications to the cloud will show other organizations how to effectively transition their systems using specific examples from the results in this study. The results from this study also provide IT project managers and mission owners with a set of strategies or best practices to understand the policies to follow, the buy-ins to obtain, the available training resources, the post-implementation lessons learned meetings and strategies to consider for cloud migrations. Findings from this study may also encourage IT project managers to consider the full picture of what transitioning to the cloud looks like and improve federal government organizations' cloud transition initiatives.

Implications for Social Change

This study's findings increase the existing literature for the federal government and the commercial industry organizations by providing information and knowledge on strategies for selecting systems to migrate to the cloud. The implication for positive social change from the results of this study may lead to home and workplace reductions of the carbon footprint by consolidating data and allowing it to be stored, managed, and processed remotely instead of locally. This may reduce the decentralized carbon footprint by placing the data at centralized data centers for multiple services such as software-as-a-service and platform-as-a-service. Furthermore, transitioning to the cloud environment and using a centralized data center may have a positive social change because it may allow easy management of the physical hardware, software, data and provide more visibility to keep the data secure. Without the physical machines spread out at different organizations and software residing on local computers, the system

administrators, network administers, and cybersecurity specialists may all concentrate on key network devices to maintain security updates, install new technologies, test new software and hardware and monitor the environment. The cloud environment and using a centralized data center may help reduce the security incidents, and outdated software that users might have that would introduce vulnerabilities. The centralized location may also reduce the carbon footprint that would usually be at every organization and household throughout the world.

Additionally, an implication for positive social change is that, by using this study's findings, IT project managers and mission owners may be able to increase the cloud migrations, better plan, and assess the decisions to move systems to the cloud in a more effective and conducive manner. The findings from this study may also encourage and increase a regular user perceived usefulness of applications and systems in the cloud. The more cloud presence within the government may allow more innovative applications and systems to serve the government employees, veterans, active-duty military, and retirees more efficiently. Additionally, acceptance of the cloud by more regular users may promote more adoption of cloud services in our society. The results of this research may also improve the awareness of implementing preplanned cloud migration tasks, milestones, projects, programs, and policies. The supporting documentation from the study connects the findings that resulted in the presentation of four major themes beneficial to successfully selecting systems to move to the cloud.

Transitioning more applications and systems to the cloud may allow more people to be able to collaborate continuously by having access to applications and systems at any

time of the day. The high availability, redundancy, and load balancing that comes with the cloud environments may ensure that we as a society continue to function in times when we are in desperate need of online technologies that may not be available on our local computers. Teleworking and staying at home have increased throughout the world due to the recent COVID 19 pandemic, so many people are learning that access to cloud technologies has allowed them to continue to work and stay in contact with loved ones and friends.

Recommendations for Action

As the requirement to select IT systems to move to the cloud increases for the federal government, IT project managers, and mission owners must understand how to implement strategies to move to the cloud. Mission owner readiness is required to nurture the project from beginning to end, so the mission owner must be able to accept the culture change of having a cloud environment. The mission owner also must be comfortable with relinquishing control of the organization's applications and systems to a CSP. The release of control is much more pleasing if a service level agreement is in place with the CSP, so that is a mandatory document. Mission owner acceptance is also a requirement with the unwavering shared support of the senior leadership stakeholders that are either sponsoring the project or a key stakeholder for the success of the project.

Project managers and mission owners must plan and identify funding needs to include required cloud services, technical refreshes, training, contracts, software licenses, and manpower. Further, organizations should encourage technical cloud recommendations and implementation proposals by industry experts. This includes not

only implementing the cloud for the federal government but also trusting the CSP with keeping the data in the cloud secure and maintaining the required service level goals.

Furthermore, strategies that were effective from this study's findings were that organizations must use the application rationalization process to understand what the application does, the operating system it resides on, why the application exist, the authoritative data sources it uses, the application and cybersecurity support it has and possible capabilities to host cloud services. Application categorization also will help an organization understand the impact that the application will have on the people and the mission of the organization. Application categorization is a critical requirement due to the existence of many federal government legacy applications. The legacy applications in some situations have limited staff expertise in support of the applications, so additional time may be needed to understand the capabilities of the application. Processes must also be updated to incorporate the strategy for selecting IT systems to move to the cloud using the most recent lessons learned. The process includes all key areas like engineering, software development, training, contracting, logistics, continuity of operations, financing, and other areas.

Data governance is still in its infancy stage, so organization leaders must enforce more monitoring and policies related to data and information management governance for moving IT systems to the cloud. As the government cloud environments continue to mature when applications and systems continue to transition to the cloud, metrics can assist with tailoring the performance of the cloud to the applications and systems that it hosts. External factors were also revealed in the findings and are best to consider in the

planning phase. Examples of external factors to follow are the government agency guidelines and policies. Therefore, it is best to consider these external factors while planning the cloud transition, especially when approvals from cybersecurity leadership are required. Cybersecurity approvals can become a very lengthy process, so as soon as the required security controls are known, a risk management framework package should be submitted. Additionally, personal biases from internal and external personnel about what they think is the best pick for cloud services and applications should not be encouraged. Likewise, bias on cloud services that internal and external personnel are familiar with can impact selecting the best applications and services, so this behavior should be shutdown immediately. Therefore, organizations must follow best practices and follow mandatory regulations or industry standards. Furthermore, organizations should have tailored local detailed organization policies related to strategies to select IT systems to move to the cloud to follow the required approvals that are unique to their organizations. Additionally, organizations must have a training plan for not only the technical staff that is dealing directly with the cloud technologies, but also for the business, finance, contracting, and logistics staff so that they are familiar with the business terms, plans, offerings, prices, packages, devices that are associated with a cloud environment. The training plan should also include a partnership with industry experts to have government employees learn at their facilities and industry experts learn at government facilities to increase the knowledge of the employees and to help improve the cloud environment services for all organizations. Lastly, remember that as organizations obtain their staff training and certifications, the cost of the training can be an annual cost,

and the cost of maintaining the certifications can also be a yearly cost. Therefore, including these additional fees in the total cost of ownership for transitioning systems to the cloud will keep the organizations staff trained and credentials current.

This study should grasp the attention of IT project managers who are responsible for selecting systems to move to the cloud, engineers, contract specialists, logisticians, financial specialists, and other government and non-government organizations with cloud related tasks. I will share the findings from this study with the case study organizations and study stakeholders via e-mail so that it may be distributed to IT project managers throughout the federal government and other areas of study. As appropriate, I will share the results of this study via presentations in my career that are related to selecting IT systems to move to the cloud. I also intend to share my findings when I receive surveys related to this topic or asked to participate in interviews related to this research. Additionally, I will share my research in public settings to groups of interest at conferences or seminars. Lastly, I anticipate that my research will be publicly available to organizations when they search for strategies that federal government IT project managers use to select systems to move to the cloud.

Recommendations for Further Study

This study was limited to exploring strategies for federal government IT project managers to select systems to move to the cloud. Additionally, this research was restricted at an unclassified level, so no investigation was done on any classified private cloud environments. Furthermore, there were limitations on how the detailed processes were conveyed to keep the security posture of the private cloud environment robust.

Therefore, my recommendations for further study include more research related to how federal government IT project managers cloud transitions are impacted due to the lack of cloud business processes to quickly execute contracts to hire industry cloud experts for both unclassified and classified environments. This can also be expounded on to further investigate the strategies or success rates of using embedded industry experts in the government workforce to recommend and implement cloud technologies. This research was widespread and was limited to exploring multiple cloud services options rather than the best cloud service offerings for transitioning specific applications or systems to an unclassified or classified cloud.

Additionally, this study was limited to large Federal Government organizations, so smaller organizations may have a different perspective on the strategies that they use for selecting systems to move to the cloud. Therefore, researchers may want to explore other government agencies strategies that they use to select systems to move to the cloud. This research was also limited to only 10 participants that were IT project managers, so future research could involve more participants with various roles related to transitioning systems to the cloud, such as engineers, contracting officers, training specialists, etc.

This research also was limited to organizations that successfully transitioned applications and systems to the cloud, so other researchers could investigate the organizations that have not successfully selected IT systems to move to the cloud. This would allow them to find out what their challenges are and how they relate to the success factors of this study. Lastly, this study was limited to more of a summary of the themes, but further analysis of the themes could provide more of the step by step procedures on

how to implement the themes in this study. Additional detailed scenarios would further explain how to implement the themes included in this study. The scenarios would also be helpful to show how to get back on track if there are delays with one of the key themes in the planning process.

Reflections

As I reflect upon this study, I have learned so much about the recent successes of the federal government race to implement systems in the cloud. I also learned that pursuing a doctoral degree is like no other degree. It requires a lot of research, determination, failures, successes, and self-motivation in the late nights when everyone has already gone to bed. Many times, I stopped and felt that I was in a deep ditch with no ladder or a helping hand to pull me up, but I was determined to complete the task. It is similar to my research since it seems that the government has also been fighting to complete the task of moving systems to the cloud for a while now and have now accomplished some of its cloud goals.

It was exciting to do this study because, as an IT professional, all of my participants are IT leaders with a wealth of knowledge that I would on a normal basis not get an opportunity to speak with in such an informal manner while at work. The opportunity was enlightening and greatly appreciated. Aggressively getting through the writing process helped me to understand and recognize the differences in good quality writing, which I have been able to apply to the IT and Cybersecurity policies and procedures that I have created at my organization over the past two years. The skills that I have obtained from this degree are evident in my professional career. Additionally,

learning about the different theories, specifically, TAM, has helped me understand how people interpret introductions of new technologies and why it can sometimes be an empathetic process to those that are skeptical of change or have to learn a new skill. During this study, it also was important that I pushed aside my IT professional biases so that I could listen to what the participants had to say without interruption about the issues, even if I agreed or disagreed. As a result of this study, I know there is a need for strategies to select IT systems to move to the cloud since there are IT project managers that have figured out the method to succeed. Unfortunately, the federal government is so big that sharing data and information is not always very timely or simple. Therefore, I am hoping that this study will contribute to sharing more information.

Summary and Study Conclusions

I wanted to pursue this study to highlight the strategies that federal IT organizations should use to select IT systems to move to the cloud. It additionally allowed me to present the importance of mission owner readiness, industry expertise, planned funding, and application categorization/rationalization to improve the likelihood of successful cloud implementations. Leadership support is needed to effectively push for the resources that the IT project manager or mission owner needs to be successful with their transition to the cloud. Therefore, continuous meetings to keep all stakeholders engaged is vital, especially when critical issues occur, the stakeholders will be more willing to help resolve them with a sense of urgency. However, if the IT project manager or mission owner organization is not committed to the cloud transition, the project will likely fail. Without the planned funding, the industry expertise will not be able to be

procured, so having unproductive resources and poor guidance will likely make the project fail as well.

Given the multitude of future applications and systems migrations to the cloud, the findings from the study should be beneficial for other federal government organizations and other industries. By utilizing the application categorization process, the organization will have a clear path to the capabilities needed in the cloud, the status of the application, and the resources needed for support. Many federal government organizations have both cloud hostable and legacy applications that they have to consider transitioning to the cloud, so the need for strategies is now.

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Appendix A: Interview Protocol

A: Pre-Interview Protocol

1. Obtain IRB approval to conduct interviews
2. Work with the gatekeeper to send an introductory email to the potential pool of participants
3. Respond to participants that want to be a part of the study with the purpose, my role, and their role
4. Coordinate the availability for interviews with the participants that return the consent form
5. Schedule interviews
6. Send a copy of interview questions to participants
7. Send a reminder email to participants 48 hours before the interview
8. Prep for the interview by planning to arrive area and set up an interview location

B: Interview Protocol

9. Arrive early at the interview location
10. Record the participant identification code to identify the participant
11. Introduce myself again and why we are doing the interview
12. Verify with the participant that they still want to participate
13. Thank participant and begin interview or terminate interview based off participants response

14. Let participant know that I will be recording the interview and why
15. Start recording and begin the interview
16. Look for nonverbal queues
17. Paraphrase or clarify questions as needed
18. Inform the participant of what happens after the interview

Appendix B: Interview Questions

1. What responsibilities do you participate in related to moving IT systems to the cloud?
2. What strategies did you use as an IT project manager organization to determine the processes that needed to be in place to select the IT systems to move to the cloud?
3. What strategies did you use as an IT project manager to quantify the requirements of moving IT systems to the cloud?
4. What are the critical success factors for effectively selecting IT systems to move to the cloud.?
5. What strategies do you use as an IT project manager to improve on the strategy to move systems to the cloud?
6. What type of strategies did you use to determine the training that is required to assist with effectively selecting IT systems to move to the cloud?
7. What strategies have you used to manage data and information management governance for moving IT systems to the cloud?
8. What external factors play a role in moving IT systems to the cloud?
9. What strategies did you use to determine how to migrate legacy systems to the cloud?

Appendix C: Letter of Cooperation from XYZ Command

XYZ Command

Contact: Participant Name

Date

Dear Mrs. Griffith

Based on my review of your research proposal, I give permission for you to conduct the study entitled "Strategies Federal Government IT Project Managers Use to Migrate IT Systems to the Cloud" with XYZ command. As part of this study, I authorize you to announce your study and request participation via XYZ command's email. Individuals' participation will be voluntary and at their own discretion. We reserve the right to withdraw from the study at any time if our circumstances change.

I confirm that I am authorized to approve research in this setting. I understand that the data collected will remain entirely confidential and may not be provided to anyone outside of the research team without permission from the Walden University IRB.

Sincerely,

Participant Name

Title
Number
Email

Appendix D: Introductory Email to Participants

Dear Participant:

Hello, my name is LaTonya Griffith, and I am an Information Technology doctoral student at Walden University. I have come to the phase of my doctoral program where I have to begin my study, which includes soliciting participants to be a part of my study in order for me to graduate. As a fellow government employee, I wanted to select a government agency that is innovative and that I would be honored to include in my research. The purpose of the study is to explore the strategies used by federal government organizations information technology project managers to select systems to migrate to the cloud. Your participation in this study is solely on a volunteer basis, and you can withdraw from the study whenever you decide that you are not comfortable with participating. Participation in the study includes an interview to allow me to collect data. The interview will be audio recorded, and then I will transcribe it to a confidential spreadsheet. I will also verify and seek your approval for all the data that I collect from you to ensure I have not misinterpreted your perspective. I would like to thank you in advance.

Sincerely,

LaTonya Griffith,

Walden University

Doctoral Student

Appendix E: Follow Up Introductory Email to Participants

Dear Participant:

Thank you for agreeing to participate in my doctoral study. I would like to find out your availability now so that we can schedule the interview. I am willing to meet you at your organization and would like the interview to be in a location where we will not be interrupted and for your privacy. I also would like to provide you with the attached interview questions so that you will have plenty of time to prepare your responses. Just a reminder, the purpose of the study is to explore the strategies used by federal government organizations information technology project managers to select systems to migrate to the cloud. Your participation in the research study could benefit the organization by sharing best practices to migrate systems to the cloud.

Additionally, please read the attached consent form and send it back when you respond with your availability. Please note that you have the right to withdraw from the study at any time for any reason without any consequences. If you need clarification or have questions about anything pertaining to the research study, please contact me. Thank you again for participating.

Very respectfully,

LaTonya Griffith

Walden University

Doctoral Student

Appendix F: Human Subject Research Certificate of Completion

CERTIFICATE

OF COMPLETION

PHRP Online Training, LLC certifies that

LaTonya Griffith

has successfully completed the web-based course
"Protecting Human Research Participants Online Training".

Date Completed: **07/05/2019**
Certification Number: **2832294**

PHRP
Protecting Human
Research Participants
Online Training